SRI VENKATESWARA COLLEGE OF ENGINEERING,

(An Autonomous Institution, Affiliated to Anna University, Chennai–600025)

B.Tech., Information Technology

CURRICULUM AND SYLLABUS

REGULATION – 2022

CHOICE BASED CREDIT SYSTEM

Curriculum Revision No:	01	Board of Studies recommendation date :	6.04.2023	Academic Council Approved date:	21.4.2023
Salient Points of the revision	01.	Finalized curriculum and syllabus for I and II semester B.Tech IT under R2022.			
	02.	Finalized curriculum and syllabus for III and IV semester B.Tech IT under R2022. Framed elective courses under 6 verticals.			
	03.	Framed curriculum for V to VIII semester and 6 verticals.			
	04.	Included finalized syllabus of core courses, vertical courses.			
	05.	Updated syllabus for few courses as per industrial needs.			

SRI VENKATESWARA COLLEGE OF ENGINEERING,

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REGULATIONS 2022

B.Tech. INFORMATION TECHNOLOGY

CHOICE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES(PEOs)

I. The graduates of the Information Technology program will demonstrate themselves as leading professionals.
II. The graduates of the Information Technology program will be equipped with the necessary skills to become proficient researchers.
III. The graduates of the Information Technology program will demonstrate their abilities as successful entrepreneurs.
IV. The graduates of the Information Technology program will excel in higher studies or modern administrative services.

PROGRAM OUTCOMES(POs)

PO   GRADUATE ATTRIBUTES

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

2. **Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

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

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

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

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

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs)

13. Exhibit proficiency in examining standard business operations in order to create and implement suitable Information Technology solutions.
14. Demonstrate the ability to establish an IT infrastructure, effectively manage resources and ensure data security.

PEO's–PO's & PSO's MAPPING: (Example)

POs	PEOs			
	I	II	III	IV
1.	✓	✓	✓	
2.	✓	✓	✓	
3.	✓	✓	✓	✓
4.	✓	✓	✓	
5.			✓	✓
6.	✓	✓		
7.	✓	✓		
8.				✓
9.	✓	✓	✓	✓
10.	✓	✓		✓
11.			✓	✓
12.			✓	✓
13.	✓	✓	✓	✓
14.	✓	✓	✓	✓

SRI VENKATESWARA COLLEGE OF ENGINEERING,

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Chennai–600025) REGULATIONS 2022
CHOICE BASED CREDIT SYSTEM

B.Tech. INFORMATION TECHNOLOGY

CURRICULUM AND SYLLABI
SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL Hours	Prerequisite	Position
				L	T	P	C			
1.	IP22151	Induction Program (Common to All)	-	-	-	-	0	-	-	-
Theory Subjects										
2.	HS22151	Tamil Language and Heritage of Ancient Tamil Society (Common to All Branches)	HS	1	0	0	1	1	-	F
3.	HS22152	Communicative English (Common to All Branches)	HS	3	0	0	3	3	-	F
4.	MA22151	Applied Mathematics I (Common to All Branches Except MR)	BS	3	1	0	4	4	-	F
5.	PH22151	Applied Physics (Common to AD/CS/EC/EE/IT)	BS	3	0	0	3	3	-	F
6.	CY22151	Applied Chemistry (Common to AD/CS/EC/EE/IT)	BS	3	0	0	3	3	-	F
7.	EE22151	Basic Electrical and Electronics Engineering (Common to All Branches except CH/EE/EC)	ES	3	0	0	3	3	-	F
8.	IT22101	Programming for Problem Solving (Common to IT/AD /CS/EE/EC)	ES	3	0	0	3	3	-	F
Practical Subjects										
8.	PH22161	Physics Laboratory (Common to All Branches except BT)	BS	0	0	2	1	2	-	F
9.	EE22111	Basic Electrical and Electronics Engineering Laboratory (Common to All Branches except EC)	ES	0	0	2	1	2	-	F
10.	IT22111	Programming for Problem Solving Laboratory (Common to IT/AD /CS/EE/EC)	ES	0	0	3	1.5	3	-	F
			Total	19	1	7	23.5	27		

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL Hours	Pre req uisite	Posit ion
				L	T	P	C			
Theory Subjects										
1.	HS22251	Science and Technology in Ancient Tamil Society (Common to All)	HS	2	0	0	2	2	-	F
2.	HS22252	Technical English (Common to All)	HS	3	0	0	3	3	-	F
3.	MA22251	Applied Mathematics II (Common to All Except MR)	BS	3	1	0	4	4	-	F
4.	ME22251	Technical Drawing (Common to AD/CS/IT)	ES	1	0	2	2	3	-	F
5.	IT22201	Computer Organization and Architecture	PC	3	0	0	3	3	-	F
6.	IT22202	OOPS using C++ and Python	PC	3	0	0	3	3	-	F
7.	BT22101	Biology for Engineers (Common to BT/AE/IT)	BS	3	0	0	3	3	-	F
Practical Subjects										
8.	IT22211	Hardware Assembling and Software Tools Laboratory	ES	0	0	3	1.5	3	-	F
9.	IT22212	OOPS using C++ and Python Laboratory	PC	0	0	3	1.5	3	-	F
			Total	18	1	8	23	27		

S. No	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite	F/M
Semester III									
THEORY									
1	MA22353	Discrete Mathematics (Common to CS&IT)	BS	4	3	1	0	4	-	F
2	IT22301	Data Structures and Algorithms	PC	3	3	0	0	3	-	F
3	IT22302	Database Concepts	PC	3	3	0	0	3	-	F
4	IT22303	Digital Communication	ES	3	3	0	0	3	-	F
5	IT22309	IT Essentials : Theory and Practices	PC	4	2	0	2	3	-	F
PRACTICAL									
6	IT22311	Data Structures and Algorithms Laboratory	PC	3	0	0	3	1.5	-	F
7	IT22312	Database Concepts Laboratory	PC	3	0	0	3	1.5	-	F
8	IT22313	Digital Communication Laboratory	ES	3	0	0	3	1.5	-	F
			TOTAL	26	14	1	11	20.5		

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL Hours	Prerequisite	Position
				L	T	P	C			
Theory Subjects										
1.	MA22454	Probability and Queuing Theory(Common to CS&IT)	BS	3	1	0	4	4	-	F
2.	GE22451	Environmental Sciences and Sustainability (Common to All Branches)	BS	3	0	0	3	3	-	F
3.	IT22401	Operating System Concepts	PC	3	0	0	3	3	-	F
4.	IT22402	Microprocessor and Microcontroller Interfacing	ES	3	0	0	3	3	-	F
5.	IT22408	Paradigms of Algorithm Design: Theory and Practices	PC	2	0	2	3	4	-	F
6.	IT22409	Software Engineering Methodologies : Theory And Practices	PC	2	0	2	3	4	-	F
Practical subjects										
8.	IT22411	Microprocessor and Microcontroller Interfacing Laboratory	ES	0	0	3	1.5	3	-	F
9.	IT22412	Operating System Concepts Laboratory	PC	0	0	3	1.5	3	-	F
			Total	**16**	**1**	**10**	**22**	**27**		

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL Hours	Prerequisite	Position
				L	T	P	C			
Theory Subjects										
1.	IT22501	Essentials of IoT	PC	3	0	0	3	3	-	F
2.	IT22502	User Interface Technologies	PC	3	0	0	3	3	-	F
3.	IT22503	Computational Intelligence	PC	3	0	0	3	3	-	F
4.	IT22504	Data Communication and Networking	PC	3	0	0	3	3	-	F
5.		Professional Elective I	PE	3	0	0	3	3	-	M
6.		Open Elective I	OE	3	0	0	3	3	-	M
Practical Subjects										
8.	IT22511	Essentials of IoT Laboratory	PC	0	0	3	1.5	3	-	F
9.	HS22511	Interview and career skills Laboratory (Common to AD,AE,CS,EE,EC,IT AND MR)	EEC	0	0	4	2	4	-	F
10.	IT22512	Data Communication and Networking Laboratory	PC	0	0	3	1.5	3	-	F
11.	IT22513	Industrial Training/Internship	EEC	-	-	-	2	-	-	M
			Total	18	0	10	23	28		

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL Hours	Prerequisite	Position
				L	T	P	C			
Theory Subjects										
1.	IT22609	Information Security : Theory and Practices	PC	2	0	2	3	4	-	F
2.	IT22601	Machine Learning Algorithms and Techniques	PC	3	0	0	3	3	-	F
3.	IT22602	Natural Language Processing and Understanding	PC	3	0	0	3	3	-	F
4.		Open Elective II	OE	3	0	0	3	3	-	M
5.		Professional Elective II	PE	3	0	0	3	3	-	M
6.		Mandatory Course	MC	3	0	0	0	3	-	M
Practical Subjects										
8.	IT22611	Machine Learning Techniques Laboratory	PC	0	0	3	1.5	3	-	F
9.	IT22612	Natural Language Processing and Understanding Laboratory	PC	0	0	3	1.5	3	-	F
10.	IT22613	Mini Project	EEC	0	0	3	2	3	-	F
			Total	17	0	11	20	28		

SEMESTER VII

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL Hours	Prerequisite	Position
				L	T	P	C			
Theory Subjects										
1.	IT22709	Cyber Forensics : Theory and Practices	PC	2	0	2	3	4	-	F
2.	IT22701	Distributed and Cloud Computing	PC	3	0	0	3	3	-	F
3.	IT22702	Big Data	PC	3	0	0	3	3	-	F
4.		Professional Elective III	PE	3	0	0	3	3	-	M
5.		Professional Elective IV	PE	3	0	0	3	3	-	M
Practical Subjects										
6.	IT22711	Distributed and Cloud Computing Laboratory	PC	0	0	3	1.5	3	-	F
7.	IT22712	Big Data Laboratory	PC	0	0	3	1.5	3	-	F
			Total	14	0	8	18	22		

SEMESTER VIII

SL. NO.	COURSE CODE	COURSE TITLE	CATEGORY#	PERIODS PER WEEK				TOTAL Hours	Prerequisite	Position
				L	T	P	C			
Theory Subjects										
1.		Professional Elective V	PE	3	0	0	3	3	-	M
2.		Professional Elective VI	PE	3	0	0	3	3	-	M
Practical Subjects										
3.	IT22811	Project Work	EEC	0	0	20	10	20	-	F
			Total	6	0	20	16	26		

Verticals

High Performance Computing	Networking & Cyber Security	Data Science	Embedded System & IoT	Multimedia Technologies	Diversified Group	Special Elective Group
Quantum Computing Concepts	Network Design	Data Science Using Python	Embedded and Real Time Systems	Graphics and Multimedia	Free and Open Source Software	Financial Statement Analysis (Common to All Branches)
Next Generation Computing	Malware Threats in Cybersecurity	Pattern Recognition Technologies and Applications	Wearable Computing	Machine Vision	Functional Programming Using SCALA	Introduction to Securities Market (Common to All Branches)
Containerization Technologies	Blockchain for Finance	Deep Learning and its Application	Industrial and Medical IoT	Digital Image Processing	Software Testing Tools and Techniques	Option Trading Strategies (Common to All Branches)
Bio Informatics	Digital and Mobile Forensics	Intelligent Decision Making	Cyber Physical System	Game Design	GO Programming : Theory and Practices	Corporate Finance (Common to All Branches)
Green Computing Technology	Ethical Laws and Policies on Cyber Security	Social Network Information Analysis	Unmanned Vehicle System	Augumented and Virtual Reality : Theory and Practices (Common to CS & IT)	Advanced Java Programming: Theory and Practices	Managerial Economics (Common to All Branches)
Cognitive Computing	Software Defined Networking Techniques	Recommendation System Techniques	Extended IoT	3D Game Modelling and Rendering	Principles of Management (Common to ME,AE,EE,IT AND MN)	Project Management (Common to All Branches)
Virtualization Tools and Techniques	Edge and Mobility Network Security Solutions	AI for Social Good	IoT for smart Applications	Human Computer Interface Design	Service Oriented Architecture for Enterprise and Cloud Applications	Mathematics For AI & ML (Common to All Branches)
Advance Cloud Computing Technolgies Laboratory	Ethical Hacking Laboratory	Data Science Exploration Laboratory	Open Source Programming for IoT Laboratory	Multimedia Tools Laboratory	Full Stack Development Laboratory	

Vertical 1 - Special Elective Group

Course Code	Course Title	T/P	L	T	P	C
SE22001	Financial Statement Analysis (Common to All Branches)	T	3	0	0	3
SE22002	Introduction to Securities Market (Common to All Branches)	T	3	0	0	3
SE22003	Option Trading Strategies (Common to All Branches)	T	3	0	0	3
SE22004	Corporate Finance (Common to All Branches)	T	3	0	0	3
SE22005	Managerial Economics (Common to All Branches)	T	3	0	0	3
SE22006	Project Management (Common to All Branches)	T	3	0	0	3
SE22007	Mathematics For AI & ML (Common to All Branches)	T	3	0	0	3

Vertical 2 - High Performance Computing

Course Code	Course Title	T/P	L	T	P	C
IT22021	Quantum Computing Concepts	T	3	0	0	3
IT22022	Next Generation Computing	T	3	0	0	3
IT22023	Containerization Technologies	T	3	0	0	3
IT22024	Bio Informatics	T	3	0	0	3
IT22025	Green Computing Technology	T	3	0	0	3
IT22026	Cognitive Computing	T	3	0	0	3
IT22027	Virtualization Tools and Techniques	T	3	0	0	3
IT22020	Advance Cloud Computing Technolgies Laboratory	P	0	0	4	2

Vertical 3 - Networking & Cyber Security

Course Code	Course Title	T/P	L	T	P	C
IT22031	Network Design	T	3	0	0	3
IT22032	Malware Threats in Cybersecurity	T	3	0	0	3
IT22033	Blockchain for Finance	T	3	0	0	3
IT22034	Digital and Mobile Forensics	T	3	0	0	3
IT22035	Ethical Laws and Policies on Cyber Security	T	3	0	0	3
IT22036	Software Defined Networking Techniques	T	3	0	0	3
IT22037	Edge and Mobility Network Security Solutions	T	3	0	0	3
IT22030	Ethical Hacking Laboratory	P	0	0	4	2

Vertical 4 - Data Science

Course Code	Course Title	T/P	L	T	P	C
IT22041	Data Science Using Python	T	3	0	0	3
IT22042	Pattern Recognition Technologies and Applications	T	3	0	0	3
IT22043	Deep Learning and its Application	T	3	0	0	3
IT22044	Intelligent Decision Making	T	3	0	0	3
IT22045	Social Network Information Analysis	T	3	0	0	3
IT22046	Recommendation System Techniques	T	3	0	0	3
IT22047	AI for Social Good	T	3	0	0	3
IT22040	Data Science Exploration Laboratory	P	0	0	4	2

Vertical 5 - Embedded System & IoT

Course Code	Course Title	T/P	L	T	P	C
IT22051	Embedded and Real Time Systems	T	3	0	0	3
IT22052	Wearable Computing	T	3	0	0	3
IT22053	Industrial and Medical IoT	T	3	0	0	3
IT22054	Cyber Physical System	T	3	0	0	3
IT22055	Unmanned Vehicle System	T	3	0	0	3
IT22056	Extended IoT	T	3	0	0	3
IT22057	IoT for smart Applications	T	3	0	0	3
IT22050	Open Source Programming for IoT Laboratory	P	0	0	4	2

Vertical 6 - Multimedia Technologies

Course Code	Course Title	T/P	L	T	P	C
IT22061	Graphics and Multimedia	T	3	0	0	3
IT22062	Machine Vision	T	3	0	0	3
IT22063	Digital Image Processing	T	3	0	0	3
IT22064	Game Design	T	3	0	0	3
CS22068	Augumented and Virtual Reality : Theory and Practices (Common to CS & IT)	T	2	0	2	3
IT22066	3D Game Modelling and Rendering	T	3	0	0	3
IT22067	Human Computer Interface Design	T	3	0	0	3
IT22060	Multimedia Tools Laboratory	P	0	0	4	2

Vertical 7 - Diversified Group

Course Code	Course Title	T/P	L	T	P	C
IT22071	Free and Open Source Software	T	3	0	0	3
IT22072	Functional Programming Using SCALA	T	3	0	0	3
IT22073	Software Testing Tools and Techniques	T	3	0	0	3
IT22074	GO Programming : Theory and Practices	T&P	2	0	2	3
IT22075	Advanced Java Programming: Theory and Practices	T&P	2	0	2	3
ME22087	Principles of Management (Common to ME,AE,EE,IT AND MN)	T	3	0	0	3
IT22077	Service Oriented Architecture for Enterprise and Cloud Applications	T	3	0	0	3
IT22070	Full Stack Development Laboratory	P	0	0	4	2

Open Elective

Course Code	Course Title	T/P	L	T	P	C
OE22801	IT Essentials for Engineers	T	3	0	0	3
OE22802	Programming for IoT	T	3	0	0	3
OE22803	Foundations of Mobile Application Development	T	3	0	0	3
OE22804	Data Analytics using R	T	3	0	0	3
OE22805	Ethical Hacking and IT Security	T	3	0	0	3
OE22806	AI for Android	T	3	0	0	3
OE22807	User Interface Design	T	3	0	0	3
OE22808	Software Testing	T	3	0	0	3

Mandatory Course

Course Code	Course Title	T/P	L	T	P	C
MC22001	Indian Constitution and Society (Common to all branches)	T	3	0	0	0
MC22002	Essence of Indian Traditional Knowledge Systems (Common to all branches)	T	3	0	0	0
MC22003	Gender Sensitization (Common to all branches)	T	3	0	0	0

Value Added Course

Course Code	Course Title	T/P	L	T	P	C
VD22801	Introduction to Java Programming	T	2	0	0	0
VD22802	Mobile Application Development	T	2	0	0	0
VD22803	Business Process Management using CAMUNDA	T	2	0	0	0
VD22804	Digital Twins	T	2	0	0	0
VD22805	Metaware and Metaverse Technologies	T	2	0	0	0
VD22806	Introduction to Kanban Methodology	T	2	0	0	0
VC22001	Basics of Entrepreneurship Development(Common to all branches)	T	2	0	0	0
VC22002	Advances in Entrepreneurship Development (Common to all branches)	T	2	0	0	0
VC22003	Communicative German (Common to all branches)	T	2	0	0	0
VC22004	Communicative Hindi (Common to all branches)	T	2	0	0	0
VC22005	Communicative Japanese (Common to all branches)	T	2	0	0	0
VC22006	Design Thinking and Prototyping laboratory (Common to all branches)	T	2	0	0	0

Sri Venkateswara College of Engineering
Department of Information Technology
R2022 – B.Tech Information Technology
Credit Distribution

Sl.No	Category	I	II	III	IV	V	VI	VII	VIII	Total Credits
1	Humanities and Social Sciences (HS)	4	5							9
2	Basic Science (BS)	11	7	4	7					29
3	Engineering Science (ES)	8.5	3.5	4.5	4.5					21
4	Professional Core (PC)		7.5	12	10.5	15	12	12		69
5	Professional Elective (PE)					3	3	6	6	18
6	Open Electives (OE)					3	3			6
7	Project Work, Seminar (EEC)					2	2		10	14
8	Mandatory Courses (MC)						3*			3*
9	Value Added Courses			2*						2*
10	Internship (EEC)					2*				2*
	Total	23.5	23	20.5	22	23	20	18	16	166

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தமிழ் மமொழியும் தமிழர் மரபும்

TAMIL LANGUAGE AND HERITAGE OF TAMILS

(Common to all Branches)

</div>

HS22151

L	T	P	C
1	0	0	1

பொடத்தின்ற ொக்கங்கள் :

- தமிழ் மமொழியின் ததொற்றம் பற்றியும், திணை கருத்துக்கள் வொயிலொக வொழ்வியல் முணறகணை பற்றியும் கற்றுக் மகொள்வொர்கள்.
- இந்திய ததசிய சுதந்திர இயக்கத்தில் தமிழர்ைகின் பங்கைிப்பு மற்றும் தமிழர்ைகின் தமலொண்ணம முணறகணை பற்றியும் கற்றுக் மகொள்வொர்கள்.

OBJECTIVES:

- They will learn about the origin of the Tamil language and the ways of life through five types of lands.
- They will also learn about the contribution of Tamils in the Indian National Freedom Movement and the management methods of Tamils.

அலகு 1   தமிழுக்கும் மதொழில்நுட்பக் கல்விக்கும் உள்ள மதொடர்பு   3

மமொழி மற்றும் பொரம்பரியம்: இந்தியொவில் உள்ை மமொழிக் குடும்பங்கள் – திரொவிட மமொழிகள் – தமிழ் ஒரு மசம்மமொழி – தமிழில் மசம்மமொழி இலக்கியம் - உ.தவ.. சொமிநொதய்யர். ஆறுமுகமநொவலர் ஆகிதயொரின் பங்கைிப்பு – மதொழில் நுட்பக் கல்வியில் தமிழ் மமொழியின் முக்கியத்துவம்.

UNIT I   LANGUAGE AND HERITAGE

Language families in India – Dravidan Languages – Tamil as a Classical language – Classical Literature in Tamil – Contribution of U. Ve. Saminathaiyar. Arumuka Navalar – Importance of Tamil language in technical education.

அலகு 2   திணை கருத்துக்கள்   9

திணை கருத்துக்கள்: -ஐந்து வணக நிலங்கள், விலங்குகள், கடவுள்கள், மதொழில், வொழ்க்ணக முணறகள், இணச, நடனம், ஊைவு முணற, தமிழர்ைகின் தொவரங்கள் மற்றும் விலங்கினங்கள் – மதொல்கொப்பியம் மற்றும் சங்க இலக்கியங்கைில் இருந்து அகம் மற்றும் புரம் கருத்து – தமிழ் பற்றிய அறம் கருத்து – கல்வி மற்றும் எழுத்தறிவு சங்க கொலம் – சங்கொலத்தின் பண்ணடய நகரங்கள் மற்றும் துணறமுகங்கள் – சங்க கொலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – தசொழர்ைகின் மைவிநொட்டு மவற்றி.

UNIT II   THINAI CONCEPTS

Five types of lands, animals, Gods, occupation, life styles, music, dance , food style, Floara and Fauna of Tamils - Agam and puram concept from Tholkappiyam and Sangam Literature – Aram concept of Tamil – Education and Literacy during Sangam Age – Ancient cities and Ports of Sangam Age – Export and Import during Sangam Age - Overseas Conquest of Choloas.

இந்திய நதசிய சுதந்திர இயக்கம் மற்றும் இந்திய கலொச்சொரத்திற்கு தமிழர்களின் பங்களிப்பு:- சுப்ரமைய பொரதி, வொஞ்சிநொதன், சுப்பிரமைய சிவொ, வீரபொண்டிய கட்ட மபொம்மன், வொ..ஊ சிதம்பரம் பிள்ணை, தீரன் சின்னமணல, மருது பொண்டிய சதகொதரர்கள், பூலி ததவர், திருப்பூர் குமரன், வீரமங்ணக தவலு நொச்சியொர் - ,தமிழர் இலக்கியங்ணகில் தமலொண்ணம கருத்துக்கள் (கி. மு. 500 முதல் கி. பி 200 வணர) – அகநொனூறு, புறநொனூறு, திருக்குறள் ஆகியவற்றில் தமலொண்ணமக் கருத்துகள்.

UNIT -3   HERITAGE OF TAMILS

Contribution of Tamils to Indian National Freedom Movement and Indian Culture: Contributions of Subramanya Bharathi, Vanchinathan, Subramaniya Siva, Veerapandiya Kattabomman, V O Chidambaram Pillai, Dheeran Chinnamalai, The Maruthu Pandiyar, Puli Thevar, Tiruppur Kumaran, Veera Mangai Velunachiyar.

TOTAL : 15 PERIODS

பொடமறி முடிவுகள் :
OUTCOMES:

CO#	CO statements Upon successful completion of the course, the students should be able to	RBT Level
1	மொணவர்கள் தமிழ் மமொழித் ததொற்றம் பற்றித் மதரிந்து மகொள்வொர்கள். Students will learn about the origin of the Tamil language	R
2	தமிழர்ணகின் வொழ்வியல் முணறகணைத் மதரிந்து மகொள்வொர்கள். They will know the ways of life of Tamils.	U
3	தமிழர்ணகின் சுதந்திர தபொரொட்ட வீரர்கணை பற்றியும், தமலொண்ணமகணை பற்றியும் மதரிந்து மகொள்வொர்கள். They will know about the freedom fighters of Tamils and the management of Tamils	U

பொடநூல்கள்:
REFERCENCES:

1. மபொன். முத்துகுமொரன் (2002), "தமிழ் மரபு", கொந்தைகம், 68, அண்ணைஂொ சொணல, மசன்ணன 600 002
   பி. டிஶ்ரீனிவொச ஜயங்கொர் (தமிழக்கமும் திறனொய்வும்) புலவர் கொ. நகொவிந்தன் (1988),
2. "தமிழர் வரலொறு (முதல் பகுதி)", திருமநல்தவலி மதன்னிந்திய ணசவ சித்தொந்த நூற்பதிப்பு கழகம் ,154, TTK சொணல, மசன்ணன 18.
3. டொக்டர். நக. நக, பிள்ணள (2009), "தமிழக வரலொறு மக்களும் பண்பொடும்", உலக தமிழொரொய்ச்சி நிறுவனம்,தரமிழ் ,மசன்ணன 600113
4. முணனவர். ச. இரொநேந்திரன் (2004), "தமிழில் மசொல்லொக்கம்", தஞ்சொவூர் தமிழ் பல்கணலக் கழகம் மவிியீடு

COURSE ARTICULATION MATRIX:

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	3	-	3	3	2	-	3	3	-	2	-	-
2	-	-	3	2	3	3	-	1	3	3	-	-	-	-
3	-	-	3	2	3	3	2	-	3	3	-	2	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation

L T P C
3 0 0 3

HS22152   **COMMUNICATIVE ENGLISH**
(Common to All Branches)

COURSE OBJECTIVES:

1. Enable learners to interact fluently on everyday social contexts.
2. Train learners to engage in conversations in an academic/scholarly setting.
3. Instil confidence in learners to overcome public speaking barriers.
4. Develop learners' ability to take notes and in the process, improve their listening skills.
5. Enhance learners' reading skill through reading text passages for comprehension and contemplation.
6. Improve learners' skills to write on topics of general interest and drafting correspondences for general purposes.

UNIT I   **9**
Listening - short video clips - conversational scenes form movies, celebrities' speeches /interviews. Speaking - several ways of introducing oneself at several situations, introducing others at several situations, inviting people for several occasions, describing people and their places. Reading - short comprehension passages - making inferences, critical analysis. Writing - completing the incomplete sentences - developing hints from the given information. Grammar - Wh-Questions and Yes or No questions - Parts of speech. Vocabulary development - prefixes - suffixes - articles - countable / uncountable nouns.

UNIT II   **9**
Listening - customer care voice files, short narratives - identifying problems and developing telephone etiquettes. Speaking - speaking over skype/ whatsapp, making business calls, making self-recorded informative videos, inquiring about a concept/activity, describing a concept/activity. Reading - reading the headlines on news magazines - slogans and taglines from advertisements. Writing - free writing - writing - headlines, slogans and taglines individual inspirations. Grammar- conjunctions, idioms, phrases, quotes. Vocabulary development - guessing the meanings of words in different contexts.

UNIT III   **9**
Listening - courtroom scenes from movies, debates and talks from news channels, notes taking. Speaking - language and tone for arguments, discussion, deliberation, contemplation, expressing opinions, reacting to different situations in an alien country. Reading - language used in instruction manuals of household appliances, cookery and other basic instructions. Writing- understanding the structure of texts - use of reference words, discourse markers- coherence, rearranging the jumbled sentences. Grammar - adjectives - degrees of comparison, framing direct and indirect questions. Vocabulary development - concise approach, single word substitution.

UNIT IV   **9**
Listening - Sports commentaries, advertisements with users' criticisms; Speaking - for social causes, for promoting a concept, negotiating and bargaining; Reading - review of a product, movie, movement or a system; Writing - writing for advertisements, selling a product; Grammar

– Tenses - Simple Past, Present and Future, Continuous - Past, Present and Future; Vocabulary Development - synonyms, antonyms and phrasal verbs.

UNIT V   **9**
Listening - video lectures, video demonstration of a concept; Speaking – presenting papers/concepts, delivering short speeches, discourses on health, suggesting natural home remedies, cleanliness, civic sense and responsibilities; Reading - columns and articles on home science; Writing - correspondences of requests, basic enquiry/observation and basic complaints; Grammar - modal verbs, perfect tenses - Vocabulary development - collocations.

TOTAL: 45 PERIODS

REFERENCES:

1. Department of English, Anna University, Mindscapes : English for Technologists and Engineers. Orient Black Swan, Chennai, 2017.
2. Downes and Colm, & quot;Cambridge English for Job-hunting& quot;, Cambridge University Press, New Delhi, 2008.
3. Murphy and Raymond, & quot;Intermediate English Grammar with Answers& quot;, Cambridge University
4. Press, 2000. Thomson, A.J., & quot;Practical English Grammar 1 & amp; 2& quot;, Oxford, 1986.

Websites

1. http://www.usingenglish.com
2. http://www.uefap.com3
3. https://owl.english.purdue.edu/owl/
4. www.learnenglishfeelgood.com/esl-printables-worksheets.html

Software

1. Face 2 Face Advance – Cambridge University Press, 2014.
2. English Advance Vocabulary- Cambridge University Press.
3. IELTS test preparation – Cambridge University Press 2017.
4. Official Guide to the TOEFL Test With CD-ROM, 4th Edition.
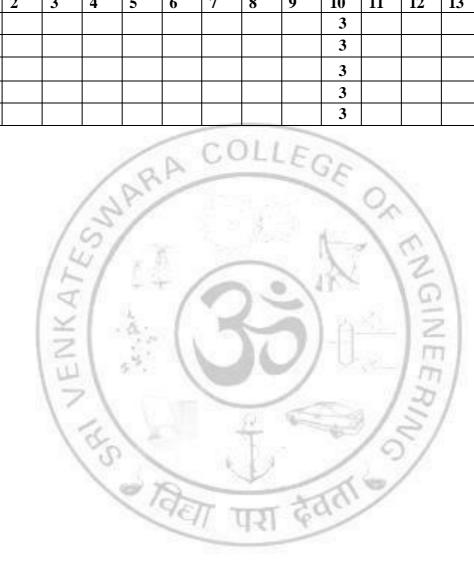5. Cambridge Preparation for the TOEFL TEST- Cambridge University Press**, 2017.**

OUTCOMES:

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

CO #	STATEMENT	RBT LEVEL
1	Acquire adequate vocabulary for effective communication	AP
2	Listen to formal and informal communication and read articles and infer meanings from specific contexts from magazines and news papers.	AP
3	Participate effectively in informal/casual conversations; introduce themselves and their friends and express opinions in English.	AN

| 4 | Comprehend conversations and short talks delivered in English. | C |
| 5 | Write short write-ups and personal letters and emails in English | C |

COURSE ARTICULATION MATRIX

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.										3				
2.										3				
3.										3				
4.										3				
5.										3				

		L	**T**	**P**	**C**

MA22151   **Applied Mathematics I**   **3   1   0   4**
(Common to all Branches except MR)

COURSE OBJECTIVES:
The Student should be made to:

1. Compute eigen values and eigen vectors and use in diagonalization and in classifying real quadratic forms.
2. Study differential calculus and its applications to relevant Engineering problems.
3. Compute derivatives using the chain rule or total differentials.
4. Understand the rotation of two dimensional geometry using definite integrals.
5. Acquaint with the Mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I   **MATRICES**   **(9+3)**

Eigen values and Eigen vectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigen vectors – Statement and Applications of Cayley-Hamilton Theorem – Diagonalization of matrices– Reduction of a quadratic form into canonical form by orthogonal transformation-Nature of quadratic forms.

UNIT II   **APPLICATION OF DIFFERENTIAL CALCULUS**   **(9+3)**

Curvature and radius of Curvature– Centre curvature – Circle of curvature –Evolutes– Envelopes- Evolute as Envelope of Normals.

UNIT III   **DIFFERENTIAL CALCULUS FOR SEVERAL VARIABLES**   **(9+3)**

Limits and Continuity - Partial derivatives – Total derivatives – Differentiation of implicit functions – Jacobians and properties– Taylor's series for functions of two variables – Maxima and Minima of functions of two variables –Lagrange's method of undetermined multipliers.

UNIY IV   **APPLICATION OF DEFINTE INTEGRALS**   (9+3)

Integration by Parts-Bernoulli's formula for integration- Definite integrals and its Properties-Solids of Revolution- Disk Method- Washer Method- Rotation about both x and y axis and Shell method.

UNITV   **MULTIPLE INTEGRALS**   **(9+3)**

Double integrals in Cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves - Change of variables in double integrals – Triple integrals –

Volume of solids.

.

TOTAL (L:45+T:15): 60 PERIODS

TEXTBOOKS:
1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics", 10th Edition, John Wiley, (2015)
2. Grewal .B.S, Grewal .J.S "Higher Engineering Mathematics",43rd Edition, Khanna Publications, Delhi, (2015).

REFERENCES:
1. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Nineth Edition, Laxmi Publications Pvt. Ltd.,(2014).
2. Glyn James, "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education,(2016).
3. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2013).

Web Link:
1. https://home.iitk.ac.in/~peeyush/102A/Lecture-notes.pdf
2. https://www.sydney.edu.au/content/dam/students/documents/mathematics-learning-entre/integration-definite-integral.pdf

COURSE OUTCOMES:

CO #	Upon completion of the course, students will be able to:	RBT* Level
1	Solve the Eigen value problems in matrices.	AP
2	Apply the basic notion of calculus in Engineering problems and to tackle for different geometries.	AP
3	Perform calculus for more than one variable and its applications in Engineering problems.	AP
4	Apply definite integrals for design of three dimensional components.	AP
5	Evaluate multiple integral in Cartesian and polar coordinates.	AP

COURSE ARTICULATION MATRIX

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3								3		
2.	3	3										3		
3.	3	3	3	3								3		
4.	3	3										3		

| 5. | 3 | 3 | 2 | 2 | | | | | | | 3 | | |

<div align="right">

L T P C
3 0 0 3

</div>

PH22151 **Applied Physics**
(Common to AD, CS, EE, EC, IT)

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

UNIT-I: LASERS AND FIBER OPTICS **9**
Lasers: population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Nd-YAG laser – CO_2 Laser – Exceimer Laser – Applications. Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, and mode) – losses associated with optical fibers–Fiber optic communication - fibre optic sensors: pressure and displacement - Endoscope.

UNIT-II: QUANTUM PHYSICS **9**
Black body radiation – Planck's theory (derivation)- deduction of Wien's and Rayleigh Jean's law – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent wave equations – particle in a one-dimensional - three dimensional potential box–Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT III: 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 – interplanar distances- coordination number and packing factor for SC, BCC, FCC, HCP and Diamond structure (qualitative) - crystal imperfections: point defects, line defects – Burger vectors, stacking faults

UNIT IV WAVES AND OSCILLATIONS **9**
Travelling waves, Wave equation for string ,Energy and momentum , Resonance Superposition & Reflection, Standing waves, Harmonic oscillations, Damped harmonic motion- Forced oscillations, amplitude resonance - Expression for Resonant frequency, Electrical analogy of mechanical oscillations, Quality factor and sharpness of resonance, Electrical analogy of mechanical oscillators.

UNIT V ELECTROMAGNETIC WAVES **9**
Maxwell's Equations. Vector and Scalar Potentials. Plane waves in Dielectric media. Poynting Theorem and Poynting Vector.- Electromagnetic (EM) Energy Density. Physical Concept of Electromagnetic Field Energy Density, EM Wave Propagation in Unbounded Media , Plane EM waves through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive index and dielectric constant.

TEXT BOOKS:
1. Gaur R.K., Gupta S.L, "Engineering Physics", Dhanput Publications, 2015.

2. Shatendra Sharma, Jyotsna Sharma, "Engineering Physics", Pearson, 2006.
3 Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
4 Arumugam M, "Materials Science", Anuradha Publications, 2015.

REFERENCES:
1. David Halliday, Robert Resnick, Jearl Walker, "Principles of Physics", 10th Edition, Wiley, 2015.
2. Peter Atkins, Julio De Paula, "Physical Chemistry",10th Edition., Oxford University Press, 2014.
3. Arthur Beiser, Shobhit Mahajan, Rai Choudhury S,"Concepts of Modern Physics", 7th Edition, McGraw Hill Education, 2017.
4. Raghavan V, "Materials Science and Engineering", PHI Learning Pvt. Ltd., 2010

Course outcomes

CO #	Upon completion of the course, students will be able to:	RBT* Level
1	Develop an understanding about photonics and Fiber Optic communication system	U
2	Acquire the knowledge of Quantum mechanics	AP
3	Classify and demonstrate the fundamentals of crystals and their defects.	AP
4	Gain knowledge in waves and oscillations	U
5	Enable to explore the theory of electromagnetic waves and its propagation	AP

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3				2	2				1				
2.	3	3	2	2	2	2				1		2		
3.	3									1				
4.	3		2							1				
5.	3	3	2	2	2					1		2		

| CY22151 | **Applied Chemistry** | L | T | P | C |
| | **(Common to AD, CS, EC, EE & IT)** | 3 | 0 | 0 | 3 |

OBJECTIVES:
- To make the students conversant with basic electrochemistry and batteries.
- To develop an understanding of the laws of photochemistry and basics.
- To acquaint the students with the basics of nanomaterials, their properties and uses.
- To acquire the basic knowledge on sensors which are essential for the software engineers for develop new devices.
- To enable the students to understand the types of instruments for material analysis and their working principle.

UNIT I   ELECTROCHEMISTRY   9

Electrodes and electrochemical cells – electrode potential, standard electrode potential, single electrode potential and its determination, types of electrodes – calomel, quinhydrone and glass electrode. Nernst equation - Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Batteries – Primary (dry cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery) and next generation batteries

UNIT II   PHOTOCHEMISTRY   9

Laws of photochemistry – Grotthuss-Draper law, Stark–Einstein law and Lambert Beer Law – determination iron by spectrophotometer. Quantum efficiency – Photo processes - internal conversion, inter-system crossing, fluorescence, phosphorescence and photo-sensitization-quenching of fluorescence and its kinetics, Stern-Volmer relationship. Applications of photochemistry.

UNIT III   NANOCHEMISTRY   9

Basics and scale of nanotechnology, different classes of nanomaterials, Distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Synthesis of nanomaterials, fabrication (lithography) and its applications – Basics of nanophotonics and quantum confined materials (surface plasmon resonance).

UNIT IV   CHEMICAL SENSOR   9

Sensors, sensor science and technology, types of sensors. Chemical Sensors – characteristics and elements. Electrochemical sensors – voltammetry, potentiometric sensors, amperometric sensors, polarization techniques.

UNIT V   INSTRUMENTATION TECHNIQUES   9

Treatment of analytical data, including error analysis. Classification of analytical methods and the types of instrumental method - Electromagnetic radiation-UV-visible and IR spectroscopy: principles, instrumentation (Block diagram only) and applications. Separation techniques chromatography: Gas chromatography, liquid chromatography - importance of column technology (packing, capillaries), separation based on increasing number of factor (volatility, solubility, interactions with stationary phase, size)

TOTAL (L: 45): 45 PERIODS

TEXT BOOKS:
1. Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010.

2. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
3. B.K.Sharma, "Instrumental Methods of Chemical Analysis", 28th Edition, Goel Publishing House, 2012.
4. Skoog, D.A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis, Cengage Learning India Ed.

REFERENCES:
1 Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.
2 B.R. Puri, L.R. Sharma, M.S. Pathania., "Principles of Physical Chemistry" Vishal Publishing Company, 2008.
3 John Vetelino, Aravind Reghu, Introduction to Sensors , Taylor & Francis Group, CRC Press, 1st edition, 2010.
4 Peter Gründler, Chemical Sensors, An Introduction for Scientists and Engineers, Springer-Verlag Berlin Heidelberg 2007.

COURSE OUTCOMES: On the successful completion of the course, students will be able to		RBT* Level
1	Identify electrochemical cells, corrosion and fundamental aspects of batteries	U
2	Interpret the photochemical reactions and make use of spectroscopic techniques	U
3	Realize the structures, properties and applications of nanoparticles.	U
4	Acquire the basic knowledge on chemical sensors to develop an interdisciplinary approach among the students which are essential for the software engineers	U
5	Develop a theoretical principles of UV-visible and IR spectroscopy and separation techniques	AP

Mapping CO – PO – PSO *

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	2								3		
2.	3	3				3	3					3		
3.	3	3	3			3	3	1				3		
4.	3	3	3		1	3	3					3		
5.	3	3		2		3	3					3		

EE22151   **BASIC ELECTRICAL AND ELECTRONICS**   **L T P C**
                              ENGINEERING

                                                                      3 0 0 3

COURSE OBJECTIVES:
1. To understand the basic theorems used in Electrical circuits.
2. To educate on the different concepts and functions of electrical machines.
3. To introduce electron devices and its applications.
4. To explain the principles of digital electronics.
5. To impart knowledge on the principles of measuring instruments.

UNITI   ELECTRICALCIRCUITS   9
Ohm's Law – Kirchhoff's Laws - Steady State Solution of DC Circuits using Mesh and Nodal
Analysis -Introduction to AC Circuits - Waveforms and RMS Value - Power and Power factor -
Single Phase and Three Phase AC Balanced Circuits.

UNIT II   ELECTRICAL MACHINES   9
Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC
Motors, Single phase induction Motor, Single Phase Transformer.

UNIT III   SEMICONDUCTOR DEVICES AND APPLICATIONS   9
Characteristics of PN Junction Diode - Zener Effect - Zener Diode - LED, Photo diode and its
Characteristics-Half Wave and Full Wave Rectifiers-Voltage Regulation. Bipolar Junction
Transistor-Common Emitter Configuration, Characteristics and CE as an Amplifier - Photo
transistors.

UNIT IV   DIGITAL ELECTRONICS   9
Number System Conversion Methods–Simplification of Boolean Expression using K-Map –
Half and Full Adders – Flip-Flops – Shift Registers - SISO, SIPO, PISO, PIPO and 4-bit
Synchronous and Asynchronous UP Counters.

UNIT V   MEASURING INSTRUMENTS   9

Types of Signals: Analog and Digital Signals- Construction and working Principle of Moving
Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters an
meters. Instrumentation Amplifier, – R-2R ladder Type D/A Converter - Flash Type and S
Approximation Type A/D Converter.

                                                              TOTAL: 45 PERIODS

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition,
   McGraw Hill Education, 2020.

2. Sedha. R.S., "A Text Book of Applied Electronics", S.Chand & Co., 2014.

REFERENCES:

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics Engineering", Tata McGraw Hill, 2013.
2. Mehta VK, "Principles of Electronics", S. Chand &Company Ltd, 2010.
3. M. Morris Mano, "Digital Logic & Computer Engineering", Prentice Hall of India, 2004.
4. Mahmood Nahvi and Joseph A.Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, Fourth Edition, 2007.

COURSE OUTCOMES

CO #	STATEMENT	RBT LEVEL
1.	Compute the electric circuit parameters for simple problems	**AN**
2.	Understand the construction and characteristics of different electrical machines.	**AN**
3.	Describe the fundamental behavior of different semiconductor devices and circuits.	**AN**
4.	Design basic digital circuits using Logic Gates and Flip-Flops.	**AN**
5.	Analyze the operating principle and working of measuring instruments.	**AN**

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3			2					2		
2.	3	3	3	3			2					2		
3.	3	3	3	3			2					2		
4.	3	3	3	3			2					2		
5.	3	3	3	3			2					2		

IT22101	**Programming for Problem Solving**	**L**	**T**	**P**	**C**
	(Common to IT, AD, CS, EE, EC)	**3**	**0**	**0**	**3**

Objectives:

- Learn the organization of a digital computer.
- Learn to think logically and write algorithms or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT - 1   **INTRODUCTION TO PROBLEM SOLVING**   **6**

Simple model of a Computer – Hardware – Software – Data Representation, Introduction to Computer Networks and Internet, Problem Solving Techniques – Bottom up design and top down design - applications, Introduction to Algorithms and Flow Chart

Suggested Activities:

Case study – Understanding the analysis and design of the Student Management System (SMS).

UNIT - 2   **C PROGRAMMING BASICS**   **12**

Introduction to 'C' programming – structure of a 'C' program – Conversion of simple algorithm to program. 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.

Suggested Activities

Case study: Dataset creation and Grade calculation in SMS.

UNIT - 3   **ARRAYS AND STRINGS**   **9**

Array: declaration, initialization. Multi dimensional arrays. Strings: Strings vs Character arrays, string operations

Suggested Activities - Grade sheet generation in SMS

UNIT - 4   **FUNCTIONS AND STRUCTURES**   **9**

Need for Modular programming, Functions: definition, call, arguments, call by value. Call by reference, Recursion. structures and unions: Need, declaration, Accessing Structure elements, Arrays of structures

Suggested Activities: Redesigning SMS in terms of modules

UNIT - 5   **POINTERS AND FILE HANDLING IN C**   **9**

Pointers : Introduction, pointers to primitive data types, pointers to user defined data types: arrays and structures, array of pointers, Dynamic Memory Allocation. Files: Read/Write of binary and text files. Preprocessor directives

Suggested Activities: Mange I/O in SMS using Files

                                                                      Total (L:45 Periods)

OUTCOMES:

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

CO#	STATEMENT	RBT LEVEL
1	Appraise the requirements, apply various problem solving techniques to solve problems and represent solution as algorithms	AN
2	Assess the given problem, design programmable solution and write C programs using the constructs of C language.	AN
3	Examine the user requirements and apply the user defined structures available in C programming language to derive solutions.	AN
4	Utilize the inbuilt functions in C and design functions to develop modularized applications in C.	AP
5	Inspect the memory organization of a computer and design C programs for problems involving varying input sizes.	AN

TEXT BKS:
1. Pradip Dey, Manas Ghosh, " Programming in C ", First Edition, Oxford University Press, 2018.
2. R G Dromey, "How to Solve it using Computer", Pearson,2006.

REFERENCES:
1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

2. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.

3. Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, Tata McGrawHill, 2010.

4. Reema Thareja, "Programming in C", 2nd ed., Oxford University Press, 2016.

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	1	3						2	3			2	2	2
2.	1	3						2	3			2	2	2
3.	1		3	2	1			2	3			2	2	2
4.	1		3	2	1			2	3			2	2	2
5.	1		3	2	1			2	3			2	3	3

PH22161   **Physics Laboratory**   L   T   P   C
           (Common to all Branches except BT)   0   0   2   1

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

LIST OF EXPERIMENTS: (Any EIGHT Experiments)

1. a) Determination of Wavelength, and particle size using Laser.
   b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
3. Determination of wavelength of mercury spectrum – spectrometer grating.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of Young's modulus by Non uniform bending method.
6. Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.
7. Determination of Rigidity modulus of a given wire -Torsional Pendulum
8. Energy band gap of a Semiconductor
9. Determine the Hysteresis loss of a given Specimen
10. Calibration of Voltmeter & Ammeter using potentiometer.

OUTCOMES:

The hands on exercises undergone by the students will help them to apply physics principles of, optics
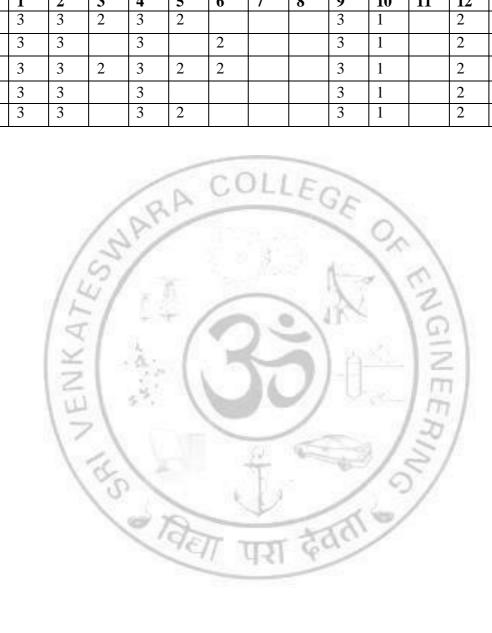and thermal physics to evaluate engineering properties of materials.

REFERENCES:

1. "Physics Laboratory practical manual", 1st Revised Edition by Faculty members, 2018.

Course outcomes

CO#	STATEMENT	RBT LEVEL
1	Analyze the physical principle involved in the various instruments; also relate the principle to new application.	AN
2	Comprehend the Experiments in the areas of optics, mechanics and thermal physics to nurture the concepts in all branches of Engineering.	AP
3	Apply the basic concepts of Physical Science to think innovatively and also improve the creative skills that are essential for engineering.	AP
4	Evaluate the process and outcomes of an experiment quantitatively and qualitatively	AP
5	Extend the scope of an investigation whether or not results come out as expected	AP

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
1.	3	3	2	3	2				3	1		2		
2.	3	3		3		2			3	1		2		
3.	3	3	2	3	2	2			3	1		2		
4.	3	3		3					3	1		2		
5.	3	3		3	2				3	1		2		

EE22111　　　**BASIC ELECTRICAL AND ELECTRONICS**　　**L T P C**
　　　　　　　　　ENGINEERING LABORATORY

　　　　　　　　　　　　　　　　　　　　　　　　　　　　0 0 2 1

COURSE OBJECTIVES:

- To provide exposure to the students with hands on experience in basic of Electrical and Electronics wiring connection and measurements.
- To introduce the students to Electrical Machines and basic laws of Electrical Circuits.

LIST OF EXPERIMENTS

1. Wiring – Residential house wiring and Stair case wiring.
2. (a) AC Analysis- Measurement of electrical quantities–voltage, current, power, and power factor using RLC.
   (b) Study of three phase system.
3. Energy conservation - Measurement and comparison of energy for incandescent lamp and LED lamp.
4. (a) Identification of circuit components (Resistor, Capacitor, Diode and BJT) and soldering practice.
   (b) Signal Measurement- Measurement of peak to peak, RMS, average, period, frequency of signals using CRO.
5. (a) VI Characteristics of Solar photovoltaic panel.
   (b) Design of Solar PV Array and Battery sizing for Residential solar PV system.
6. Design a 5V/12V Regulated Power Supply using FWR and IC7805/IC7812.
7. DC Analysis- Verification of Ohm's Law and Kirchhoff's Laws.
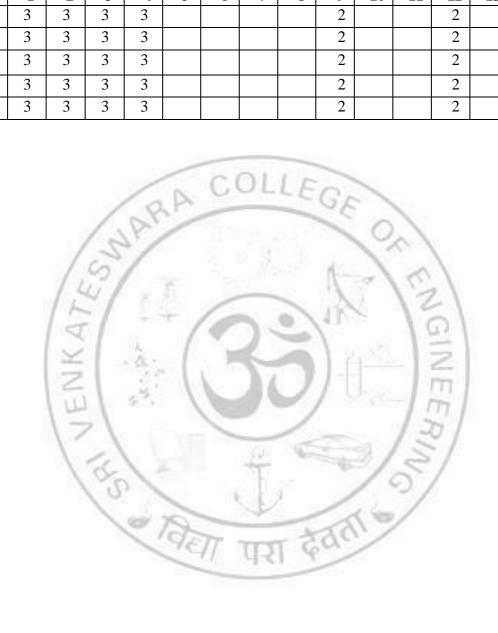8. Study of Transformer and motor characteristics.

TOTAL: 30 PERIODS

REFERENCES:

1. Mittle V.N, Arvind Mittal, "Basic Electrical Engineering", Tata Mc Graw Hill (India), Second Edition, 2013.
2. Sedha R.S., "A Text Book of Applied Electronics", S.Chand & Co., 2014.

BL – Bloom's Taxonomy Levels

CO#	STATEMENT	RBT LEVEL
1.	Wiring of basic electrical system and measurement of electrical parameters.	AN
2.	Verify the basic laws of Electric circuits and select various Electrical Machines.	AN
3.	Construct electronic circuits and design solar photovoltaic system.	AN
4.	Apply the concept of three-phase system.	AN
5.	Construct a fixed voltage regulated power supply.	AN

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3					2			2		
2.	3	3	3	3					2			2		
3.	3	3	3	3					2			2		
4.	3	3	3	3					2			2		
5.	3	3	3	3					2			2		

		L	**T**	**P**	**C**
IT22111	**Programming for Problem solving Laboratory** **(Common to IT, AD, CS, EE, EC)**	**0**	**0**	**3**	**1.5**

OBJECTIVES:

- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

LIST OF EXERCISES

1. Usage of Basic Linux commands.
2. C Programming using Simple statements and expressions.
3. Scientific problem solving using decision making and looping.
4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using Strings.
6. C Programming using Pointers.
7. C Programming using user defined functions (Pass by value and Pass by reference) .
8. C Programming using Recursion.
9. C Programming using structures and union.
10. C Programming using enumerated data types.
11. C Programming using macros and storage classes.
12. C Programming using Files.
13. Develop modularized application for any one of the following scenarios.

Scenarios:

- Student Management System
- Stock Management System
- Banking Application
- Ticket Reservation System

Total (P:45 PERIODS)

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

CO#	STATEMENT	RBT LEVEL
1	Demonstrate the shell commands in Linux OS.	AP
2	Utilize primitive data types and simple input-output statements in C.	AP
3	Demonstrate simple and advanced conditional and iterative control structures in C.	AP
4	Demonstrate the use of user-defined data types like functions, structures and unions in developing modularized applications.	AP
5	Experiment data processing using files pointers in C.	AP

TEXT BOOKS:
1. Pradip Dey, Manas Ghosh, " Programming in C ", First Edition, Oxford University Press, 2018.
2. Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, Tata McGrawHill, 2010.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

- Computer with Windos/Linux OS and C compiler - 30 No.s

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	1	3						2	3			2	2	2
2.	1	3						2	3			2	2	2
3.	1		3	2	1			2	3			2	2	2
4.	1		3	2	1			2	3			2	2	2
5.	1		3	2	1			2	3			2	3	3

அறிவியல் மற்றும் மதொழில்நுட்பத்தில் தமிழ்
SCIENCE AND TECHNOLOGY IN ANCIENT TAMIL SOCIETY

HS22251

(Common to all Branches)

L	T	P	C
2	0	0	2

பொடத்தின்ற ொக்கங்கள் :

- அறிவியலில் தமிழின் பயன்பொடு பற்றி மதரிந்து மகொள்வொர்கள்.
- மதொழில்நுட்பத்தில் தமிழ் பொரம்பரியத்தின் தொக்கம் பற்றி அறிந்து மகொள்வொர்கள்.

OBJECTIVES:

- They will know about the use of Tamil in science.
- Learn about the impact of Tamil heritage on technology.

அலகு 1   அறிவியல் தமிழ்   6

கருவி உருவொக்கம் – ஆரொய்ச்சி தமம்பொடு – கல்வி வைர்ச்சி – அறிவியல் தமிழ் மசொற்கள் உருவொக்கம்.

UNIT I   SCIENTIFIC TAMIL

Tool Development - Research Development - Educational Development - Scientific Tamil words Creation.

அலகு 2   மதொழில்நுட்பத்தில் தமிழ்   24

வடிவணமப்பு மற்றும் கட்டுமொன மதொழில்நுட்பம் : சங்க கொலத்தில் கட்டுமொனப் மபொருட்கள் – தசொழர்தகின் மபரியதகொவில்கள் மற்றும் பிற வழிபொட்டுதலங்கள் – பல்லவர்தகின் சிற்பங்கள் மற்றும் தகொவில்கள் (மொமல்லபுரம்) - நொயக்கன் கொல தகொவில்கள் (மதுணர மீனொட்சி அம்மன் தகொவில்), திருமணல நொயக்கர் மஹொல், மசட்டிநொட்டு வீடுகள்.

உற்பத்தி மதொழில் நுட்பம் : கப்பல் கட்டும் கணல, உதலொகவியல் ஆய்வுகள், தங்கம், தொமிரம், இரும்பு பற்றிய அறிவு – மதொல்மபொருள் சொன்றுகள் – சுடக் கைமண் மைகள், சங்கு மைகள், எலும்பு மைகள்.

விவசொயம் மற்றும் ீர்ப்பொசன மதொழில்நுட்பம் : அணைகள், ஏரிகள், குஎகள், மதகுகள், தசொழர் கொல குமுழி தூம்பு ஆகியவற்றின் முக்கியத்துவம் – கொல்நணட பரொமரிப்பு, கொல்நணடகைின் பயன்பொட்டிற்கொக வடிவணமக்கப்பட்ட கிஎறுகள். விவசொயம் மற்றும் தவொண மசயலொக்கம் – கடல் பற்றிய அறிவு – மீன் பிடித்தல், முத்து குஎித்தல், சங்கு தசகரித்தல்.

தமிழ் கைனி: அறிவியல் தமிழ் வைர்ச்சி – தமிழ் கைனி, தமிழ் புத்தகங்கைின் டிஜிட்டல்மயமொக்கல், தமிழ் டிஜிட்டல் நூலகம், தமிழ் மமன்மபொருள் உருவொக்கம் – தமிழ் மமய் நிகர் அகொடமி – மசொற்குணவ திட்டம்.

தமிழின் எதிர்கொலமும் தகவல் மதொழில்நுட்பமும்- உலகமயமொக்கலும் தகவல் மதொழில்நுட்பமும் – கைனிக்கு தமிழ் கற்று மகொடுத்தல் – தமிழ்மமொழித் மதொழில்நுட்பத்தில் வைங்கள்.

UNIT II   TAMIL IN TECHNOLOGY

Design and Construction Technology : Building materials in Sangam age – Great temples of Cholas and other workship places – Sculptures and Temples of Pallavas (Mamallapuram) – Temples of Nayakas period (Madurai Meenakshi amman temple), Thirumalai Nayakar Mahal, Chetti Nadu Houses.

Manufacturing Technology : Art of Ship building, Metallurgical studies, Knowledge about Gold, Copper, Iron – Archeological evidences – Terracotta beads, Shell beads, Bone beads.

Agriculture and Irrigation Technology: Dams, Tank, ponds, sluice, Significance of Kumuzhi Thoompu of Cholas period- Animal Husbandry, Wells designed for cattle use. Agriculture and Agro processing, - Knowledge about Sea – Fisheries, Pearl, Conche diving.

Tamil Computing : Development of Scientific Tamil – Tamil Computing, Digitization of Tamil books, Tamil Digital Library, Development of Tamil Softwares – Tamil virtual Academy – Sorkuvai project. Future of Tamil and Information Technology- Globalization and Information Technology-Teaching Tamil for Computer-Resources in Tamil Language Technology.

TOTAL : 30 PERIODS

பொடம றி முடிவுகள் :
OUTCOMES:

CO#	CO statements Upon successful completion of the course, the students should be able to	RBT Level
1	அறிவியலில் தமிழ் மமொழியின் பயன்பொடு பற்றி மதரிந்து மகொள்வொர்கள் They will know about the use of Tamil language in science	U
2	பல்தவறு மதொழில்நுட்பத்தில் தமிழ்மமொழியின் தொக்கம் பற்றி அறிந்து மகொள்வொர்கள் They will learn about the influence of Tamil language in various technologies	AP

பொட நூல்கள்:
REFERCENCES:

1. டொக்டர், வொ.மச .குழந்ணதசொமி (1985), "அறிவியல் தமிழ்" , பொரதி பதிப்பகம், 126/108, உஸ்மொன் சொணல, தியொகரொய நகர் , மசன்ணன 600017.

2. சுப. திண்ணைப்பன், (1995), "கைகினியும் தமிழ் கற்பித்தலும்", புலணம மவையீடு, 38-B மண்ணை த்நததொட்டத் மதரு, ஆழ்வொர்தபட், மசன்ணன 600018.

3. மு. மபொன்னணவக்தகொ, (2003), "வைர்தமிழில் அறிவியல் – இணையத் தமிழ்", அணனத்திந்திய அறிவியல் தமிழ்க் கழகம், தஞ்சொவூர் 615 005.

4. துணர. மைகண்டன், (2008), "இணையமும் தமிழும்", நல்நிலம் பதிப்பகம், 7-3, சிதமட்லி சொணல, தியொகரொய நகர், மசன்ணன 600 017.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	-	-	3	2	3	3	2	2	3	3	-	2	-	-
2	-	-	3	2	3	3	2	-	3	3	-	2	-	-

3-High, 2-Medium, 1-Low, '-' – no correlation

HS22252	**Technical English**	**L**	**T**	**P**	**C**
	(Common to all Branches)	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

1. Enable learners to define and understand technical communication and scientific writing
2. Expose learners to the technicalities of seminar presentation, group discussion, and public speaking
3. Develop learners' writing skills for scientific and documenting purposes
4. Improve learners' ability to draft correspondences for business purposes
5. Cultivate learners' ability to holistically understand the nuances of job interviews and recruiting process.

UNIT I   **9 Hours**
Listening - AV files pertaining to manufacturing processes of products, scientific documentaries; Speaking - syllable division and word stress, intonation, sharing opinions; Reading - news articles related to science and technology; Writing - definitions, instruction, recommendation, data interpretation, resume; Grammar -tenses and their aspects, sentence connectors – discourse markers, sequential words, active and passive voice, subject-verb agreement.

UNIT II   **9 Hours**
Listening - AV pertaining to marketing strategies, peer reading and pronunciation; Speaking- turn taking, sharing opinions; conducting and attending a meeting, understanding the nuances of spoken communication among internal audience and external audience; Reading - analytical documents, descriptive documents; Writing - fliers, brochures, resume - letter of application, checklists; Grammar - modal verbs, clauses - types and uses, conditional clauses, articles.

UNIT III   **9 Hours**
Listening - AV related to how to use components, scientific description, Speaking - speaking for motivation and initiation, speaking at a seminar presentation; Reading - scientific journals, papers; Writing - Technical descriptions - process description, purpose and function, PowerPoint, Google forms, user manuals; Grammar - phrasal verbs, prepositions, technical and scientific affixes.

UNIT IV   **9 Hours**
Listening - scientific debates, crisis management; Speaking - handling conflicts, speaking about the loss of benefits, progress or decline of business, identifying the connotative meanings, Reading- documented evidences of uses and functions of a product, review of a product, Writing - memos, follow-up letters, reports - proposal, project, progress reports, sales reports, reports on industrial visits, executive summary. Grammar - reported speech and tag questions, sentence structure - comparative, imperative, cause and effect, infinitive of result.

UNIT V   **9 Hours**

Listening - AV of Group discussions, panel discussions, face to face interviews for recruitment purposes; Speaking- speaking at group discussions, interviewing a personality, answering at the interviews; Reading - WebPages of top notch engineering companies, Writing - blogging, e-mails, letter of complaint, minutes of the meeting; Grammar - one word substitution, collocations, better word/sentence substitution (rephrasing the content/improvising ideas).

TOTAL: 45 PERIODS

REFERENCES:
1. Department of English, Anna University. *Mindscapes: English for Technologists and Engineers.* Orient Blackswan, Chennai. 2012.
2. Downes, Colm, *Cambridge English for Job-hunting*, Cambridge University Press, New Delhi. 2008
3. Murphy, Raymond, *Intermediate English Grammar with Answers*, Cambridge University Press 2000.
4. Thomson, A.J., *Practical English Grammar 1 & 2*, Oxford, 1986.
5. Herbert A J, *The Structure of Technical English*, Longman, 1965.

Websites

1. http://www.usingenglish.com
2. http://www.uefap.com3
3. https://owl.english.purdue.edu/owl/
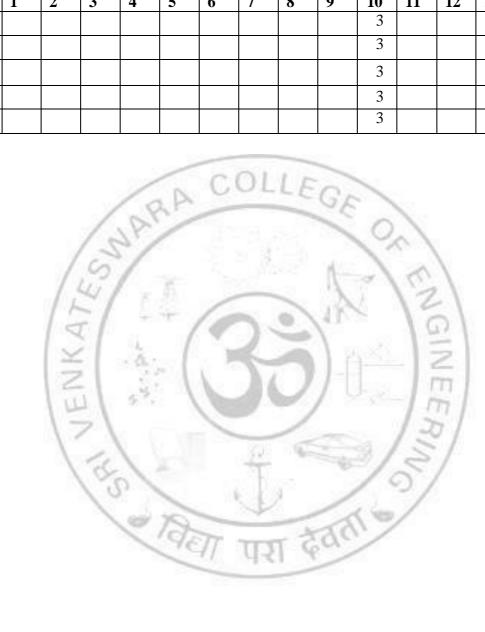4. www.learnenglishfeelgood.com/esl-printables-worksheets.html

Software

1. Face 2 Face Advance – Cambridge University Press, 2014.
2. English Advance
   Vocabulary- Cambridge University Press.
3. IELTS test preparation – Cambridge University
   Press 2017.
4. Official Guide to the TOEFL Test With CD-ROM, 4th Edition.
5. Cambridge Preparation for the TOEFL TEST- Cambridge University Press, 2017.

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

CO #	STATEMENT	RBT LEVEL
1	Understand the nuances of technical communication and scientific writing	AP
2	Present papers and give seminars	C
3	Discuss in groups and brainstorm	C
4	Draft business correspondences and write for documenting purposes	C
5	Face job interviews with confidence	C

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.										3				
2.										3				
3.										3				
4.										3				
5.										3				

MA22251   **Applied Mathematics II**
                 (Common to all Branches except MR)

COURSE OBJECTIVES:
The Student should be made to:

1. Acquire the concepts of vector calculus needed for problems in all engineering disciplines and compute different types of integrals using Green's, Stokes' and Divergence theorems.
2. Skilled at the techniques of solving ordinary differential equations that model engineering problems.
3. Extend their ability of using Laplace transforms to create a new domain in which it is easier to handle the problem that is being investigated.
4. Explain geometry of a complex plane and state properties of analytic functions.
5. Understand the standard techniques of complex variable theory so as to apply them with confidence in application areas such as heat conduction, elasticity, fluid dynamics and flow of electric current.

UNIT I   VECTOR CALCULUS   12
Gradient, divergence and curl - Directional derivative - Vector identities – Irrotational and solenoidal vector fields - Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's theorem in a plane, Gauss divergence theorem and Stokes'theorem (excluding proofs) – Verification and application in evaluating line, surface and volume integrals.

UNIT II   ORDINARYDIFFERENTIAL EQUATIONS AND ITS APPLICATIONS   12
Differential equations of first order – Equations of the first order and first degree – Linear equations – Higher order linear differential equations with constant coefficients - Method of variation of parameters - Cauchy's and Legendre's linear equations - Simultaneous first order linear equations with constant coefficients – Applications of Linear differential equations – Oscillatory electrical circuit – Deflection of beams.

UNIT III   LAPLACE TRANSFORM   12
Conditions for existence - Transform of elementary functions - Transforms of unit step function and impulse functions – Basic properties – Shifting theorems - Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Initial and final value theorems - Transform of periodic functions. Inverse Laplace transforms - Convolution theorem – Application to solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

UNIT IV   ANALYTIC FUNCTIONS   12
Analytic functions - Necessary and sufficient conditions (Cauchy-Riemann equations) - Properties of analytic function - Harmonic conjugates - Construction of analytic functions - Conformal mapping – Mapping by functions $W = Z + C$, CZ, $1/Z$, Z^2 – Joukowski's

transformation- Bilinear transformation.

UNIT V   COMPLEX INTEGRATION   12

Cauchy's integral theorem - Cauchy's integral formula - Taylor's and Laurent's series expansions - Singular points - Residues - Cauchy's Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semi-circular contour.

TOTAL (L:45+T:15): 60 PERIODS

TEXT BOOKS:
1. Erwin Kreyszing, Herbert Kreyszing, Edward Norminton, "Advanced Engineering Mathematics"*,* 10th Edition, John Wiley, (2015).
2. Grewal .B.S, Grewal .J.S "Higher Engineering Mathematics",43rd Edition, Khanna Publications, Delhi, (2015).

REFERENCES:
1. Dass, H.K., and Rajnish Verma, "Higher Engineering Mathematics", S.Chand Private Ltd., 2011.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, (2013).
3. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", 9th edition, Laxmi Publications(p) Ltd., 2014.
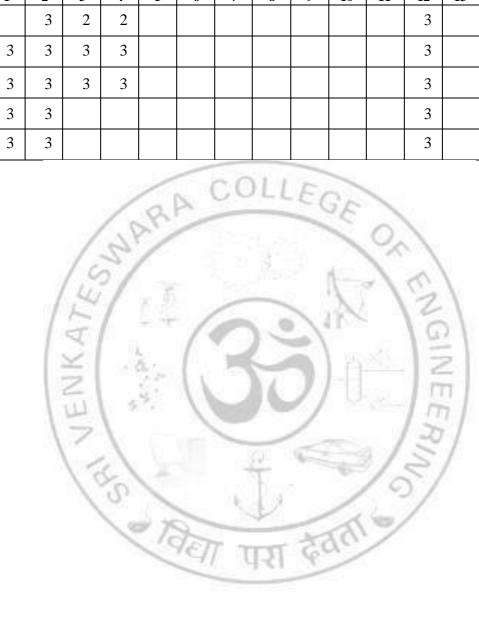
WEB LINK:
1. https://nptel.ac.in/courses/111/105/111105134/
2. https://nptel.ac.in/courses/111/105/111105121/

COURSE OUTCOMES:

CO #	Upon completion of the course, students will be able to:	RBT* Level
1	Interpret the fundamentals of vector calculus and execute evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems.	AP
2	Solve first order linear, homogeneous differential equations and use series solution method to solve second order differential equations.	AP
3	Determine the methods to solve differential equations using Laplace transforms and Inverse Laplace transforms.	AP
4	Explain Analytic functions and Categorize transformations.	AP
5	Perform Complex integration to evaluate real definite integralsusing Cauchy integral theorem and Cauchy's residue theorem.	AP

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO1		3	2	2								3		
CO2	3	3	3	3								3		
CO3	3	3	3	3								3		
CO4	3	3										3		
CO5	3	3										3		

		L	**T**	**P**	**C**
ME22251	**Technical Drawing** (Common to AD, CS, IT)	**1**	**0**	**2**	**2**

OBJECTIVES :
- This course will introduce the students to build their ability to read drawings and interpret the position and form of simple geometries.

UNIT 0   **CONCEPTS AND CONVENTIONS AND GEOMETRIC**   **2**
CONSTRUCTION (NOT FOR EXAM)

Importance of drawing in engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning. Geometric construction - to draw perpendiculars, parallel lines, divide a line and circle, to draw equilateral triangle, square, regular polygons.

UNIT I   **CONICS, CYCLOID, AND INVOLUTES**   **7**

Geometric construction - Curves used in engineering practices: Conics - Construction of parabola and hyperbola by eccentricity method -Construction of ellipse by Concentric circle method - Drawing of tangents and normal to the above curves -Construction of cycloid in a straight line only- Drawing of tangents and normal to the above curve. Construction of involutes of square, pentagon and circle - Drawing of tangents and normal to the above involutes.

UNIT II   **PROJECTION OF LINES AND PLANE SURFACES**   **9**

Orthographic projection – First angle projection - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method.
Projection of planes (polygonal and circular surfaces) inclined to one of the principal planes and perpendicular to other by rotating object method.

UNIT III   **PROJECTION OF SOLIDS**   **9**

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

UNIT IV   **DEVELOPMENT OF SURFACES**   **9**

Development of Surfaces – Development of lateral surfaces of simple solids - Parallel line Development – Prisms, Cylinder - Radial line development – Pyramids and Cone.

UNIT V   **ORTHOGRAPHIC AND ISOMETRIC PROJECTION**   **9**

Isometric view of simple solids -Free Hand Drawing - Orthographic Projection - Orthographic views of simple blocks from their Isometric view

TOTAL : 45 (15 L+30P) PERIODS

OUTCOMES : On Completion of the course the student will be able to

CO #	*CO statements*	RBT level
1	*Construct* conic sections, cycloid and involutes as per drawing standards	U
2	*Draw* orthographic projections of lines and plane surfaces.	AP
3	*Sketch* orthographic projections of simple solids.	AP
4	*Develop* the lateral surfaces of simple solids.	AP
5	*Sketch* the orthographic projections of a given isometric view using free hand	AP

TEXT BOOKS:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House,53rd Edition, 2019.
2. Dhananjay M. Kulkarni, A.P. Rastogi, Ashoke K. Sarkar, "Engineering Graphics with AutoCAD", PHI Learning Private Ltd., 2009.
3. Venugopal K. and Prabhu Raja V., "Engineering Drawing + AutoCAD", New Age International (P) Limited, 6th edition, 2022

REFERENCES :

1. Dhananjay A Jolhe, "Engineering Drawing with an Introduction to AutoCAD", Tata McGraw-Hill Publishing Company Limited., 2008
2. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
3. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
4. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.

WEB RESOURCES:
1. https://nptel.ac.in/courses/112105294
2. https://nptel.ac.in/courses/112103019

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO1										1				
CO2										2				
CO3										2				
CO4										3				
CO5										3				

IT22201   COMPUTER ORGANIZATION AND ARCHITECTURE   L   T   P   C
                                                            3   0   0   3
OBJECTIVES:

- To make students understand the basic structure and operation of digital computer
- To understand the hardware-software interface
- To familiarize the student with arithmetic and logic unit and implementation of fixed point and floating point arithmetic operations.
- To expose the students to the concept of pipelining
- To familiarize the students with hierarchical memory system including cache memory and virtual memory
- To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I   BASIC COMPUTER ORGANIZATION AND DESIGN   9

Instruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Complete computer description, Design of Basic computer, design of Accumulator Unit.

UNIT II   ALU AND CU   9

ALU - Addition and subtraction – Multiplication – Division – Floating Point operations –Subword parallelism. CPU- General Register Organization, Stack Organization, Instruction format, Addressing Modes, data transfer and manipulation, Program Control, Reduced Instruction Set Computer (RISC).

UNIT III   PIPELINING AND HAZARDS   9

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions, The ARM Cortex-A8 and Intel Core i7 Pipelines.

UNIT IV   MEMORY AND I/O SYSTEMS   9

Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

UNIT V   MULTICORES,   MULTIPROCESSORS,   AND   9
                 CLUSTERS

Shared Memory Multiprocessors, Clusters and Other Message-Passing Multiprocessors Hardware Multithreading, SISD, MIMD, SIMD, SPMD, and Vector, Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers, and Other Message-Passing Multiprocessors.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO	CO statements	RBT level
1	Build the basic structure of computer, operations and instructions.	AP
2	Design arithmetic and logic unit.	AP
3	Design and analyze pipelined control units.	AP
4	Evaluate performance of memory and I/O systems.	E
5	Construct the parallel processing architectures.	AP

TEXT BOOKS:
1. David A. Patterson and John L. Hennessey, "Computer organization and design", Morgan kauffman / elsevier, Fifth edition, 2014.

REFERENCES:
1. V. Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI edition, McGraw-Hill Inc, 2012.
2. William Stallings "Computer Organization and Architecture", Seventh Edition, Pearson Education, 2006.
3. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.
4. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005.
5. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998.
6. http://nptel.ac.in/.

COURSE ARTICULATION MATRIX

COs	PO													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	1	3							3			2		
2.	1	3							3			2		
3.	1		3	2	1				3			2		
4.	1		3	2	1				3			2		
5.	1		3	2	1				3			2		

IT22202   **OOPS USING C++ AND PYTHON**   **L   T   P   C**
                                                         3   0   0   3

OBJECTIVES
- Be familiar with the C++ concepts of abstraction, encapsulation, constructor , polymorphism, overloading and Inheritance.
- Be familiar with objects in python.
  Be familiar with python data structures and design patterns.

UNIT I   OBJECT ORIENTED PROGRAMMING FUNDAMENTALS

C++ Programming features - Data Abstraction - Encapsulation - Class -Object - Constructors – Static members – Constant members – Member functions – Pointers – References - Role of this pointer – String Handling.

UNIT II   OBJECT ORIENTED PROGRAMMING CONCEPTS

Dynamic memory allocation - Nested classes - Polymorphism – Compile time and Run time polymorphisms – Function overloading – Operator overloading - Inheritance – Virtual Functions - Abstract class.

UNIT III   C++ PROGRAMMING ADVANCED FEATURES

Generic Programming - Function template - Class template - Exception handling - Standard template libraries – containers – iterators – function adaptors – allocators - File handling concepts.

UNIT IV   OBJECTS IN PYTHON

Creating python classes, modules and packages, basic inheritance and multiple inheritance, Managing objects

UNIT V   PYTHON DATA STRUCTURES AND DESIGN CONCEPTS

Tuples, Dictionaries, List, Sets, Built-in functions, Design patterns-Decorator, Observer , Strategy, State, Singleton, Template.

TOTAL : 45 PERIODS

OUTCOMES:

CO #	*CO statements*	RBT level
1	Examine the features and basics of OOPS.	AN
2	Apply the various features of object oriented programming to construct applications in C++.	AP
3	Develop the software using advanced features of Object oriented programming to solve real time problems.	AP
4	Develop the programs to implement the basics of python	AP
5	Choose the data structures and design patterns to construct applications using python	E

TEXT BOOKS:

1. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley Professional, 2013.
2. Dusty Philips Python 3 Object-oriented Programming - Second Edition 2015, packt publishers.

REFERENCES:

1. KR.Venugopal& Rajkumar Buyya " Mastering C++", second edition 2013.
2. Reema Thareja "PYTHON PROGRAMMING Using Problem Solving Approach", Oxford University Press, 2017.

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	1	3							3			2		
2.	1	3							3			2		
3.	1		3	2	1				3			2		
4.	1		3	2	1				3			2		
5.	1		3	2	1				3			2		

BT22101	**BIOLOGY FOR ENGINEERS**	**L**	**T**	**P**	**C**
	(Common to BT/AE/IT)	**3**	**0**	**0**	**3**

OBJECTIVES:
- To Illustrate the unit of life and its function
- To Study the implications of engineered products and process on living matters
- To Understand biological function for the application in the product and process engineering
- To Discuss the impact of the machine on human
- To Understand the regulation and ethics

UNIT – I   Introduction to Biology   8

Origin of life and Evolution, Cells - Prokaryotes and Eukaryotes, Biochemical nuts and bolts - water, carbohydrates, lipids, proteins, DNA, RNA and enzymes, Introduction to metabolism, Mendelian genetics, Chromatin, DNA structure, replication, transcription and translation.Human system - skeletal structure, types of connective tissues, structure of joints, muscle and organ structure and function, cardiac physiology, blood properties and flow, nervous system. Plant system- organization of plants, Photosynthesis and Respiration, Growth and Development Hormones. Microbial system - Bacteria, yeast, fungi, protozoan, Algae and virus.

UNIT – II   Application of Biological Principles in Engineering   12

Biological functions forCamera for imaging, image recognition, visual information processing, Information and Communication Technologies, memristor, optoelectronic, speech recognition, smart sensing, sensorimotorics, neuromorphic and artificial intelligence.Biology in biomimicry – Sharkskin inspired swimsuits, Burr inspired Velcro, Whale fin inspired wind turbine blades, cooling fans, airplane wings and propellers, lotus inspired paintbrushes, Stenocara shell inspired water collection, skeleton structure of blowfish inspired designing of vehicles, termites and *Scyliorhinus canicular* inspired architecture and natural colour inspired nanophotonic crystal.

UNIT – III   Biologically Inspired products, process, and matters   12

Case study on workload ergonomics, system ergonomics and information ergonomics, Ultrasound imaging, X-Ray and PET scanning, Bioelectromagnetism - Touch Screen Technology, Force and torque sensor, inertial sensing technology and motion capture systems, Human-in-the-loop process, Bioactuators, Biocybernetics, Biotelemetry, Bionic (rehabilitation), Bioreactor, Bioremediation, Biofertilizer, Bioenergy, Biosensors, Biopolymers, Biofilters, Biochips, Microbial fuel cells in vehicles. Biotechnological reliance in space, agriculture and nuclear energy.

UNIT – IV   Impact of Machine/Devices on Human   5

Biological effects – Somatic and genetic effect, Exposure and health effects – microwaves, radiation, radiofrequency and electronic gadgets, Man-made and Technological hazards, Impact on ecosystem - Chemical, nuclear, radiological, transportation and e-waste hazards.

UNIT – V   Regulations   8

International and National regulatory bodies - Radiation in the electromagnetic spectrum, Electronic devices, Cell phones, Smart meters, Medical use of radiation and Nuclear power plants,Labeling Regulatory Requirements for Medical Devices, Ethics and privacy cameras and surveillance system,Regulation of Human Cloning and Embryonic Stem Cell Research, Privacy and ethical issues in 3D whole body scanning, Regulation of emerging gene technologies.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

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

CO#	STATEMENT	RBT LEVEL
1.	Distinguish the structure and function of prokaryotic and eukaryotic cells.	AN
2.	Explains the usage of biological principles in engineering.	U
3.	Integrate the concepts of biology with engineering through case studies.	AP
4.	Describe the influence of biologically inspired materials/machine/devices on environment and society.	U
5.	Understand the regulations, ethics, security and safety of engineering applications.	U

TEXTBOOKS:

1. Johnson, A. T. Biology for engineers. CRC Press, 2011.
2. Vaccari, D. A., Strom, P. F., & Alleman, J. E. Environmental biology for engineers and scientists (Vol. 7, p. 242). New York: Wiley-Interscience, 2006.
3. Waite, G. N., & Waite, L. R. Applied cell and molecular biology for engineers. McGraw-Hill Education, 2007.
4. Khandpur, R. S. Biomedical instrumentation: Technology and applications (Vol. 1). New York: Mcgraw-hill, 2005.
5. Salvendy, G. (Ed.). Handbook of human factors and ergonomics. John Wiley & Sons, 2012.

REFERENCE BOOKS:

1. Nelson, D. L., Lehninger, A. L., & Cox, M. M. Lehninger principles of biochemistry. Macmillan, 2008.
2. Subrahmanyam, S. A Textbook of Human Physiology. S. Chand Limited, 1987.
3. Kindt, T. J., Goldsby, R. A., Osborne, B. A., & Kuby, J. Kuby immunology. Macmillan, 2007

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	2											1		
2.	3	2				1								
3.		2	1			2				2		1		
4.		1		2			3							
5.						3	3	3				1		

IT22211 **Hardware Assembling And Software Tools Laboratory** L T P C
0 0 3 1.5

OBJECTIVES

The students should be made to:

- To acquire basic of Computer assembling and trouble shooting.
- To gain knowledge on installation processTo acquire basic knowledge in computer hardware and peripherals for installation, PC assembly, trouble shooting and maintenance including system management and its backup and to undertake disaster prevention, a basic knowledge of TCP/IP networks work group, internet and intranet.
- To install OS, customize OS.

List of Exercises

1. To make comparative study of motherboards.
2. To study various cards used in a system viz. display card, LAN card etc.
3. To study monitor, its circuitry and various presents and some elementary fault detection.
4. To study printer assembly and elementary fault detection of DMP and laser printers.
5. To observe various cables and connectors used in networking.
6. To study parts of keyboard and mouse.
7. To assemble a PC.
8. Troubleshooting exercises related to various components of computer like monitor, drives, memory and printers etc.
9. Any OS installation
10. Customize Operating System and maintenance of system application *software*.
11. Configuration of Proxy Server.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO #	CO statements	RBT level
1	Demonstrate installation of computer hardware and peripherals	AP
2	Demonstrate PC assembly, trouble shooting and maintenance including system management and its backup	AP
3	Elucidate knowledge of TCP/IP networks work group, internet and intranet.	AP
4	To install OS, customize OS	AP
5	To Configure Proxy server	AP

REFERENCES:

1. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley Professional, 2013.
2. Dusty Philips Python 3 Object-oriented Programming - Second Edition 2015, packt publishers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Computers - 30 No.s

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	1	3							3			2		2
2.	1	3							3			2		2
3.	1		3	2	1				3			2		2
4.	1		3	2	1				3			2		2
5.	1		3	2	1				3			2		2

IT22212   **OOPS USING C++ AND PYTHON**   **L   T   P   C**
                            LABORATORY   **0   0   3   1.5**

OBJECTIVES
The students should be made to:
- To understand the concepts of Object Oriented Programming
- To understand the features of C++ constructs.
- To understand python data structures and design patterns

List of Exercises

Creating simple applications using C++ by implementing the following concepts
1. Constructors and Destructor.
2. Friend Function and Friend Class.
3. Polymorphism and Function Overloading.
4. Overload Unary and Binary Operators Both as Member Function and Non Member Function.
5. Inheritance.
6. Virtual Functions.
7. Class Templates and Function Templates.
8. Exception Handling Mechanism.
9. Standard Template Library concept

Creating simple applications using Python by implementing the following concepts
1. Classes, Modules and Packages
2. Basic Inheritance and Multiple Inheritance
3. Tuples, Dictionaries, List, Sets
4. Built-in functions
5. Design patterns.

TOTAL: 45 PERIODS

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

CO #	*CO statements*	RBT level
1	Develop programs using OOPS concepts to solve the problems	AP
2	Apply design patterns to design the solution for the problem	AP
3	Choose inheritance, polymorphism or exception handling mechanism to implement reusable robust C++ programs	AP
4	Apply the concepts of classes, packages, data structures using python	AP
5	Design user interface using C++ and Python for the real time applications.	C

REFERENCES:
1. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley Professional, 2013.
2. Dusty Philips Python 3 Object-oriented Programming - Second Edition 2015, packt publishers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Computers installed with Linux OS/Windows OS and Python Compiler   - 30 No.s

COURSE ARTICULATION MATRIX

COs	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	1	3							3			2		2
2.	1	3							3			2		2
3.	1		3	2	1				3			2		2
4.	1		3	2	1				3			2		2
5.	1		3	2	1				3			2		2

MA22353

DISCRETE MATHEMATICS
(Common to CS & IT)

L	T	P	C
3	1	0	4

OBJECTIVES:

The Students should be made to:

- Extend student's Logical and Mathematical ability to deal with abstraction.
- Acquire basics of set theory, functions and counting, apply them in day to day problems.
- Understand the fundamental concepts of the Graph theory and Network connectivity.
- Gain the concepts to identify structures of algebraic nature, prove and use properties about them.
- Learn relations, Lattice, Boolean algebras and their properties to comprehend problems in computer Science.

UNIT – I   LOGIC   9+3

Propositional Logic- Connectives -– Propositional equivalences -Normal form –Predicates and Quantifiers – Nested Quantifiers -Validity of a well-formed formula– Rules of inference.

UNIT – II   SET THEORY AND BASICS OF COUNTING   9+3

Basic Concepts of Set Theory- Cartesian product- The Power Set – Functions- Composition of functions -Mathematical induction- The basics of counting - Inclusion and exclusion principle and its applications – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions.

UNIT – III   GRAPH THEORY   9+3

Graphs and Graph models- Graph terminology and special types of Graphs – Matrix representation of Graphs and Graph isomorphism – connectivity – Eulerian and Hamiltonian Graphs.

UNIT – IV   ALGEBRAIC STRUCTURES   9+3

Algebraic structures with one binary operation – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Algebraic structures (Definitions and simple examples only) with two binary operation- Ring, Integral domain and field.

UNIT – V   LATTICES AND BOOLEAN ALGEBRA   9+3

Relations -Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.

TOTAL : (L:45+T:15):60 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

CO #	STATEMENT	RBT LEVEL
1.	Acquire the concepts of set theory and logic to convert from informal language to logic expressions and test the validity of a program.	AN
2.	Apply the counting techniques to comprehend computer simulations	AP
3.	Develop graph theory tools to map day-to-day applications.	AP
4.	Expose to the concepts and properties of algebraic structures which provides solutions in design and analysis of algorithms.	AP
5.	Explore Boolean algebraic structures on numerous levels, the concepts needed to test the logic of a program.	AP

TEXTBOOKS:

1 Kenneth H.Rosen, "Discrete Mathematics and its Applications", 8thEdition, Tata Mc Graw

Hill Pub. Co. Ltd., New Delhi, 2021.

2 Tremblay J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata Mc Graw Hill Pub. Co. Ltd, New Delhi, 53rd reprint 2018.

REFERENCE BOOKS:

1 Ralph P.Grimaldi., "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2018.

2 Thomas Koshy., "Discrete Mathematics with Applications", Elsevier Publications, 2006.

3 Seymour Lipschutz and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd reprint, 6th Edition, 2016.

WEB LINK:

1. **https://home.iitk.ac.in/~arlal/book/mth202.pdf**
2. **https://archive.nptel.ac.in/courses/106/103/106103205**

COURSE ARTICULATION MATRIX

COs	PO												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1.	3	3	3	3								3		
2.	3	3										3		
3.	3	3	3	3								3		
4.	3	3										3		
5.	3	3	3	2								3		

<table>
<tr><td></td><td></td><td>**L T P C**</td></tr>
<tr><td>**IT22301**</td><td>**DATA STRUCTURES AND ALGORITHMS**</td><td>**3 0 0 3**</td></tr>
</table>

OBJECTIVES:

The Students should be made to:

- To understand the concepts of ADTs.
- To learn linear data structures – arrays, lists, stacks, and queues.
- To understand non-linear data structures – trees and graphs.
- To understand sorting, searching and hashing algorithms.
- To apply linear and non-linear data structures.

UNIT – I   LINEAR DATA STRUCTURES – ARRAYS   12

Abstract Datatypes (ADT) - Arrays: insert, delete, reverse, merge sorted arrays; Stack ADT: operations: push-pop-display, Applications – Infix to Postfix Expression Conversion – Postfix expression evaluation, Problems on Stacks: reverse, copy; Queue ADT: Linear Queue operations: enqueue, dequeue, limitations - Circular Queue: operations.

UNIT – II   LINEAR DATA STRUCTURES – LISTS   12

Structures: Self referential structures with single and multiple links; Limitations of arrays; List ADT: types, Singly Linked List-operations: create, insert, delete, search, sort, truncate, reverse operations; Applications of Singly Linked Lists: Polynomial Manipulation; Limitations of Singly Linked List; Doubly Linked List operations, Circular Linked List operations.

UNIT – III   NON LINEAR DATA STRUCTURES – TREES   9

Linear Vs Non-Linear Data structures; Binary Trees: terminology, operations: create, find maximum, find minimum, count the number of nodes, swap two Binary Trees ; Binary Search Trees: Operations: insert, delete, search, find minimum, find maximum, traversals; AVL Trees: rotations. Operations; Binary Heaps: Min Heap operations: heapify, remove minimum.

UNIT – IV   NON LINEAR DATA STRUCTURES – GRAPHS   6

Graphs: Terminologies- weighed graphs, directed and undirected graphs, cycles in graphs; Graph Representations: Adjacency matrix, Adjacency lists; Traversals: Depth First Search, Breadth First Search; Applications and problems: Topological Sort, Single Source Shortest Path problem: Dijkstra's algorithm; Minimal Spanning Trees: Prim's and Kruskal's algorithms.

UNIT – V   SORTING, SEARCHING, AND HASHING   6

Sorting algorithms: Bubble Sort – Selection Sort – Heap Sort – Insertion Sort; Searching: Linear Search – Binary Search, Hashing: Hash table, Hash function- Collision and resolution strategies: Separate Chaining and open addressing, Rehashing, Double hashing Applications of hashing in file management operations.

TOTAL :45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

CO #	STATEMENT	RBT LEVEL
1.	Implement ADT linear data structures.	AP
2.	Choose appropriate linear data structure for solving the problem.	E
3.	Implement ADT non–linear data structure.	AP
4.	Apply appropriate graph algorithms for real time applications.	AP
5.	Analyze the various searching and sorting algorithms.	AN

TEXTBOOKS:

1   Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2e Pearson Education.

2   Thomas H Cormen at el, "Introduction to Algorithms", 3e The MIT Press.

REFERENCE BOOKS:

1   Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3e Pearson Education.

2   How to Think About Algorithms, Jeff Edmonds, Cambridge University Press.

3   Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education.

4   Narasimha Karumanchi, "Data Structures and Algorithms Made Easy", CareerMonk.

5   Narasimha Karumanchi, "Data Structures and Algorithmic Thinking with Python", CareerMonk.

 COURSE ARTICULATION MATRIX

COs	PO												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1.	2	3	1	2	2	1	1	0	1	2	1	3	1	1
2.	1	2	1	2	2	0	0	0	1	1	1	2	1	1
3.	2	3	1	2	3	0	1	0	1	1	1	2	1	1
4.	2	1	2	1	1	0	1	0	2	1	1	2	1	1
5.	1	2	1	2	2	1	1	0	1	2	1	2	1	1

IT22302	**DATABASE CONCEPTS**	**L T P C**
		3 0 0 3

OBJECTIVES:

The Students should be made to:

- To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To learn about the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.
- To have an introductory knowledge about the Storage and Query processing Techniques.

UNIT – I   DATABASE CONCEPTS AND DESIGN   9

Purpose of Database System – Levels of Data Abstraction – Data Models– Database System Architecture, – Introduction to relational databases - Relational Model - Keys - Entity-Relationship Model – E-R Diagrams - Motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's–, Non-loss Decomposition– First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form - Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT – II   SQL and NoSQL   9

Relational Algebra –Relational Calculus, SQL fundamentals - Advanced SQL features- Triggers- Embedded SQL–Dynamic SQL - NoSQL databases - Hbase, MongoDB, Cassandra.

UNIT – III   TRANSACTION PROCESSING AND CONCURRENCY CONTROL   9

Transaction Concepts, Model – ACID Properties –Serializibilty-schedules – Recovery and Isolation Levels – SQL transaction Commands - Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Timestamp Protocols.

UNIT – IV   DATA STORAGE AND QUERY PROCESSING   9

Overview of Physical Storage Media – RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing - Query Processing - Evaluation of relational algebra expressions, query equivalence, join strategies, query optimization algorithms.

UNIT – V   ADVANCED DATABASES   9

Distributed databases, Spatial Databases, Temporal Databases, XML Databases, Multimedia Databases.

TOTAL :45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

CO #	STATEMENT	RBT LEVEL
1.	Demonstrate the knowledge on basic elements of different data models and normalize the given relation.	AP
2.	Construct SQL queries for a given application.	AP
3.	Illustrate transaction processing and concurrency control concepts and manage transactions.	AP
4.	Examine the basic database storage structures and access techniques.	AN
5.	Analyze the recent advancements in databases and design database for real world applications.	AN

TEXTBOOKS:

1 Ramez Elmasri, Shamkant B. Navathe, Fundamentals o f Database Systems , Seventh Edition, Pearson Education, 2016.

REFERENCE BOOKS:

1 Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Database System Concepts, Sixth Edition, Tata McGraw Hill, 2010.

2 Raghu Ramakrishnan, Johannes Gehrke Database ManagementSystems, Fourth Edition, Tata Mc Graw Hill, 2010.

3 G.K.Gupta, TDatabase Management Systems, Tata McGraw Hill, 2011.

4 Carlos Coronel, Steven Morris, Peter Rob, Database Systems: Design, Implementation and Management, Ninth Edition, Cengage Learning.

5 Bipin Desai, An Introduction to Database Systems, Galgotia .

6 Pang, N. T., Steinbach, M. and Kumar,V., "Introduction to Data Mining", Pearson Education.

COURSE ARTICULATION MATRIX

COs	PO												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1.	1	2		2	1					1		1		
2.	2	2	2	2	3					1		1	2	
3.	2			1								1		
4.			1	2								1		
5.	2		3	1	3	2	2	1	2		1			2

		L	**T**	**P**	**C**
IT22303	**DIGITAL COMMUNICATION**	**3**	**0**	**0**	**3**

OBJECTIVES:

The Students should be made to:

- To understand various number systems, different methods used for the simplification of Boolean functions.
- To design and implement a system that uses combinational logic for the given specification; Simulate combinational logic systems using verilog or VHDL.
- To design and implement synchronous sequential system for the given specification; Simulate sequential logic systems using verilog or VHDL.
- To understand encoding and decoding of digital data streams.
- To have a detailed knowledge of compression and decompression techniques.

UNIT – I   BOOLEAN ALGEBRA AND LOGIC GATES   9

Review of Number Systems – Arithmetic Operations – Binary Codes – Boolean algebra and Theorems – Boolean Functions - Logic Gates – Simplification of Boolean Functions using Karnaugh Map and Tabulation Methods-NAND & NOR Implementation

UNIT – II   COMBINATIONAL CIRCUITS   9

Combinational Circuits – Analysis and Design Procedures – Circuits for Arithmetic Operations, Code Conversion – Decoders and Encoders – Multiplexers and De-multiplexers – Tri-State Gates–Introduction to HDL programs.

UNIT – III   SYNCHRONOUS SEQUENTIAL LOGIC   9

Latches and Flip Flops–S-R Flipflop,J-KFlipflop,T Flipflop,D Flipflop,Master-Slave JK Flipflop–Analysis and Design Procedures –Shift Registers – Counters –State Diagram, State Table, State Assignment & Minimization.

UNIT – IV   INFORMATION ENTROPY FUNDAMENTALS   9

Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding–Mutual Information–Channel capacity-Binary Symmetric Channel-Binary Erasure Channel-channel coding Theorem – Channel capacity Theorem.

UNIT – V   AUDIO AND VIDEO CODING   9

Linear Predictive coding – code excited LPC – Perceptual coding, MPEG audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.261 & MPEG-1,2,3,4 Video standards.

TOTAL :45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

CO #	STATEMENT	RBT LEVEL
1.	Perform arithmetic operations in any number system & to simplify the Boolean expression using K –Map and Tabulation techniques.	AP
2.	Design and analysis of a given digital Combinational circuit	AN
3.	Design and analysis of a given digital Sequential hardware circuit.	AN
4.	Analyse channel capacity for various channels and to generate codewords for different media elements.	AN
5.	To analyze the performance of audio and video coders.	AN

TEXTBOOKS:

1 Morris Mano M and Michael D. Ciletti, "Digital Design with An Introduction to Verilog HDL", 5th edition, Pearson Education India, 2013.

2 Simon Haykin, "Communication Systems", John Wiley and Sons, 4th Edition, 2004.

3 Khalid Sayood, "Introduction to Data Compression", Fifth Edition,Elsevier, 2017.

REFERENCE BOOKS:

1 Fred Halsall, "Multimedia Communications, Applications Networks Protocols and Standards", Pearson Education, Asia 2002.

2 R Bose, "Information Theory, Coding and Cryptography", Fifth Edition, Tata Mcgraw Hill, 2009.

3 John F. Wakerly, "Digital Design Principles and Practices", Fourth Edition, Pearson Education, 2007.

4 Charles H. Roth Jr, "Fundamentals of Logic Design", Fifth Edition, Jaico Publishing House, Mumbai, 2003.

COURSE ARTICULATION MATRIX

COs	PO												PSO's	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1.	2	3	1	2	2	1	1	1	1	2	1	3	1	1
2.	1	2	1	2	2	0	0	1	1	1	1	2	1	1
3.	2	3	1	2	3	0	1	1	1	1	1	2	1	1
4.	2	1	2	1	1	0	1	1	2	1	1	2	1	1
5.	1	2	1	2	2	1	1	1	1	2	1	2	1	1

	L	T	P	C

IT22309   **IT ESSENTIALS : THEORY AND PRACTICES**   L T P C
                                                                      2 0 2 3

OBJECTIVES:

The Students should be made to:

- To know the difference between data and information.
- To introduce the concept of Internet, Networks and its working principles.
- To know the scripting languages.
- To understand various applications related to Information Technology.

UNIT – I   INFORMATION SYSTEMS   6+4

Data and Information - Types of Data - Acquisition of Text and Image - Textual data - Storage formats - Image Compression - Acquisition of Audio - Acquiring and Storing audio signals - Audio compression techniques - Acquisition of Video - Compression of video data - Internet Application - E-commerce - Business Information Systems.

Suggested Activities: Demonstrate the working of an E-commerce applications.

UNIT – II   NETWORKING ESSENTIALS   6+4

Fundamental computer network concepts - Types of computer networks - Network topologies - Components of network - Network layers - OSI Model - TCP/IP Model - Wireless local area network - Ethernet - WiFi Technologies - Bluetooth - Network Routing - Routing techniques - Switching. - Switching techniques.

Suggested Activities: Set up a simple network topology using NS2 simulation tool.

UNIT – III   MOBILE COMMUNICATION ESSENTIALS   6+4

Cell phone working fundamentals - GSM - Mobile services - Architecture - Entities - Call routing - CDMA - Features of CDMA - Cell phone frequencies and channels - Digital cell phone components - Generations of cellular networks - Cell phone network technologies/architecture - Voice calls & SMS.

Suggested Activities - Develop simple mobile applications using Android Studio.

UNIT – IV   WEB ESSENTIALS   6+9

Creating a Website - Working principle of a website - Markup Languages: HTML. An Introduction to HTML History - Versions - Basic HTML Syntax and Semantics - Some Fundamental HTML Elements - Relative URLs Lists - tables - Frames - Forms - HTML 5.0 - Style Sheets: CSS - Introduction to Cascading Style Sheets – Features - Core Syntax - Authoring tools - Types of servers: Application Server – Web Server - Database Server. Suggested Activities: Develop static and interactive web pages using HTML and Authoring tools.

UNIT – V   SCRIPTING ESSENTIALS   6+9

Need for Scripting languages - Types of scripting languages - Client side scripting - Syntax - Variables and Data Types - Statements - Operators - Literals - Functions - Objects - Arrays - Built - in Objects - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and MySQL - PHP and HTML - Cookies - Simple PHP scripts.

Suggested Activities: Incorporate dynamism in websites using PHP scripts.

                                             TOTAL :L:30+P:30=60 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

CO #	STATEMENT	RBT LEVEL
1.	Analyse the various information systems and technologies to improve an organization's performance.	AN
2.	Demonstrate the use of networking concepts to develop a simple network.	AP
3.	Apply the cellular radio concepts and standards in real time applications.	AP
4.	Design and Deploy web based applications.	AP
5.	Develop dynamic and interactive Web pages using scripting languages.	AP

TEXTBOOKS:

1 V. Rajaraman, "Introduction to Information Technology", PHI Learning , Second Edition, 2013.

2 Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'REILLY, 2014.

3 James F. Kurose, —Computer Networking: A Top-Down Approach‖, Sixth Edition, Pearson, 2012.

REFERENCE BOOKS:

1 GottapuSasibhushana Rao, "Mobile Cellular Communication", Pearson, 2012.4. Reema Thareja, "Programming in C", 2nd ed., Oxford University Press, 2016.

2 R. Kelly Rainer , Casey G. Cegielski , Brad Prince, Introduction to Information Systems, Fifth Edition, Wiley Publication, 2014.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE: Java, MySQL or Equivalent, Apache Server, Android SDK.

HARDWARE: Standalone desktops 30 Nos

COURSE ARTICULATION MATRIX

COs	PO												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1.	3	2	3	2	1	0	1	1	0	2	0	2	3	2
2.	3	2	2		3	0	0	1	0	0	0	0	2	2
3.	3	2	3	1	3	2	2	1	2	0	0	2	3	3
4.	3	2	3	1	3	0	0	1	2	0	3	0	2	3
5.	3	2	3	1	3	0	2	1	2	0	3	0	2	3

		L	T	P	C
IT22311	**DATA STRUCTURES AND ALGORITHMS LABORATORY**	**0**	**0**	**3**	**1.5**

OBJECTIVES:

The Students should be made to:
- To demonstrate arrays and structure in C.
- To demonstrate operations in linear and non-linear data structures.
- To demonstrate applications of stacks and queues.
- To demonstrate applications of graphs.
- To demonstrate various sorting, searching, and hashing algorithms.

List of Experiments

1 Implementation of problems on Arrays and structures.

2 Implementation of Singly Linked List operations: Creation, insertion, deletion, search, middle element, reverse, merge.

3 Implementation of Doubly Linked List operations on an application: Creation, insertion, deletion, search, middle element, reverse, merge.

4 Implementation of Circular Linked List operations on an application.

5 (a) Implementation of Stack operations
   (b) Application of Stack – Expression conversion

6 Implementation of Circular Queue operations on a dragon wheel.

7 Implementation of Binary search Tree operations on an application.

8 Implementation of AVL Tree operations on an application.

9 Implementation of Dijkstra's algorithm for Single Source Shortest Path problem.

10 Implementation of Minimal Spanning Tree algorithms.

11 Implementation of insertion sort, Heap Sort on an application.

12 Implementation of Hash Table on an application.

TOTAL :45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

CO #	STATEMENT	RBT LEVEL
1.	Implement algorithms using arrays and structures.	AP
2.	Implement operations in linear and non-linear data structures.	AP
3.	Apply linear and non-linear data structures to real-time applications.	AP
4.	Implement graph algorithms.	AP
5.	Apply the various sorting, searching and hashing algorithms.	AP

REFERENCE BOOKS:

1 Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2e Pearson Education.

2 Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3e Pearson Education.

3 Thomas H Cormen at el, "Introduction to Algorithms", 3e The MIT Press.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C compiler 30 Nos.

      Or

Server with C compiler supporting 30 terminals or more.

COURSE ARTICULATION MATRIX

COs	PO												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1.	2	2	2	2	0	0	0	0	1	1	1	2	1	1
2.	1	2	1	2	0	0	0	0	1	1	1	1	1	1
3.	2	3	1	2	0	0	0	0	1	1	2	2	1	1
4.	3	1	3	3	0	0	0	0	1	1	2	2	1	1
5.	1	2	1	2	0	0	0	0	1	1	2	2	1	1

		L	**T**	**P**	**C**
IT22312	**DATABASE CONCEPTS LABORATORY**	**0**	**0**	**3**	**1.5**

OBJECTIVES:

The Students should be made to:

- To understand data definitions and data manipulation commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of data bases
- To be familiar with the use of a front end tool
- To understand design and implementation of typical database applications.

List of Experiments

1	Database Design using ER modeling tool
2	Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
3	Database Querying – Simple queries, Nested queries, Sub queries and Joins
4	Views, Sequences, Synonyms
5	Database Programming: Implicit and Explicit Cursors
6	Procedures and Functions
7	Triggers
8	Exception Handling
9	Normalization for any application
10	Database Connectivity with Front End Tools
11	Mini Project using real life database applications

TOTAL :45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

CO #	STATEMENT	RBT LEVEL
1.	Design and implement a database schema for a given problem domain.	AP
2.	Create and maintain tables.	AP
3.	Analyze the database using queries to retrieve records.	AP
4.	Investigate an information storage problem and derive an information model.	AN
5.	Create real life database applications.	C

REFERENCE BOOKS:

1 Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Database System Concepts, Sixth Edition, Tata McGraw Hill, 2010.

2 Raghu Ramakrishnan, Johannes Gehrke Database ManagementSystems, Fourth Edition, Tata Mc Graw Hill, 2010.

3 G.K.Gupta, TDatabase Management Systems, Tata McGraw Hill, 2011.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
HARDWARE:

Standalone desktops 30 Nos.
                    (or)
Server supporting 30 terminals or more.

SOFTWARE:

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

COURSE ARTICULATION MATRIX

COs	PO												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1.	1	2	0	2	1	0	0	0	0	1	0	1	0	0
2.	2	2	2	2	3	0	0	0	0	1	0	1	2	0
3.	2	0	0	1	0	0	0	0	0	0	0	1	0	0
4.	0	0	1	2	0	0	0	0	0	0	0	1	0	0
5.	2	0	3	1	3	2	2	1	2	0	1	0	0	2

IT22313	DIGITAL COMMUNICATION LABORATORY	L	T	P	C
		0	0	3	1.5

OBJECTIVES:

The Students should be made to:

- To be an adjunct to the "Digital Principles and System design" Course through hands-on experience with design, construction, and implementation of digital circuits like combinational /sequential.
- To provide the capability to understand and to simulate digital circuits through Xilinx.
- Explore digital communications models using MATLAB/ SCILAB / Equivalent).

List of Experiments

1   Study of logic gates.

2   Verification of Boolean theorems.

3   Combinational circuits-Implementation of arbitrary functions and code converters.

4   Design and implementation of Binary adder/subtractor.

5   Design and implementation of Parity generator/checker.

6   Design and implementation of magnitude comparator.

7   Design and implementation of applications using multiplexers.

8   Study and Implementation of Flip-Flops.

9   Design and implementation of shift registers.

10 Design and implementation of synchronous counters.

11 Amplitude modulation and demodulation Simulation using MATLAB / SCILAB / Equivalent).

12 Frequency modulation and demodulation Simulation using MATLAB / SCILAB / Equivalent).

TOTAL :45 PERIODS

COURSE OUTCOMES:

At the end of the course, students would:

CO #	STATEMENT	RBT LEVEL
1	Enumerate the working of various logic gates.	AP
2	Enumerate the various combinational circuits and their applications.	AP
3	Design various building blocks of digital computers.	AP
4	Enumerate the basic elements of analog and digital communication systems.	AP
5	To analyze the performance of audio and video coders.	AN

REFERENCE BOOKS:

1 Fred Halsall, "Multimedia Communications, Applications Networks Protocols and Standards",

Pearson Education, Asia 2002.

2 R Bose, "Information Theory, Coding and Cryptography", Fifth Edition, Tata Mcgraw Hill, 2009.

3 John F. Wakerly, "Digital Design Principles and Practices", Fourth Edition, Pearson Education, 2007.

4 Charles H. Roth Jr, "Fundamentals of Logic Design", Fifth Edition, Jaico Publishing House, Mumbai, 2003.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
1. Digital Trainer Kits
2. Bread board and components
3. PC s – 10Nos.
4. IC tester-1
5. MATLAB / SCILAB for simulation experiments.

COURSE ARTICULATION MATRIX

COs	PO												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1.	2	3	1	2	2	1	1	1	1	2	1	3	1	1
2.	1	2	1	2	2	0	0	1	1	1	1	2	1	1
3.	2	3	1	2	3	0	1	1	1	1	1	2	1	1
4.	2	1	2	1	1	0	1	1	2	1	1	2	1	1
5.	1	2	1	2	2	1	1	1	1	2	1	2	1	1

| MA22454 | PROBABILITY AND QUEUEING THEORY | L | T | P | C |
| | (Common to CSE & INT) | 3 | 1 | 0 | 4 |

Objectives
- To perform probability calculations for discrete and continuous random variables.
- To categorize discrete and continuous distributions by learning their properties.
- To compute and interpret correlation coefficient and regression describing association between two variables.
- To expose the fundamental concepts of random processes and related structures.
- To describe various key features of queuing systems.

UNIT-I   PROBABILITY AND RANDOM VARIABLES   (9+3)
Notion of Probability – Conditional Probability - Baye"s Theorem - Random Variables - Discrete and Continuous Random Variables – Moments – Moment generating functions.

UNIT-II   SPECIAL DISTRIBUTIONS   (9+3)
Discrete Distributions - Binomial, Poisson, Geometric, Hypergeometric Distributions; Continuous Distributions - Uniform, Exponential, Gamma, Weibull and Normal Distributions and their properties.

UNIT-III   TWO - DIMENSIONAL RANDOM VARIABLES   (9+3)
Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Regression for two variables– Transformation of random variables – Central Limit Theorem.

UNIT IV   RANDOM PROCESS   (9+3)
Definition - Classification – Poisson Process – Markov Process – Discrete parameter Markov Chain – Chapman Kolmogorov equations – Limiting distributions - Birth and Death Processes.

UNIT-V   QUEUEING SYSTEMS   (9+3)
Characteristics of queuing systems - Little"s Formula - Markovian queues – Single and multiple server queueing models – Queues with finite waiting rooms - Finite source models – Non-Markovian queues - M/G/1 queue – PollaczekKhinchin formula .

TOTAL (L:45+T:15):60 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Extend and formalize the knowledge of probability theory and random variables.	AP
2	Describe commonly used univariate discrete and continuous probability distributionsand apply various distributions to solve real world problems.	AP
3	Identify various distribution functions and acquire skills in handling situations involving more than one variable.	AP
4	Analyse various classifications of Random Processes and characterize phenomena which evolve with respect to time in a probabilistic manner.	AP
5	Understand the basic characteristic features of a queuing system and acquire skills in analyzing queuing models.	AP

TEXT BOOKS:
1. Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Edition IndianReprint, 2010.
2. Gross. D. and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student edition, 2013.

REFERENCES:
1. Robertazzi, "Computer Networks and Systems: Queueing Theory and PerformanceEvaluation",Springer, 3rd Edition, Reprint 2011.
2. Taha H.A., "Operations Research", Pearson Education, Asia, 10th Edition, 2019.
3. Veerarajan. T, "Probability, Statistics and RandomProcesses", McGraw Hill Publishers, 3rd Edition, 2013.
4. Hwei Hsu, "Schaum‟s Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2013.
5. Yates R.D. and Goodman. D. J., "Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition, 2012.

WEBLINKS:

1. https://www.analyticsvidhya.com/blog/2016/04/predict-waiting-time-queuing-theory/

https://www.informit.com/articles/article.aspx?p=1863432&seqNum=3

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	2	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	2	2	-	-	-	-	-	-	2	-	-

		L	T	P	C
GE22451	**ENVIRONMENTAL SCIENCES AND SUSTAINABILITY**	**3**	**0**	**0**	**3**
	(Common to all Branches)				

Objectives

1. To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize the biodiversity of India and its conservation.
2. To impart knowledge on the causes, effects and control or prevention measures of environmental pollution.
3. To study and understand the various types of renewable sources of energy and their applications.
4. To familiarize the concept of sustainable development goals, economic and social aspects of sustainability, recognize and analyze climate changes, and environmental management challenges.
5. To inculcate and embrace sustainability practices, develop a broader understanding of green materials and energy cycles, and analyze the role of sustainable urbanization.

UNIT I   ENVIRONMENT AND BIODIVERSITY   9

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– food chains, food webs and ecological pyramids, ecological succession. Biodiversity- types- genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: fragmentation and habitat loss, poaching of wildlife, human-wildlife conflicts – endangered and endemic species of India –conservation of biodiversity: In-situ and ex-situ.

UNIT II   ENVIRONMENTAL POLLUTION   9

Definition, causes, effects and preventive measures of air, water and soil pollution. Marine and thermal pollution - causes, effects and control measures. Light and noise pollution - effect on flora and fauna. Nuclear pollution- Sources, effects and control measures. Disposal of radioactive wastes (Nuclear hazards). Pollution case studies. Role of an individual in the prevention ofpollution. Solid, hazardous and E-waste management. Occupational health and safety management system (OHASMS). Environmental protection, Environmental protection acts, categorization of spices according to IUCN.

UNIT III   RENEWABLE SOURCES OF ENERGY   9

Energy resources: Growing energy needs, Nonrenewable resources – types, uses. Energy management and conservation - New energy sources, Need of new sources - geo suitability of establishing renewable energy sources, different types new energy sources. Applications of hydrogen energy, ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy. Role of an individual in conservation of energy.

UNIT IV   SUSTAINABILITY AND MANAGEMENT   9

Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects ofsustainability-from unsustainability to sustainability-millennium development goals, and protocols, Sustainable Development Goals-targets, indicators and intervention areas - Principles of green chemistry, Climate change- Global, Regional and local environmental issues and possible solutions-case studies - Role of non-governmental organization, Concept of carbon credit, carbon footprint - Environmental management in industry - A case study

UNIT V SUSTAINABILITY PRACTICES 9

Zero waste and R concept, circular economy, ISO 18000 series, material life cycle assessment, environmental impact assessment. Wasteland reclamation, Sustainable habitat: green buildings, green materials, energy efficiency and energy audit, sustainable transports. Energy cycles, carbon cycle, emission and sequestration, Green engineering: sustainable urbanization-socio-economical and technological change. Rainwater harvesting, watershed management, environmental ethics: Issues and possible solutions.

TOTAL :45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Explain the fundamental role of ecosystems and biodiversity and discuss theimportance of their conservation.	U
2	Describe the different types of pollution, their effects and strategies to minimize oreliminate pollution.	U
3	Identify the need of renewable and non-renewable resources and describe energymanagement measures to preserve them for future generations.	U
4	Explain the various goals of sustainable development applicable for suitabletechnological advancement and societal development.	U
5	Demonstrate the knowledge of sustainability practices and identify green materials,energy cycles and the role of sustainable urbanization.	U

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik‟s "Perspectives in Environmental Studies", 7th Edition, New Age International Publishers, 2022.

2. Benny Joseph, „Environmental Science and Engineering‟, Tata McGraw-Hill, New Delhi, 2016.

3. Gilbert M. Masters, „Introduction to Environmental Engineering and Science‟, 2nd edition, Pearson Education, 2004.

4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Pearson. 2011.

5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, CL Engineering, 2015.

6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.

7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCES:

1. R.K. Trivedi, „Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media. 38

2. Cunningham, W.P. Cooper, T.H. Gorhani, „Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.

3. Dharmendra S. Sengar, „Environmental law", Prentice hall of India PVT. LTD, New Delhi, 2007.

4. Rajagopalan, R, „Environmental Studies-From Crisis to Cure", Oxford University Press, 3rdedition, 2015.

5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 3rd edition, 2021.

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	-	-	-	-	3	3	2	-	2	-	1	-	-
CO2	3	-	-	-	-	3	3	2	-	2	-	2	-	-
CO3	3	-	1	-	-	3	3	1	-	2	-	1	-	-
CO4	3	-	-	-	-	3	3	3	-	2	-	2	-	-
CO5	3	-	-	-	-	3	3	3	-	2	-	2	-	-

IT22401   **OPERATING SYSTEM CONCEPTS**   L   T   P   C
                                                                   3   0   0   3

Objectives:

- To understand the basic concepts and functions of operating systems.
- To analyze Scheduling algorithms
- To understand the concept of Deadlocks.
- To analyze various memory management and storage management schemes.
- To be familiar with the basics of Linux system, Windows and Mobile OS.

Unit 1   Operating Systems Overview   9

Computer System - Elements and organization; Operating System- Overview - Objectives and Functions – Evolution- Structures –Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods.

Unit 2   Process Management   9

Processes - Concept - Scheduling - Operations; Inter-process Communication; CPU Scheduling - Criteria & Algorithms; Threads - Multithread Models – Threading issues; Process Synchronization - The critical-section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Prevention, Avoidance, Detection & Recovery

Unit 3   Memory Management   9

Main Memory - Swapping - Contiguous Memory Allocation –Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing.

Unit 4   Storage Management   9

Mass Storage system – Disk Structure - Disk Scheduling and Management; File-System Interface - File concept - Access methods - Directory Structure & organization - File system - mounting, Sharing , Protection, Implementation & Structure - Directory implementation - Allocation Methods - Free Space Management; I/O Systems –Hardware, Application interface, Kernel subsystem.

Unit 5   Case Study   9

Linux, Windows, iOS and Android: History- Design principles – Kernel modules – Process management – Scheduling – Memory management – File systems – Input and output – Inter Process Communication – Network structure – Security

                                                                Total (L:45)

OUTCOMES:

CO1	Outline the key concepts and functions of an operating system, including process management, memory management, file systems, and storage systems	U
CO2	Examine the role of system calls and system programs in an operating system, and understand their interaction with the kernel and hardware components	AN
CO3	Analyze different operating system architectures, including Unix-based systems like Linux, and compare their process management, memory management, and security features	AN
CO4	Analyze the impact of virtual memory management and page replacement algorithms on system performance, particularly in high-demand computing environments	AN
CO5	Evaluate the effectiveness of different synchronization techniques and deadlock handling methods in multi-threaded and multi-process environments.	E
CO6	Apply various process scheduling algorithms, synchronization techniques, memory management techniques, and file system management methods to solve real-world computing problems	AP

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc.
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5 th Edition.

REFERENCES:

1. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education".
2. D M Dhamdhere, "Operating Systems: A Concept-based Approach", Tata McGraw-Hill Education, Eighth Edition.
3. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall, Seventh Edition.
4. Reto Meier, John Wiley and sons, "Professional Android 4 Application Development".

COURSE ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	1	2	2	3	2	2	2	2	2
CO2	3	3	2	3	2	2	2	2	3	3	3	2	3	3
CO3	3	3	3	2	2	1	1	1	3	3	2	2	3	3
CO4	2	3	2	3	2	1	3	2	3	2	2	3	2	3
CO5	2	3	3	3	3	2	2	3	3	2	3	2	3	2
CO6	3	3	3	3	3	3	2	2	3	3	3	3	3	3

IT22402   MICROPROCESSOR AND MICROCONTROLLER   L   T   P   C
                              INTERFACING   3   0   0   3

Objectives:

• Study the Architecture of 8086 microprocessor.
• Learn the design aspects of I/O and Memory Interfacing circuits.
• Study about communication and bus interfacing
• Study the Architecture of 8051 microcontroller.

Unit 1   THE 8086 MICROPROCESSOR   9

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

Unit 2   8086 SYSTEM BUS STRUCTURE   9

8086 signals – Basic configurations – Pins in 8086-–System Bus architecture using 8086 – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations

Unit 3   8086 INTERFACING   9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication
interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller –
DMA controller.

Unit 4   THE 8051 MICROCONTROLLER   9

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits – Instruction
set – Addressing modes - Assembly language programming.

Unit 5   8051 INTERFACING and ARM Processor   9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing –ADC&DACInterfacing- Stepper Motor Interfacing-ARM Design Philosophy,Overview of ARM architecture-States [ARM, Thumb, Jazelle].

                                                                Total (L:45)

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Develop and implement programs on 8086 microprocessor.	AP
2	Interpret I/O circuits.	AN
3	Build Memory Interfacing circuits.	AP
4	Develop and implement 8051 microcontroller based systems	AP
5	Interpret on 8051 interfaces and understand about ARM Processor.	AN

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, ―Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design, Second Edition, Prentice Hall of India, 2007.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, ―The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Second Edition, Pearson Education, 2011.

REFERENCES:

1. Doughlas V.Hall, ―Microprocessors and Interfacing, Programming and Hardware:,TMH, 2012.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	2	3	2	1	1	-	-	-	-	-	-	2
2.	3	2	2	2	2	-	-	-	-	-	-	-	-	-
3.	3	2	2	2	2	-	-	-	-	1	-	-	-	2
4.	3	2	2	2	2	1	-	-	-	-	-	-	-	2
5.	3	2	2	2	2	-	-	-	-	1	-	-	-	2

IT22408   **PARADIGMS OF ALGORITHM DESIGN:**   **L   T   P   C**
              THEORY & PRACTICES   2   0   2   3

Objectives:
- To learn about the process of problem solving.
- To be conversant with algorithms for common problems.
- To analyse the algorithms for time/space complexity.
- To learn to write algorithms for a given problem using different design paradigms.
- To understand computational complexity of problems.

Unit 1   INTRODUCTION   6+6

Overview of Algorithms - Definition, characteristics, and types, real-world applications - Algorithm Analysis Basics - Time and space complexity - Asymptotic notations (Big O, Omega, Theta). Brute Force Algorithms - Exhaustive search techniques - Examples and applications

Suggested Activity (not limited to)
Implement on various input sizes (n) and plot a graph for n Vs time taken
1. Problems on linear and quadratic time complexities ex: Linear Search, matrix operations
2. Selection Sort
3. Insertion Sort
4. Bubble Sort

Unit 2   Recursion and Backtracking   6+6

Recursive Functions-Recursion and Memory, Recursion vs Iteration, Recurrence Relation. Backtracking-Strategy, problems.

Suggested Activity (not limited to)
Implement on various input sizes (n) and plot a graph for n Vs time taken
1. Checking for ascending order of array
2. Reversing a singly linked list
3. Heap sort.
4. kth smallest/largest element in Binary Search Tree
5. N-Queens Problem
6. Sum of Subsets

Unit 3   Divide & Conquer and Greedy Approaches   6+6

Divide and Conquer Technique - Strategy-Recurrence equation for divide and conquer-Application. Greedy Algorithm- Strategy, problems

Suggested Activity (not limited to)
Implement on various input sizes (n) and plot a graph for n Vs time taken
1. Binary Search
2. Merge Sort
3. Quick Sort
4. Pairwise multiplication of elements (Greedy)
5. Fractional Knapsack Problem (Greedy)
6. Minimal Spanning Tree

Unit 4   Dynamic Programming   6+6

Introduction to Dynamic Programming - Principles and applications -Memoization and Tabulation - Techniques for optimization - Analysis of DP algorithms- Applications of Dynamic Programming.
Suggested Activity (not limited to)
Implement on various input sizes (n) and plot a graph for n Vs time taken
1. Fibonacci sequence
2. Binomial Co.efficient
3. Longest Common Subsequence
4. Matrix Chain Multiplication
5. Travelling Salesman problem
6. Hamiltonian cycles
7. 0/1 Knapsack Problem

Unit 5   NP Completeness   6+6

Understanding of Computational Complexity – Tractable and Intractable Problems - P, NP-Hard, NP Complete problems – Bin Packing problem - Reducibility – Approximation algorithms - TSP – Randomized Algorithms - Randimized Quick Sort

Suggested Activity
Mini Project

Total (L:30+P:30)60 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Articulate the process of problem solving and writing algorithms.	AP
2	Analyze recursive and non-recursive algorithms	AN
3	Apply different algorithmic design techniques to solve computational problems	AP
4	Evaluate the effectiveness of a solution by comparing the various approaches.	E
5	Explain the limitations of computing power and solve problems using Approximation and randomized algorithms	AP

TEXT BOOKS:
1. NarasimaKarumanchi, "Algorithm Design Techniques: Recursion, Backtracking, Greedy, Divide and Conquer, and Dynamic Programming", CareerMonk Publications, 2018
2. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms", PHI Learning Private Limited, 2012.

REFERENCES:

1. Richard E Nepolitan., Foundations of Algorithms, Fifth Edition, Jones and Bartlett Publishers
2. Design and Analysis of Algorithms, S. Sridhar, Oxford Univ.Press,2014

List of equipment for a batch of 30 students:

SOFTWARE:
C/C++/Java

HARDWARE:
Standalone desktops with Windows 7 or higher**.**

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	1	1	1	1	1	1	3	2	-	3	3	3
2.	3	3	1	2	3	1	1	-	2	1	-	3	3	3
3.	1	3	3	3	3	1	1	1	3	-	2	3	3	3
4.	3	3	3	3	3	1	1	-	2	2	1	3	3	3
5.	3	3	3	3	2	1	1	1	1	2	2	3	3	3

IT22409   SOFTWARE ENGINEERING METHODOLOGIES: L   T   P   C
                THEORY & PRACTICES   2   0   2   3

Objectives:
- To understand the roles of software process
- To understand how an iterative, incremental development process leads to faster delivery of more useful software.
- To understand the essence of agile development methods

**Unit 1   SOFTWARE PROCESS AND SOFTWARE REQUIREMENT   6+4
            ANALYSIS**

Generic process model, Prescriptive Process models, Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process.

Suggested Activity (not limited to)
1. Identify a software system that needs to be developed.
2. Document the Software Requirements Specification (SRS) for the Identified system.

Unit 2   SOFTWARE DESIGN   6+9

System Modeling - Context models, Interaction models, Structural models, Behavioral models, Model driven engineering, - context diagram, class diagram, sequence diagram, interaction diagram, communication diagram, state chart diagram.

Suggested Activity (not limited to)
1. Identify use cases and develop the Use Case model.
2. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
3. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams.
4. Draw relevant State Chart and Activity Diagrams for the same system.

Unit 3   ARCHITECTURAL DESIGN   6+9

Introduction - Architectural views-Architectural patterns-Application architecture- Data processing systems, Transaction processing systems, Event processing systems, Language processing systems, User Interface Design: Interface analysis, Interface Design. **Testing throughout the Software Life Cycle.**

Suggested Activity (not limited to)
1. Implement the system as per the detailed design
2. Test the software system for all the scenarios identified as per the use case diagram

Unit 4   AGILE PRODUCT MANAGEMENT WITH SCRUM   6+4

Agile methods - Agile development techniques - Agile project management - Scaling agile methods. Understanding product owner role - Working with product backlog - Planning the release, **Agile model driven development (AMDD)**

Suggested Activity
Demo on Kanban

Unit 5   ADVANCED SOFTWARE ENGINEERING   6+4

Software Reuse –benefits, problems, model view controller, COTS product reuse, Distributed Software engineering - Architectural patterns for distributed systems, Software as a service, **Performance engineering.**

Suggested Activity (not limited to)
1. Improve the reusability and maintainability of the software system by applying appropriate design patterns.
2. Implement the modified system and test it for various scenarios

Total (L:30+P:30)60 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Assess the roles of software process	E
2	Compare different software engineering methodologies.	AN
3	Develop real-world software development projects	AP
4	Adapt agile methodology in real world software engineering projects	AP
5	Assess software Projects responding to change and involving customer in the development process.	E

TEXT BOOKS:
1. Ian Sommerville, "Software Engineering", 10th Edition, Pearson Education Asia.
2. Roman Pichler, "Agile Product Management with Scrum Creating Products that CustomersLove", Pearson Education.

REFERENCES:
1. Roger S. Pressman and Bruce Maxim, "Software Engineering – A Practitioner‟s Approach", Ninth Edition, Mc Graw-Hill International Edition.
2. Ken Schwaber , "Agile Project Management with Scrum" , Microsoft Press.
3. Tilak Mitra, "Practical Software Architecture: Moving from System Context to Deployment", IBM press.

List of equipment for a batch of 30 students:

SOFTWARE:
ArgoUML/ Rational Suite that supports UML 1.4 and higher /Selenium/ JUnit 30 Nos,
Online resources for demo on Kanban.

HARDWARE:
Standalone desktops with Windows 7 or higher**.**

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	3	2	3	3	3	2	3	1	3	3	3	3
2.	3	2	3	2	3	3	3	2	3	1	3	3	3	3
3.	3	2	3	2	3	3	3	2	3	1	3	3	3	3
4.	3	2	3	2	3	3	3	2	3	1	3	3	3	3
5.	3	2	3	2	3	3	3	2	3	1	3	3	3	3

IT22411   MICROPROCESSOR AND MICROCONTROLLER   L   T   P   C
INTERFACING LABORATORY

                                                         0   0   3   1.5

Objectives:
- Introduce ALP concepts and features
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

List of Experiments

8086 Programs using kits and MASM
1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

Peripherals and Interfacing Experiments
7. Traffic light control
8. Stepper motor control
9. Digital clock
10. Key board and Display
11. Serial interface and Parallel interface
12. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM
13. Basic arithmetic and Logical operations
14. Square and Cube program, Find 2''s complement of a number
15. Mini project using modern microcontrollers

                                                 Total (P:45)

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Write ALP Programs for fixed and Floating Point and Arithmetic	**AP**
2	Infer different I/Os with processor	AN
3	Generate waveforms using Microprocessors	AP
4	Execute Programs in 8051	**AP**
5	Assess the difference between simulator and Emulator	**AN**

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, ―Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design, Second Edition, Prentice Hall of India, 2007.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, ―The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Second Edition, Pearson Education, 2011

REFERENCES:

1. Doughlas V.Hall, ―Microprocessors and Interfacing, Programming and Hardware:,TMH, 2012.

Equipment's Required

HARDWARE:
- 8086 development kits - 60 nos
- Interfacing Units - Each 15 nos
- Microcontroller - 60 nos

SOFTWARE:
- Intel Desktop Systems with MASM - 60 nos

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	2	3	2	1	1	-	-	1	-	-	-	2
2.	3	2	2	2	2	-	-	-	-	-	-	-	-	-
3.	2	2	2	2	2	1	-	-	-	1	-	-	-	2
4.	2	2	2	2	2	1	-	-	-	-	-	-	-	2
5.	2	2	2	2	2	-	-	-	-	1	-	-	-	2

		L	T	P	C
IT22412	**OPERATING SYSTEM CONCEPTS LABORATORY**	0	0	3	1.5

Objectives:

- Learn shell programming and work in the UNIX environment.
- Be exposed to programming in C using system calls.
- Be exposed to process creation and inter process communication.
- Be familiar with implementation of CPU Scheduling Algorithms, page replacementalgorithms and Deadlock avoidance.
- Be familiar with File Organization and File Allocation Strategies.

List of Experiments

1. Illustrate UNIX commands and Shell programming
2. Process Management using System Calls-Fork, Exit, Getpid, Wait, Close
3. CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority
4. File allocation strategies
   a) Sequential b) Indexed c) Linked
5. Mutual exclusion by Semaphore
6. File Organization Techniques
   a) Single level directory b) Two level c) Hierarchical d) DAG
7. Bankers Algorithm for Dead Lock Avoidance
8. Algorithm for Dead Lock Detection
9. Page replacement algorithms
   a) FIFO b) LRU c) LFU
10. Inter process communication.
11. Paging Technique of memory management.
12. Various disk scheduling algorithms.
13. Multithreading
14. Install any guest operating system like Linux using VMware.

Total (P:45)

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Understand the concepts of basic UNIX commands and shell programming.	U
2	Evaluate the performance of various CPU scheduling algorithms and deadlock avoidance and detection Algorithms.	E
3	Analyze the performance of various page replacement algorithms.	AN
4	Develop File Organization and File Allocation Strategies.	AP
5	Assess the performance of various Disk Scheduling Algorithms.	E

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc.

REFERENCES:

1. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition.

Equipment's Required

(List hardware and software needed for 60 no's)

Standalone desktops with C / C++ / Java / Equivalent complier 30 Nos. (or)
Server with C / C++ / Java / Equivalent complier supporting 30 terminals.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	1	3	1	1	-	-	-	1	3	3	3	3	3
2.	3	1	1	2	2	-	1	-	3	2	1	1	2	2
3.	3	3	2	1	2	-	-	-	3	3	1	2	2	2
4.	1	2	2	3	2	-	-	1	3	1	3	1	2	2
5.	2	2	1	1	3	-	-	-	1	2	2	3	2	2

		L	T	P	C
	ESSENTIALS OF IOT	3	0	0	3

IT22501

Objectives:

- To understand the fundamentals of Internet of Things
- To define the infrastructure for supporting IoT deployments.
- To Establish data migration techniques from IoT devices to the cloud.
- To Use visualization techniques to show data generated from the IoT device.
- To apply the concept of Internet of Things in the real world scenario.

Unit 1   Introduction To IoT   9

Definition and Characteristics of IoT, Physical and logical Design of IoT – IoT enabling technologies- IoT levels-smarts objects-connecting smart objects-communication criteria. Programming Arduino and Raspberry Pi-Interfacing and controlling devices.

Unit 2   IoT Architecture   9

IoT architecture outline- ETSI architecture- IETF architecture for IoT- OGC architecture-IoT reference Model- Domain model, Information, Functional, Communication Model-IoT reference architecture.

Unit 3   IoT Protocols   9

Legacy Protocols-BACnet, ModBus,KNX,ZigBee -MAC Layer Protocols – IEEE 802.15.4 –Variants of IEEE 802.15.4 – IEEE 802.11ah – IEEE 1901.2a – LoRaWAN – 6LoWPAN ,RPL REST Based Protocols – SCADA, CoAP and MQTT.

Unit 4   IoT Programming and Data Analytics   9

Introduction to Data Analytics for IoT- Big Data Analytics Tools and Technology. Cloud offerings -Cloud Storage Models and Communication API – WAMP AutoBahn – Xively Cloud – Python Web Application Framework – Django–IBM Watson – AWS for IoT.

Unit 5   IoT Applications   9

Smart Grid - smart metering, smart house, smart energy city, Smart and Connected Cities, IoT in industry - manufacturing –oil and Gas, Transportation - Environment - Agriculture, IoT in Health Care

Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Explain the concept and enabling technologies of Internet of Things.	AP
2	Examine the various architecture models of IoT.	AN
3	Analyze appropriate protocols for various parts of IoT based systems	AN
4	Apply data analytics and use cloud offerings related to IoT.	AP
5	Develop IoT applications for various real time Scenario.	AP

TEXT BOOKS:

1. David Hanes, Gonzalo Salguerio, Patrick Grossetete, Rob Barton, Jerome Henry,―IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for Internet of Things‖, Cisco Press, 2017.

REFERENCES:

1. Internet of things(A-Hand-on-Approach) By Vijay Madisetti and ArshdeepBahga1st Edition, Universal.
2. The Internet of Things – Key applications and Protocols By Olivier Hersent, David Boswarthick, Omar Elloumi,, Wiley, 2012.
3. Jan Ho¨ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand.David Boyle, "From Machine-to-Machine to the Internet of Things Introduction to a New Age of Intelligence", Elsevier, 2014.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.				1								1		
2.				1								1	1	1
3.		2		2	2	1	1	1					2	2
4.		2		2	2	1	1	1					2	1
5.	2	2	3	3	2	3	3	1	2	1	2		2	2

IT22502	**USER INTERFACE TECHNOLOGIES**	L	T	P	C
		3	0	0	3

Objectives:

- To understand the concepts and architecture of the World Wide Web
- To understand and practice Markup Language
- To understand Embedded Dynamic Scripting on Client-side Internet Programming
- To understand and practice NoSQL, MongoDB Database
- To understand and practice Server-side JS Framework

Unit 1   Web Foundations   9

Introduction to Computer networks - Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 – File Transfer Protocol - Overview of HTTP, HTTP request – response –– Generation of dynamic web pages.

Unit 2   UI Design Features   9

HTML5 – HTML5 Images and Frames – HTML New Elements – CSS – Bootstrap - Bootstrap Global Styles And Responsive Design - Bootstrap Global Styles And Responsive Design - Bootstrap Grid System & Button - Bootstrap Forms - Bootstrap Form Controls & Typography

Unit 3   Javascript Foundations   9

Identifiers - Data types, Operators, Expressions and Statements – Loops, Functions and Classes – Event Handling – Objects - Iterables - Asynchronous Programming - Modular Programming - JavaScript - Security - JavaScript - Best Practices - Capstone Project

Unit 4   Angular Foundations   9

Getting Started with Angular - Creating Components and Modules – Templates – Directives – Data Binding – Pipes - Nested Components – Forms – Services – Routing – Capstone Project

Unit 5   NOSQL and Mongo DB   9

NoSQL Database and MongoDB use cases - Difference between MongoDB & RDBMS - Download & Installation - Common Terms in MongoDB – Implementation of Basic CRUD Operations using MongoDB

                                                                  Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Demonstrate the ability to generate dynamic web pages using HTTP concepts.	AP
2	Develop responsive and visually appealing user interfaces using HTML5, CSS, and Bootstrap frameworks	**AP**
3	Apply JavaScript for implementing dynamic client-side functionalities.	**AP**
4	Build scalable and dynamic single-page applications (SPAs) using Angular.	AP
5	Develop web applications by integrating client-side and server-side programming with NoSQL database.	AP

TEXT BOOKS:

1. Angular: Up and running: Learning angular, step by step, Seshadri, Shyam, O'Reilly Media, Inc., 2018.

2. Amol Nayak, ―MongoDB Cookbook‖, Second Edition, Packt Publishing, 2016

3. ―JavaScript‖ course from Infosys Springboard

4. ―Angular‖ course from Infosys Springboard

REFERENCES:

1. An Introduction to web development and Programming- Michael Mendez Suny Fredonia, 2014

2. Kristina Chodorow, ―MongoDB : The Definitive Guide‖, Second Edition, O' Reilly Publications, 2013.

3. Matt Frisbie, ―Angular 2 Cookbook‖, First Edition, Packt Publishing, 2017

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.				1								1		
2.				1								1	1	1
3.		2		2	2	1	1	1					2	2
4.		2		2	2	1	1	1					2	1
5.	2	2	3	3	2	3	3	1	2	1	2		2	2

IT22503   **COMPUTATIONAL INTELLIGENCE**

L	T	P	C
3	0	0	3

Objectives:

- To learn search strategies and to understand the concepts of game playing.
- To represent and infer knowledge using predicate logic.
- To understand basic concepts of data mining.
- To introduce the concepts of Expert Systems.
- To learn evolutionary computation, neural networks, fuzzy systems.

Unit 1   PROBLEM SOLVING METHODS   9

Problems, Problem Spaces and Search - problem characteristics -production system characteristics- Heuristic Search Techniques – Generate and Test- Hill Climbing- Best First Search- Problem Reduction-Constraint Satisfaction Problems – Game Playing – Minimax procedure - Alpha-Beta Pruning.

Unit 2   KNOWLEDGE REPRESENTATION   9

Knowledge representation-Using Predicate logic- Representing Simple Facts- Representing Instance –Computable Functions and Predicates -Resolution, Knowledge Inference – Backward chaining, Forward chaining.

Unit 3   DATA MINING   9

Fundamentals – Classification - Decision tree Induction - Associations- Frequent Itemset Mining Methods – Apriori Algorithm – FP Growth Problem, Partitioning methods – K mean & K Medoid.

Unit 4   EXPERT SYSTEMS   9

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

Unit 5   GENETIC ALGORITHMS   9

Canonical Genetic Algorithm - Crossover - Mutation - Control Parameters - Genetic Algorithm Variants – Travelling Salesperson - Genetic Programming - Artificial and Financial Trading Application.

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Analyze the problems and solve them using AI techniques.	AN
2	Infer knowledge for the problem represented in the language/framework using different AI methods.	AP
3	Apply data mining techniques to real-world problems.	AP
4	Design expert systems for various applications.	AN
5	Generate solutions to problems using Genetic Algorithms.	AN

TEXT BOOKS:
1. Kevin Night and Elaine Rich, Nair B., ―Artificial Intelligence (SIE)‖, Third edition, McGrawHill, 2008.
2. Kumar S., ―Neural Networks – A Classroom Approach‖, Tata McGraw Hill, 2004.

REFERENCES:
1. Jiawei Han and Micheline Kamber, ―Data Mining Concepts and Techniques‖, Third Edition,Elsevier, 2012.
2. Dan W. Patterson, ―Introduction to Artificial Intelligence and Expert Systems‖, PearsonEducation, 2007.
3. Andries .P. Engelbrecht, ―Computational Intelligence: An Introduction‖, Second Edition, JohnWiley & Sons, 2012.
4. S. Russell and P. Norvig, ―Artificial Intelligence: A Modern Approach‖, Prentice Hall, ThirdEdition, 2014.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	0	0	2	0	0	0	0	0	3	3	3
2.	3	3	3	3	3	0	0	0	0	0	0	3	3	3
3.	3	3	3	3	3	0	0	0	2	0	0	3	3	3
4.	3	3	3	3	3	2	1	0	2	0	0	3	3	3
5.	3	3	3	3	3	0	0	0	2	0	0	3	3	3

IT22504 **DATA COMMUNICATION AND NETWORKING**   L   T   P   C
                                                       3   0   0   3

Objectives:

The objective of this course is to enable the students to

- Understand the concepts of Protocol Layering and transmission medium.
- Understand the various components required to build different networks.
- Be exposed to various addressing schemes and routing protocols.
- Familiarize the functions and protocols of Transport and Application Layer
- Be familiar with real time applications of networks and network management approach

Unit 1   FUNDAMENTALS & PHYSICAL LAYER   9

Data Communications – Networks and Types – Protocol Layering – TCP/IP Protocol Suite – The OSI Model; Physical Layer: Signal – Signal Impairment - Digital and Analog Transmission- Multiplexing - Transmission Media

Unit 2   DATA LINK LAYER   9

Introduction – Node – Links - Framing – Error Detection and Correction; Media Access Protocols – Link-Layer Addressing – ARP – RARP - DHCP; Local Area Networks: Ethernet – WIFI, IEEE 802.11 Project– Bluetooth; Connecting devices – Hubs – Link-layer Switches – Routers - Virtual LANs

Unit 3   NETWORK LAYER   9

Services – Packet Switching – Performance – Internet Protocol Version 4 – subnetting and suppernetting- CIDR - Next Generation IP (IPV6) – Transition from IPV4 to IPV6 – Routing – Adaptive and Non-Adaptive Routing – Routing Algorithms- Distance Vector Routing – Link State Routing – Unicast Routing – RIP - OSPF and Multicast Routing Protocols –DVMRP, PIM - IGMP

Unit 4   TRANSPORT & APPLICATION LAYER   9

Transport layer Services– Protocols - User Datagram Protocol – Transmission Control Protocol – Error Control - Flow Control - TCP Congestion Control – SCTP. Application Layer: Introduction – Standard Applications - HTTP - Electronic Mail (SMTP, POP3, IMAP, MIME) – DNS – Socket Interface Programming

Unit 5   SOFTWARE DEFINED NETWORKS   9

Introduction to SDN – Centralized Control Planes - Distributed Control Planes - Data Planes – OpenFlow - SDN Controllers – Network Programmability

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Choose the components required to build different types of communication networks.	AP
2	Select the protocols of data link layer and apply error control mechanisms.	AN
3	Appraise the concept of addressing scheme and various routing protocols in data communication.	E
4	Inspect information flow of real time applications using appropriate transport and application layer protocols.	AN
5	Analyze the functionalities of Software Defined Network	AN

TEXT BOOKS:

1. Behrouz A. Forouzan, ―Data Communications and Networking with TCP/IP Protocol Suite‖, Sixth Edition, McGrawHill, 2022.

2. Thomas D Nadeau, Ken Gray, ―SDN: Software Defined Networks‖, First Edition, O'Reilly, 2013.

REFERENCES:

1. James F. Kurose, Keith W. Ross, ―Computer Networking - A Top-Down Approach Featuring the Internet‖, Fifth Edition, Pearson Education, 2009.

2. Nader. F. Mir, ―Computer and Communication Networks‖, Pearson Prentice Hall Publishers, 2010.

3. Larry L. Peterson, Bruce S. Davie, ―Computer Networks: A Systems Approach‖, Sixth Edition, Morgan Kaufmann Publishers, 2018.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	2	2	2	-	-	1	2	-	1	2	2	-
2.	3	2	2	2	2	-	-	1	1	-	1	2	2	2
3.	3	2	2	2	2	-	-	1	2	-	1	2	2	-
4.	3	2	2	2	2	-	1	1	2	2	1	2	2	2
5.	3	2	3	2	3	-	1	1	2	2	1	3	2	2

	L	T	P	C

IT22511   **ESSENTIALS OF IOT LABORATORY**   L   T   P   C
                                                          0   0   3   1.5

Objectives:

- To enable Students to understand the concepts of Internet of Things and build IoT applications.
- To familiarize with different types of sensors/actuators and development board used in Internet of Things applications.
- To provide students with practical concept of IoT system design.
- To enhance research activities in different application areas of IoT.
- To learn how to deploy and test the open-source IoT platform.

List of Experiments

Provide list of experiments – min 12 exercise

1. Introduction to Arduino, Raspberry Pi, ESP32 platform- installation and programming.
2. Interfacing sensors with IoT platforms.
3. Controlling Actuators connected to the boards.
4. Communication between Arduino, Raspberry Pi, ESP32 using any wireless medium.
5. Internet based control of devices.
6. Bluetooth based control of devices.
7. Set up cloud platform to log IoT data.
8. Implement publish and subscribe model using MQTT broker.
9. Create a mobile app to control an actuator and sensor.
10. Implement I2C and SPI based communication.
11. Develop a TCP/UDP server and implement client server communication for sensor data.
12. Design an IoT based application in areas of Agriculture, Health care, Energy, Manufacturing and Transport.(Mini Project)

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Setup basic IoT hardware**.**	AP
2	Implement interfacing of various sensors with Arduino/Raspberry Pi.	**AP**
3	Demonstrate the ability to transmit data wirelessly between different devices.	**AN**
4	Show an ability to upload/download sensor data on cloud and server.	**AP**
5	Design and develop Application which can interact with Sensors and Actuators.	**C**

REFERENCES:

1. Internet of Things with Arduino Cookbook Marco Schwartz,Packt Publishing Ltd.
2. Internet of Things with Arduino Blueprints Pradeeka Seneviratne,Packt Publishing Ltd.
3. www.spoken-tutorial.org
4. www.nptel.ac.in
5. www.swayam.gov.in

Equipment's Required
(List hardware and software needed for 60 no's)

1. Arduino
2. Raspberry PI
3. ESP32
4. Sensors (LED, switch , buzzer , temperature ,ultra sound, PIR, servo motor ,soil moisture sensor, tilt sensor)
5. Actuator.
6. Wireless Module

Software

1. Raspian
2. Arduino IDE
3. Blynk
4. ThingsSpeak

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	3	2	3	2	2	2	2	1	1	1	2	2
2.	3	2	2	1	3							1		1
3.	2	2	2	1	1	1	1			1		1	1	1
4.	2	1	2	1	1							1	1	1
5.	3	1	2	2	3	3	1	2	3	2	1	1	2	2

HS22511   **INTERVIEW AND CAREER SKILLS**   L   T   P   C
                             LABORATORY   0   0   3   2

Objectives:
- Build confidence and develop learners' language proficiency.
- Better learners' performance in competitive examinations.
- Improve learners' employability skills.
- Develop entrepreneurship skills.
- Expose learners to the use of professional English.

Unit 1   **LISTENING AND SPEAKING SKILLS**   **12**

Conversation Skills – types small talk, face to face and telephonic, formal and informal conversations – skills in presenting ideas and collating information during conference calls (one –to one and technical group / team) – academic and workplace situations – conversing with faculty / visiting faculty / guests / officials/ employers and employees – group discussion – etiquette and dos and don'ts, turn taking –presentation skills – seminars and projects using digital tools; mock interview – etiquette and dos and don'ts – audio - visual interface for enhancement of listening and speaking skills. IELTS and TOEFL (Listening related exercises)

Unit 2   **READING / SPEED READING, CRITICAL THINKING AND**   **12**
                    WRITING SKILLS

Reading Comprehension – general and scientific texts / articles / case studies from different or relevant fields of study for analysis and critical thinking; employability skills – writing job applications – cover letter accompanying résumé – types of business letters and email writing and etiquette; writing reports – statement of purpose – writing articles for publication style and format – creating blogs or company profiles – speed reading of voluminous reports / documents and exacting necessary information and abstract preparation including dissemination. IELTS and TOEFL (Reading related exercises)

Unit 3   **ENGLISH FOR PROFESSIONAL EXAMINATIONS**   **12**

Sentences, paragraphs and reading comprehension – vocabulary building – general and technical terms – contextual meaning – spelling – subject specific words – usage and user specific terminology. IELTS and TOEFL(Grammar and verbal exercises)

Unit 4   **ENTREPRENEURSHIP SKILLS**   **9**

Introduction to entrepreneurship - fundamentals of entrepreneurial skills - developing leadership qualities and team work;– marketing strategies microcosmic and macrocosmic levels of product sales and survey – sector / industry appraisal and appreciation (review and understanding state of the nation / economy / environment / sector reports published) interaction and understanding the role of multilateral financial / institutional / industrial agencies such as World Bank, ADB, UNDP, CII - Influencing in Business Meetings - Active Listening and responding - Role-play - Strengthening – Negotiating/ Argumentative and Persuasive Skills - Defend a character/idea or attack it. - Networking Skills - engaging strangers in a conversation - introducing themselves, making small talk

                                          TOTAL :45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Develop approaches for mastering international English language tests such as IETLS and TOEFL, as well as national-level competitive exams.	AP
2	Make presentations and participate in Group Discussions.	AP
3	Face interviews with confidence and develop strategies for negotiating job offers.	AP
4	Build effective resumes, cover letters and professional emails to enhance job application success.	AP
5	Explore strategies for scaling and growing entrepreneurial ventures.	AN

REFERENCES:

1. *Business English Certificate Materials*, Cambridge University Press.
2. *Graded Examinations in Spoken English and Spoken English for Work* downloadable materials from Trinity College, London.
3. *International English Language Testing System Practice Tests*, Cambridge University Press.
4. *Interactive Multimedia Programs on Managing Time and Stress.*
5. *Personality Development* (CD ROM), Times Multimedia, Mumbai.

WEB SOURCES:
http://www.slideshare.net/rohitjsh/presentationon group discussion
http://www.washington.edu/doit/TeamN/present_tips.html
http://www.oxforddictionaries.com/words/writingjobapplications
http://www.kent.ac.uk/careers/cv/coveringletters.html
http://www.mindtools.com/pages/article/newCDV_34.html

COURSE ARTICULATION MATRIX

Cos	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.										3				
2.										3				
3.										3				
4.										3				
5.										3				

IT22512	**DATA COMMUNICATION AND NETWORKING**	L	T	P	C
	LABORATORY	0	0	3	1.5

Objectives:

- To learn socket programming.
- To learn Addressing scheme.
- To implement and Analyze various networking Protocols.
- To be familiar with simulation tools.
- To use simulation tools to analyze the performance of various networking protocols.

List of Experiments

1. Study of Socket Programming and Client – Server model
2. Applications using TCP Sockets
      1. Date and Time server & client
      2. Echo server & client,
      3. Chat
3. Applications using UDP Sockets
      1. Date and Time server & client
      2. Echo server & client,
      3. Chat
4. Simulation of DNS
5. Simulation of DHCP
6. Simulation of ARP /RARP protocols.
7. Simulation of PING and TRACEROUTE commands
8. Implementation RMI (Remote Method Invocation)
9. Implementation of Subnetting
10. Simulation of Cisco Packet Tracer,
      a). Establish a Local Area Network (LAN) with 4 hosts and a switch/Hub
      b). Connect two LANs using multi-router topology with static routes
10. Study of Network simulator (NS3) and Simulation of Congestion Control Algorithms using NS3
11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.
      i. Link State routing protocol
      ii. Distance vector routing protocol
12. Simulation of software defined network using OpenDaylight SDN controller with the Mininet Network Emulator

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Establish communication between the peers using socket programming	AP
2	Implement addressing scheme	AP
3	Simulate various routing protocols in data communication.	AP
4	Generate real time applications using networks protocols	AP
5	Simulate real time applications between host using simulation tools	AP

TEXT BOOKS:

2. Behrouz A. Forouzan, ―Data Communications and Networking with TCP/IP Protocol Suite‖, Sixth Edition, McGrawHill, 2022.

2. Thomas D Nadeau, Ken Gray, ―SDN: Software Defined Networks‖, First Edition, O'Reilly, 2013.

REFERENCES:

2. James F. Kurose, Keith W. Ross, ―Computer Networking - A Top-Down Approach Featuring the Internet‖, Fifth Edition, Pearson Education, 2009.

2. Nader. F. Mir, ―Computer and Communication Networks‖, Pearson Prentice Hall Publishers, 2010.

3. Larry L. Peterson, Bruce S. Davie, ―Computer Networks: A Systems Approach‖, Sixth Edition, Morgan Kaufmann Publishers, 2018.

4. https://www.brianlinkletter.com/2016/02/using-the-opendaylight-sdn-controller-with-the-mininet-network-emulator/

Equipment's Required

(List hardware and software needed for 60 no's)

1. C / C++ / Java / Equivalent Compiler 60
2. Network simulator like NS2/Glomosim/OPNET/OpenDaylight/Mininet/ Equivalent

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	-	-	-	1	1	2	-	1	1	2
2.	3	3	3	3	-	-	-	1	1	2	-	1	1	2
3.	3	3	3	3	2	-	-	1	1	2	2	1	1	2
4.	3	3	3	3	2	1	1	1	1	2	2	1	1	2
5.	3	3	3	3	2	1	1	1	1	2	2	1	1	2

IT22609   **INFORMATION SECURITY : THEORY AND PRACTICES**   L   T   P   C
                                                     2   0   2   3

Objectives:

- To study and practice fundamental techniques in developing secure applications
- To learn about secure coding practices.
- To Learn to implement the symmetric and asymmetric cryptographic algorithms
- To implement security controls.
- To learn techniques specific to mitigating the occurrence of common software vulnerabilities.

Unit 1   INTRODUCTION TO SECURITY AND CRYPTOGRAPHY   6+6

Overview of Security Parameters: Confidentiality, integrity and availability; Security violation and threats; Security policy and procedure; Assumptions and Trust; Security Assurance, Implementation and Operational Issues; Security Life Cycle. Foundations of Cryptography- Classical Encryption Techniques-Substitution Ciphers -Transposition ciphers - Cryptanalysis.

Suggested Activity : Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts: a) Caesar Cipher b) Playfair Cipher c) Hill Cipher d) Vigenere Cipher e) Rail fence – row & Column Transformation

Unit 2   SYMMETRIC AND ASYMMETRIC TECHNIQUES   6+6

Block Ciphers and the Data Encryption Standard, Advanced Encryption Standard, Introduction to Number Theory - The Euclidean Algorithm - Greatest Common Divisor, Modular Arithmetic - Euclidean Algorithm Revisited - The Extended Euclidean Algorithm, Public Key Cryptography and RSA, Other Public Key Cryptosystems - Diffie-Hellman Key Exchange – Elgamal Cryptographic Systems – Elliptic Curve Cryptography.

Suggested Activity: Implement the following algorithms a) DES b) RSA Algorithm c) Diffiee-Hellman

Unit 3   DIGITAL SIGNATURE AND KEY MANAGEMENT   6+6

Digital Signatures, Key Management - Session and Interchange Keys - Key Exchange - Symmetric Cryptographic Key Exchange – Kerberos - Public Key Cryptographic Key Exchange and Authentication - Key Generation - Storing and Revoking Key

Suggested Activity: Implementation of Encryption and Decryption using Kelopatra tool. Implement of Authentication and Digital Signature using Kelopatra tool.

Unit 4   SECURITY TECHNOLOGY   **6+6**

Introduction- Access control- firewall, firewall using IP tables, protecting remote connections- Intrusion Detection and Prevention system –Honey pots, Honey Nets and Padded cell systems, scanning and analysis tools, Digital forensics.

Suggested Activity: Implement IDS using Snort tool

Unit 5   BLOCK CHAIN AND BEYOND   **6+6**

Hashing – SHA – MD5 – Block chain: Basics – Contents of a Block – Hashchain to Blockchain - Digital Money to Distributed Ledgers , Design Primitives: Protocols, Security, Consensus, Permissions, Privacy - Basic consensus mechanisms Requirements for the consensus protocols, Proof of Work (PoW) – Crypto Currency.

Suggested Activity: Implement SHA, MD5, Secure File Management.

Total (L:30+P:30=60)

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Evaluate the fundamental principles of information security, analyze and apply classical encryption techniques to secure data and information systems.	AN
2	Apply advanced cryptographic algorithms to secure data and communication systems effectively.	AP
3	Demonstrate a deep understanding of digital signatures, key management techniques, and cryptographic key exchange methods, both symmetric and public key-based.	AP
4	Apply access control principles, utilize firewall technologies, and configure intrusion detection and prevention systems	AP
5	Evaluate various hashing algorithms and demonstrate an understanding of block chain fundamentals, design primitives, consensus mechanisms, and their application to crypto-currencies	E

TEXT BOOKS:
1. Stallings William. Cryptography and Network Security: Principles and Practice, Seventh Edition, Pearson/PrenticeHal; 2018.
2. Matt Bishop ,―Computer Security art and science ‖, Second Edition, Pearson Education.
3. Michael E Whitman and Herbert J Mattord, ―Principles of Information Security‖, Vikas Publishing House, New Delhi, fifth edition, Cengage learning , 2015.

REFERENCES:
1. Melanie Swa, ―Block chain: Blueprint for a new economy‖, First edition, O'Reilly, 2015
2. Charles P. Pfleeger, Shari Lawrence Pfleeger, ―Security in Computing‖, Fourth Edition, Prentice Hall, 2007.
3. Mark Rhodes- Ousley ,―Information Security: The complete Reference‖, Second Edition Mcgraw Hill, 2013.

EQUIPMENT'S REQUIRED
SOFTWARE:
Java, C, C++ or any Open Source tool
HARDWARE:
Standalone desktops 60 Nos
Pentium P5, 3 GHz or higher
8 GB (or higher) RAM,
100 GB (or higher) HD
Windows 8 or 10 (or higher)

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	3	3	2	2	3	2	2	3	3	2	2	3	3	3
2	3	3	2	2	3	2	2	3	3	2	2	3	3	3
3	3	3	2	2	3	2	2	3	3	2	2	3	3	3
4	3	3	2	2	3	2	2	3	3	2	2	3	3	3
5	3	3	2	2	3	2	2	3	3	2	2	3	3	3

IT22601	Machine Learning Algorithms and Techniques	L	T	P	C
		3	0	0	3

Objectives:
- To provide solid understanding of the fundamental concepts and techniques of Machine Learning.
- To equip students with the knowledge and skills to apply various supervised learning algorithms.
- To introduce students to unsupervised learning techniques
- To pioneer the concept of reinforcement learning and familiarize students with learning tasks.
- To expose students to advanced learning models and their applications.

Unit 1 INTRODUCTION TO MACHINE LEARNING 9

Definition- Machine learning Process -ML application –types of ML –-Terminologies-basic Concepts in ML-**Testing ML algorithms**-Design of a Learning system-perspectives and issues of ML-Data Preprocessing Techniques.

Unit 2 SUPERVISED LEARNING ALGORITHMS 9

Linear Models: Linear, Logistic Regression-LDA – Tree based methods: Decision Trees-, ID3-Random Forest- Instance-Based Methods: KNN. Probabilistic Methods: Naive Bayes Classifier- Standard regularization techniques and Model validation.

Unit 3 UNSUPERVISED AND REINFORCEMENT LEARNING 9

Introduction - Clustering Algorithms - K- Means – Hierarchical Clustering - Cluster Analysis – Association Rules –Apriori Algorithm -Dimensionality Reduction –PCA - EM algorithm. Reinforcement Learning – learning Task-Q learning.

Unit 4 ADDITIONAL LEARNING METHODS 9

Optimization and Search-Learning set of Rules –Kernel methods-SVM -Hidden Markov Models-RBF. Evolutionary Learning – Genetic Algorithm- Neural Networks –Perceptrons- Back propagation Algorithm- Ensemble Learning Techniques - Bagging and boosting

Unit 5 TIME SERIES ANALYSIS 9

Time series analysis and its components-Forecasting process -Stationary and Non-Stationary Process-Testing methods - DFT, ACF, PACF-Time series analysis techniques - AR, MA ARMA and ARIMA.

Total (L:45)

OUTCOMES:

CO #	Course Outcomes	RBT Level
1	Apply machine learning techniques to solve real-time industry applications.	AP
2	Design and implement algorithms for an application and analyze the results	E
3	Distinguish between, supervised, unsupervised and semi-supervised learning and suggest suitable learning algorithms for any given problem.	AN
4	Modify existing machine learning algorithms to improve its efficiency.	E
5	Demonstrate an understanding of advanced learning models.	AP

TEXT BOOKS:

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3. "Introduction to Time Series Analysis and Forecasting" by Douglas C. Montgomery, Cheryl L. Jennings, and Murat Kulahci,Wiley ,2008

REFERENCES:

4. Christopher Bishop, ―Pattern Recognition and Machine Learning‖ Springer, 2007.
5. Shalev-Shwartz, S., & Ben-David, S. (2014). "Understanding Machine Learning: From Theory to Algorithms." Cambridge University Press.
6. Kevin P. Murphy, ―Machine Learning: A Probabilistic Perspective‖, MIT Press, 2012.

COURSE ARTICULATION MATRIX

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1.	3	2	1	3		1							1	
2.	2	3	3		2		1	1	1	1	1		2	2
3.	2	2	2	2		1					1		2	
4.	2	3	3		2	1	1			1	1		2	
5.	1	1	1	2	2					1		2		1

		L	T	P	C
IT22602	**NATURAL LANGUAGE PROCESSING AND UNDERSTANDNG**	3	0	0	3

Objectives:
- To learn the automata theory and tools of the compiler.
- To learn the concepts natural language processing techniques
- To learn how to represent sentence using grammer.
- To learn word syntax and semantic analysis
- To learn pragmatics and discourse analysis

Unit 1   FINITE AUTOMATA & LEXICAL ANALYSIS   9+3

Introduction- Basic Mathematical Notation and techniques- Finite Automaton – DFA & NDFA – Finite Automaton with €- moves – Regular Languages- RegularExpression – Equivalence of NFA and DFA – Lexical Analysis-language processors -The Phases of Compiler-Errors Encountered in Different Phases-compiler Construction Tools

Unit 2   NATURAL LANGUAGE GENERATION   9+3

Natural Language Generation: Architecture of NLG Systems- Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation- Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages, Porter Stemmer, Lemmatizer

Unit 3   WORD LEVEL ANALYSIS   9+3

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing-Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

Unit 4   SEMANTICS AND PRAGMATICS   9+3

Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Requirements for representation, First-Order Logic, Description Logics – Semantic analysis, Word Senses, Relations between Senses, Thematic Roles, Selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

Unit 5   DISCOURSE ANALYSIS   9+3

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution -applications

                                                                        TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Examine the various recognizers to understand language processors in compilers.	AN
2	Evaluate the tasks and techniques of NLG systems, including machine translation challenges for Indian languages.	E
3	Apply word-level analysis techniques like grammar, syntactic parsing, and POS tagging to process sentences.	AP
4	Assess methods of semantic analysis and ambiguity resolution in natural language understanding.	E
5	Analyze discourse analysis techniques to improve coherence and reference handling in NLP systems.	AN

TEXT BOOKS:

John. E. Hopcroft, Rajiv Motwani and Jeffrey D Ullman, ―Introduction to Automata Theory, Languages and Computation‖, Third Edition, Pearson Education, 2014

Daniel Jurafsky, James H. Martin,Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with Python‖, First Edition, O_Reilly Media, 2009.

REFERENCES:

K. C. Louden, Compiler Construction Principles and Practice, Thomson Learning Inc. , 1st Ed, 2007.

L. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.

M. Richard M Reese, ―Natural Language Processing with Java‖, O_Reilly Media, 2015.

Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.

Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval‖, Oxford University Press, 2008.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3	-	3	-	-	-	-	3	3	3
2.	3	3	3	-	3	-	3	-	-	-	-	3	3	3
3.	3	3	3	3	3	3	3	1	2	-	2	3	3	3
4.	3	3	3	3	3	3	3	-	2	-	2	3	3	3
5.	3	3	3	3	3	3	3	-	-	-	-	3	3	3

		L	T	P	C
IT22611	**MACHINE LEARNING TECHNIQUES LABORATORY**	0	0	3	1.5

Course Objective:
- To introduce classical and foundational concepts, results, methodologies and applications in machine learning.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.
- To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models

List of experiments:
1.   Learn the different libraries - NumPy, Pandas, SciPy, Matplotlib, Scikit Learn.
2.   Implement data preprocessing and for text.
3.   EDA (Exploratory Data Analysis) - Handling missing values or human error, Identifying outliers.
4.   Feature Engineering – feature improvements, feature selection, feature extraction, feature construction, feature transformations, feature learning
5.   Regression (Linear and Logistics) - Algorithm
6.   Classification and Clustering - Algorithm
7.   SVM (Support Vector Machine) – Algorithm
8.   Dimensionality Reduction Technique
9.   Regularization Techniques
     •Lasso/Ridge regression)
     •Implement the Ensemble learning method (Adaboost &Random Forest).
10. Hyperparameter optimization.
     - Manual Search,   Random Search,Grid Search.
     - Halving. Grid Search. Randomized Search.
     - Automated Hyperparameter tuning.
     - Bayesian Optimization. Genetic Algorithms.
11. Bayes Search.Modeling and forecasting of real life time series data.
     • linear stationary and non stationary data
     • Methods to Check Stationarity
     • Converting Non-Stationary Into Stationary
     • Moving Average Methodology (SMA,CMA,EMA)
12. Deployment of Machine Learning Models simple Web API using Flask library.

*For Exercise 4-11 evaluate the performance of the algorithm.

TOTAL : 45 PERIODS

OUTCOMES:

CO #	Course Outcomes	RBT Level
1	Apply machine learning techniques to solve real-time industry applications.	AP
2	Design and implement algorithms for an application and analyze the results	E
3	Distinguish between, supervised, unsupervised and semi-supervised learning and suggest suitable learning algorithms for any given problem.	AN
4	Modify existing machine learning algorithms to improve its efficiency.	E
5	Demonstrate an understanding of advanced learning models.	AP

Software specification:

Python, Google co lab.

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1.	3	1		3	1		1	1	1	1			2	
2.	1		1	2	1									
3.	1	3	3		2									
4.	1		3		3			1	1	1			2	
5.	2	3		3	1		1	1	1	1			2	

		L	T	P	C
IT22612	**NATURAL LANGUAGE PROCESSING AND UNDERSTANDING LABORATORY**	0	0	3	1.5

Objectives:
- To Understand Natural Language Processing and to learn how to apply basic algorithms in this field
- To get acquainted with the basic concepts and algorithmic description of the main language levels: Mophology, Syntax, Semantics and Pragmatics.
- To design and implement application based on Natural language processing
- To implement Various Language models
- To design systems that uses NLP technologies.

List of Experiments

1. Implementation of Symbol Table

2. Construction of DFA for a given regular expression and acceptance of a string

3. Preprocessing of Text(Tokenization,Filtration,Script Validation,StopWord Removal,Stemming)

4. Perform Word Analysis

5. Perform Word Generation

6. Perform Morphological Ananlysis

7. Implement N-Gram(Bigram Extraction)

8. Implement Parts of Speech Tagging using Hidden Markov model

9. Implement Parts of Speech Tagging using Viterbi Decoding

10. Building Part of Speech Tagger

11. Implement chunking to extract Noun phrases

12. Building Chunker

13. Perform Name Entity Recognition on given text

14. Mini Project based on NLP Application-One real life Natural language application is to be implemented(Use Standard Datasets from Web)

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Apply text pre-processing techniques to transform raw text	**AP**
2	Implement language models (e.g., finite automata, n-grams) to improve language processing.	**AP**
3	Design part-of-speech tagging algorithms to identify syntactic structures and word classifications.	**AP**
4	Develop and apply techniques like named entity recognition and chunking to extract entities, noun phrases, and other linguistic units.	**AP**
5	Design and implement an NLP application integrating text pre-processing, tagging, and entity recognition to address real-world challenges.	**AP**

REFERENCES:

- K. C. Louden, Compiler Construction Principles and Practice, Thomson Learning Inc. , 1st Ed, 2007.
- L. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
- M. Richard M Reese, ―Natural Language Processing with Java‖, O_Reilly Media, 2015.
- Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
- Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval‖, Oxford University Press, 2008.

Equipment's Required

(List hardware and software needed for 60 no's)

EQUIPMENT'S REQUIRED

SOFTWARE:

Java, C, C++ or any Open Source tool

HARDWARE:

Standalone desktops 60 Nos,Pentium P5, 3 GHz or higher,8 GB (or higher) RAM,

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1.	2	3	3	2	3	3	-	1	-	-	-	1	3	3
2.	2	3	3	2	3	3	-	1	-	-	-	1	3	3
3.	2	3	3	2	3	3	-	1	-	-	-	1	3	3

| 4. | 2 | 3 | 3 | 2 | 3 | 3 | - | 1 | - | - | - | 1 | 3 | 3 |
| 5. | 2 | 3 | 3 | 2 | 3 | 3 | - | 1 | - | - | - | 1 | 3 | 3 |

IT22709   **CYBER FORENSICS : THEORY AND PRACTICE**   L   T   P   C
                                                                2   0   2   3

Objectives:

- To understand the fundamentals of Computer Forensics and computing Investigations.
- To recognize the legal underpinnings and critical laws affecting forensics
- To apply the tools and methods to uncover hidden information in digital systems.
- To learn about current licensing and certification requirements to build the career in digital forensics.

Unit 1   INTRODUCTION   6+6

The Scope of Computer Forensics - Windows Operating and File Systems –Linux Operating and File System- Handling Computer Hardware –Anatomy of Digital Investigation.

Suggested Activities: Hide and Extract text file behind an image using Hex Editor, Create Forensic Image using FTK Imager

Unit 2   INVESTIGATIVE SMART PRACTICES   6+6

Forensics Investigative Smart Practices –Scope- Evidence Handling- Acquisition Objectives - Data Preparation -Investigation Objectives –Time and Forensics –Incident closure.

Suggested Activities:Create Raw Image using DUMPIT and Collect Email evidence using Bulk Extractor, Magnet Forensics for RAM Capture

Unit 3   LAWS AND PRIVACY CONCERNS   6+6

Cyber Crime-Search Warrantsand Subpoenas - Laws Affecting Forensic Investigations in India and US ––Legislated Privacy Concerns –The admissibility of Evidence –First Response and Digital Investigator.

Suggested Activities:Live Forensic case investigation using Autopsy

Unit 4   DATA ACQUISITION AND REPORT WRITING   6+6

Data Acquisition –Finding Lost Files –Document Analysis –Case Management and Report Writing –Preparation-Investigation – Presentation stages-Structure of a Forensic Report-Building a Forensics Workstation

Suggested Activities: Recover the deleted files using Forensic Tools, Extracting windows password from computers.

Unit 5   TOOLS AND CASE STUDIES   6+6

Tools of the Digital Investigator-Licensing and Certification –Case Studies: E-mail Forensics –Web Forensics –Searching the Network –Excavating a Cloud –Mobile device Forensics.

Suggested Activities: Analyzing network traffic using Wireshark, Mobile forensics using Cellebrite tool,

Total (L:30+P:30):60 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Apply the fundamentals of computer forensics, laws, report writing and tools in digital investigations.	AP
2	Assess the investigative smart practices and applicability of concerned laws & investigative tools	AN
3	Inspect the acquired data, recover the deleted data and manage a case .	AN
4	Select the correct method to handle the digital evidence and acquire appropriate certification to build the career in digital forensics.	E
5	Create a method for gathering, assessing and applying new and existing legislation specific to the practice of digital forensics	AP

TEXT BOOKS:

1. Michael Graves, ―Digital Archaeology: The Art and Science of Digital Forensics‖, Addison-Wesley Professional, 2014.
2. Darren R. Hayes, ―Practical Guide to Computer Forensics Investigation‖, Pearson, 2015.

REFERENCES:

1. Albert J. Marcella and Frederic Guillossou, ―Cyber Forensics: From Data to Digital Evidence, Wiley, 2015.
2. Bill Nelson, Amelia Phillips and Christopher Steuart, ―Guide to Computer Forensics and Investigations, Fourth Edition, Cengage, 2013.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1.	3		3	3	3	3		2	1	2		1	3	
2.	3	3	3	3	3	3	1	2	2	2		1	3	3
3.	3		3	3	3			2		2	2	1	3	3
4.	3	3	3	3	3		1		2		2	1		3
5.	3	3	3	3	3	2			1	2		1	3	

IT22701   **DISTRIBUTED AND CLOUD COMPUTING**

L	T	P	C
3	0	0	3

Objectives:
- To provide comprehensive knowledge of fundamental concepts of cloud computing
- To understand service models, deployment models and virtualization
- To familiarize Docker fundamentals, including containerization, image creation
- To do programming and experiment with the various cloud computing environments and platforms
- To shed light on the security issues in cloud computing.

Unit 1   CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE   9

Definition of Cloud Computing – Characteristics of Cloud - Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges

Unit 2   VIRTUALIZATION BASICS   9

Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts – Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization – Virtualization of CPU, Memory and I/O devices.

Unit 3   VIRTUALIZATION INFRASTRUCTURE AND DOCKER

Desktop Virtualization – Network Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management – Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories.

Unit 4   CLOUD PROGRAMMING AND SOFTWARE ENVIRONMENT   9

Google App Engine – GAE Architecture - Functional modules of GAE - GAE Applications - Google File System - Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus, Nimbus, OpenNebula, Sector/Sphere, and OpenStack - CloudStack- Manjrasoft Aneka Cloud and Appliances.

Unit 5   CLOUD SECURITY   9

Cloud Security Defense Strategies-Distributed Intrusion and Anomaly Detection-Data and Software Protection Techniques- Cloud Computing Software Security Fundamentals - Cloud Security Services, Cloud Security Design Principles, Cloud Security Policy implementation and Decomposition, NIST 33 Security Principles.

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Articulate the main concepts, key technologies, strengths and limitations of cloud computing.	AP
2	Develop the ability to understand the key and enabling technologies that help in the development of cloud.	AP
3	Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.	AP
4	Ability to analyze the core issues of cloud computing such as resource management and security.	AN
5	Install and use current cloud technologies.	AP

TEXT BOOKS:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, ―Distributed and Cloud Computing, From Parallel Processing to the Internet of Things‖, Morgan Kaufmann Publishers, 2012.
2. James Turnbull, ―The Docker Book‖, O'Reilly Publishers, 2014.
3. Krutz, R. L., Vines, R. D, ―Cloud security. A Comprehensive Guide to Secure Cloud Computing‖, Wiley Publishing, 2010.

REFERENCES:

1. James E. Smith, Ravi Nair, ―Virtual Machines: Versatile Platforms for Systems and Processes‖, Elsevier/Morgan Kaufmann, 2005.
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, ―Cloud Security and Privacy: an enterprise perspective on risks and compliance‖, O'Reilly Media, Inc., 2009.
3. Thomas Erl , Ricardo Puttini, Zaigham Mahmood,‖ Cloud Computing: Concepts, Technology & Architecture‖, First Edition, Prentice Hall,2013.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	2			3	2	3	3	3	3	3	3	
2.	3	3	2		3	3	2	3	3	3	3	3	3	3
3.	3	3	2	3	2	3	2	3	3	3	3	3	3	3
4.	3	3	2	3	3	3	2	3	3	3	3	3	3	2
5.	3	3	3	3	3	3	2	3	3	3	3	3	3	3

	L	T	P	C

IT22702   **BIG DATA**

L   T   P   C
3   0   0   3

Objectives:
- To Utilize and implement the Hadoop distributed file system and Mapreduce applications
- To learn and use the current and emerging big data frameworks for processing Big Data
- To explore tools and practices for working with big data

Unit 1   INTRODUCTION TO BIG DATA
Introduction to Big Data- Characteristics of Big Data - Needs and challenges of Big Data - Big Data Tools and Techniques - Big Data and the new School of Marketting - Risk and Big Data - Big Data Technology - The cloud and Big Data , Predictive Analytics , Crowdsourcing Analytics, Inter- and Trans-Firewall Analytic.

Unit 2   BASICS OF HADOOP   9
Big Data Vs Hadoop - The Hadoop Distributed File System – Components of Hadoop, Analyzing the Data with Hadoop- Scaling Out- Design of HDFS- Java interfaces to HDFS Basics - Developing a Map Reduce Application-Anatomy of a Map Reduce Job run Failures- Job Scheduling-Shuffle and Sort – Task execution

Unit 3   ASSOCIATION AND RECOMMENDATION SYSTEM   9
 Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association & finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.

Unit 4   NOSQL DATA MANAGEMENT FOR BIG DATA   9
Pig Latin, User Defined Functions– Data processing operators in Pig – Hive services - HiveQL – Querying Data in Hive -Applications on Big Data Using Pig and Hive - Fundamentals of HBase and ZooKeeper - Spark - Spark applications, Anatomy of a Spark Job run, Executors and Cluster Managers

Unit 5   DATA VISUALIZATION TOOLS AND TECHNIQUES   9
Data Visualization Tools - Tableau, Power BI, Datawrapper, Infogram, Grafana. Google Charts, Data Visualization Techniques - Bar Charts, Histograms, Pie Charts, Scatter Plots, Line Plots, Maps.

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Learn and apply different mining algorithms and recommendation systems for large volumes of data	AP
2	Ability to integrate machine learning libraries and mathematical and statistical tools with modern technologies like hadoop and mapreduce	AP
3	Ability to use big data tools and its analysis techniques	AN
4	Ability to understand of how to manage Big Data	AN
5	Visualize big data to perform decision making in real world problems	AN

TEXT BOOKS:

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013
2. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
3. Tom White,‖ Hadoop: The Definitive Guide‖, Third Edition, O_reilly Media, 2012

REFERENCES:

1. Zikopoulos, Paul, Chris Eaton, ―Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data‖, Tata McGraw Hill Publications, 2011.
2. Anand Rajaraman and Jeffrey David Ullman,―Mining of Massive Datasets‖, Cambridge University Press, 2012.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	2			3	2	3	3	3	3	3	3	
2.	3	3	2		3	3	2	3	3	3	3	3	3	3
3.	3	3	2	3	2	3	2	3	3	3	3	3	3	3
4.	3	3	2	3	3	3	2	3	3	3	3	3	3	2
5.	3	3	3	3	3	3	2	3	3	3	3	3	3	3

IT22711	**DISTRIBUTED AND CLOUD COMPUTING LABORATORY**	L	T	P	C
		0	0	3	1.5

Objectives:

- Be exposed to tool kits for cloud environment.
- Learn to run virtual machines of different configuration.

List of Experiments

1. Develop a new Web Service for Calculator.
2. Develop a Cloud environment using CloudSim simulator
3. Use Eucalyptus or Open Nebula or equivalent to set up the cloud
4. Find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time.
5. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
6. Install a C compiler in the virtual machine and execute a sample program.
7. Show the virtual machine migration based on the certain condition from one node to the other.
8. Install Google App Engine. Create hello world app and other simple web applications using python/java.
9. Explore how Docker can be used for virtualization and application deployment.
10. Deploy a simple web application (e.g., a Flask app) on a cloud platform using a PaaS service.

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Design and deploy a web application in cloud environment.	AP
2	Use Cloud open source Tools for managing cloud resources.	AP
3	Create virtual Machines using Eucalyptus	AP
4	Use GAE launcher and Google App Engine to launch Web applications.	AP
5	Learn how to simulate a cloud environment	AP

TEXT BOOKS:

1. David Chisnall. ―The Definitive Guide to XEN Hypervisor‖.

2. Vmware ― www.vmware.com‖

REFERENCES:

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, ―Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet‖, First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.
2. Tom White,‖ Hadoop: The Definitive Guide‖, Third Edition, O_reilly Media, 2012

Equipment's Required
(List hardware and software needed for 60 no's)

SOFTWARE:
Eucalyptus or Open Nebula or equivalent
SPARK, Pig, Hive, Hadoop

HARDWARE:
Standalone desktops   30 Nos

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	2			3	2	3	3	3	3	3	3	
2.	3	3	2		3	3	2	3	3	3	3	3	3	3
3.	3	3	2	3	2	3	2	3	3	3	3	3	3	3
4.	3	3	2	3	3	3	2	3	3	3	3	3	3	2
5.	3	3	3	3	3	3	2	3	3	3	3	3	3	3

IT22712 **BIG DATA LABORATORY**

L	T	P	C
0	0	3	1.5

Objectives:

- Be familiar with the algorithms of data mining
- Learn to use Hadoop frameworks.

List of Experiments

1. Creation of Large data set
2. Load large dataset and visualize data in different dimensions
3. Perform preprocessing on data set
4. Perform association rule mining on data set
5. Develop a knowledge flow layout for finding strong association rules by using Apriori,FPGrowth algorithms
6. Find procedure to set up the one node Hadoop cluster.
7. Write a program to use the API's of Hadoop to interact with it.
8. Implement an application that stores big data in Hbase using Hadoop
9. Implement CRUD operations in a Big Data Environment.
10. Demonstrate the use of Hadoop Map Reduce using JAVA.
11. Implement an application that stores big data in Pig and Hive.
12. Demonstrate the use of SPARK for near-real time processing.
13. Visualize data using any plotting framework
14. Implement an application that stores big data in Hbase / MongoDB / Pig using Hadoop / R

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Develop sample Webapplications using HadoopMapReduce algorithms.	AP
2	Inspect the different types of Hadoop framework for large datasets.	AN
3	Use of different types graphical methods in data analysis	AP
4	Develop association rules for market basket analysis using FP growth and Apriori algorithm	AP
5	Develop and evaluate real time applications using Hadoop Frameworks	E

TEXT BOOKS:

3. Sridhar Alla, ―Big Data Analytics with Hadoop 3‖, Packt Publishing; 1st edition,2018.

4. Alex Holmes, ―Hadoop in Practice‖ , ISBN:9781638353362, 1638353360, Manning Publisher,2014

REFERENCES:

1. Tom White,‖ Hadoop: The Definitive Guide‖, Third Edition, O_reilly Media, 2012

Equipment's Required
(List hardware and software needed for 60 no's)

SOFTWARE:
PYTHON/R

HARDWARE:
Standalone desktops 30 Nos

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	3	3	3	3	3	3	3	3	3	3	3	3
2.	2	2	2	3	3	3	3	3	3	3	3	3	3	3
3.	3	3	2	2	2	2	2	2	2	2	2	2	2	2
4.	3	3	2	3	3	2	2	2	2	2	2	2	2	2
5.	3	3	3	3	3	3	3	3	3	3	3	3	3	3

IT22021 **QUANTUM COMPUTING CONCEPTS** L T P C
                                                                            3 0 0 3

Objectives:
- To know the difference between classical computing and quantum computing
- To learn the fundamental concepts of quantum computing
- To understand the Quantum state transformations and the algorithms
- To explore the applications of quantum computing

Unit 1   INTRODUCTION TO QUANTUM INFORMATION   9

Complex Numbers - Linear Algebra - Matrices and Operators–States-Quantum Bits - Measurements – No-Cloning theorem -Superposition- Quantum Entanglement–Bloch Sphere-Quantum Teleportation

Unit 2   QUANTUM STATE TRANSFORMATIONS   9

Universal logic gates - Basic single qubit gates - Multiple qubit gates - Unitary Transformations as Quantum Circuits – ReversibleClassical Computationsto Quantum Computations

Unit 3   QUANTUM ALGORITHMS   9

Quantum parallelism –Query Complexity - Deutsch's algorithm - The Deutsch–Jozsa algorithm - Quantum Fouriertransform and its applications - Quantum Search Algorithms: Grover's Algorithm

Unit 4   QUANTUM ADVANCEMENTS   9

Quantum True Random Number Generators (QTRNG): Detailed design and issues of Quantumness- Commercial products and applications. Quantum Oracle, Introduction to Quantum Machine Learning.

Unit 5   QUANTUM CRYPTOGRAPHY   9

Classical cryptography basic concepts - Private key cryptography - Implication of Shor's algorithm towards factorization and Discrete Logarithm basedclassical public-key cryptosystems- Quantum Key Distribution - BB84 - Ekert 91

                                                                    Total (L:45)

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Illustrate the basic concepts of quantum computing	AN
2	Examine the operations of quantum logic gates	AP
3	Analyze the quantum algorithms for performing computations on quantumcomputers	AN
4	Explore the applications of quantum computing	AN
5	Ensure secure communication using quantum key distribution	E

TEXT BOOKS:
1. A. Nielsen and I. L. Chuang, ―Quantum Computation and Quantum Information‖, Cambridge University Press, 2010
2. Chris Bernhardt, ―Quantum Computing for Everyone‖, The MIT Press, 2019

REFERENCES:

1. David McMahon, ―Quantum Computing Explained‖, John Wiley & Sons, 2008
2. Parag K. Lala, Quantum Computing - A Beginners Introduction, Mc Graw Hill,2019
3. Jack D. Hidary, Quantum Computing: An Applied Approach 1st ed. Edition, Springer 2019

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	1	1						2		1	3	
2.	3	3	2	2						2		1	3	
3.	3	3	2	3						2		1		3
4.	3	3	2	1	3	1	1		1	2		1	3	
5.	3	3	2	1				3		2	1	1		3

IT22022 **NEXT GENERATION COMPUTING**

L	T	P	C
3	0	0	3

Objectives:
- To understand evolution of technologies of 4G and beyond.
- To learn the fundamentals of 5G internet.
- To explore NGN architecture and management activities.
- To gain the knowledge of Cooperation for Next Generation Wireless Networks
- To learn security risks in 5G networks.

Unit 1   INTRODUCTION TO NEXT-GENERATION COMPUTING   9

Introduction - Overview of traditional computing models, Evolution of computing: past, present, and future, Introduction to quantum computing, edge computing, and neuromorphic computing.

Unit 2   QUANTUM COMPUTING   9

Principles of quantum mechanics, Quantum gates and circuits, Quantum algorithms: Shor's algorithm, Grover's algorithm, Quantum programming languages and tools, Hands-on project: Implementing a simple quantum algorithm.

Unit 3   EDGE COMPUTING   9

Introduction to edge computing and its significance, Edge computing architectures and frameworks, Edge devices and sensors, Edge computing applications in IoT, healthcare, manufacturing, Hands-on project: Developing an edge computing application.

Unit 4   NEUROMORPHIC COMPUTING   9

Neuromorphic computing principles and concepts, Spiking neural networks, Neuromorphic hardware architectures: TrueNorth, SpiNNaker, Applications of neuromorphic computing in AI, robotics, Hands-on project: Building a simple neuromorphic computing model.

Unit 5   BIO-INSPIRED AND OTHER EMERGING COMPUTING   9
**   PARADIGMS**

DNA computing, Optical computing, Bio-inspired computing, Memristor-based computing Potential applications and challenges, Future trends and directions, Ethical and societal implications of next-generation computing.

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Explore the theoretical foundations and principles of next-generation computing paradigms.	AN
2	Explore the practical applications and challenges of emerging computing technologies.	AN
3	Gain hands-on experience with tools and platforms for implementing next-generation computing solutions.	AP
4	Analyze case studies and real-world examples to understand the impact of next-generation computing on various industries and domains.	AN
5	Develop critical thinking and problem-solving skills in the context of future computing challenges.	AN

TEXT BOOKS:
1. "Quantum Computing: A Gentle Introduction" by Eleanor Rieffel and Wolfgang Polak
2. "Edge Computing: A Primer" by XinXu and Hui Cao
3. "Neuromorphic Computing" by KwabenaBoahen

REFERENCES:
1. The Age of Quantum Computing" by Ronald L. Rivest
2. "Edge Computing: Concepts and Applications" edited by Danda B. Rawat and Joel J.P.C. Rodrigues
3. "Neuromorphic Engineering" edited by Christoph von der Malsburg, William A. Philips, and Wolf Singer

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	1	1						2		1	3	
2.	3	3	2	2						2		1	3	
3.	3	3	2	3						2		1		3
4.	3	3	2	1	3	1	1		1	2		1	3	
5.	3	3	2	1				3		2	1	1		3

		L	T	P	C
IT22023   **CONTAINERIZATION TECHNOLOGIES**   3   0   0   3

Objectives:
- To provide the opportunity to learn concepts of design Containerization and build an Orchestration of containers.
- To promote cost-effective lightweight virtualization using container orchestration management tools and techniques

Unit 1   INTRODUCTION TO CONTAINER TECHNOLOGY   9

Introduction to Container Technology: Containerization, History of Containers, Namespaces and C-groups, Containers vs. Virtual Machines, Types of Containers. Docker: Overview, Installing Docker on Linux, Installation, Hub, Images, Containers, Features of Docker, Components of Docker.

Unit 2   CREATING CONTAINERIZED SERVICES   9

Working with Containers, Architecture, Containers& Hosts, Configuring, Containers & Shells, File, Building Files, Public Repositories, Managing Ports, Private Registries, Building a Web Server DockerFile.

Unit 3   MANAGING CONTAINERS   9

Instruction Commands, Container Linking, Storage, Networking, Setting Node.js, Setting MongoDB, Setting NGINX, Toolbox, Setting ASP.Net, Docker Cloud, Logging, Docker – Compose, Docker - Continuous Integration.

Unit 4   ORCHESTRATION IN DOCKER   9

Create and run multi-container applications using Docker, Compose and manage clusters of Docker nodes using Docker Swarm,Docker Service, Placement Rolling Update and Rollback Docker Stack, deploy a multi-container application using Compose and in Swarm Scale.

Unit 5   INTRODUCTION TO KUBERNETS   9

Understanding Kubernetes architecture, Introduction to Kubernetes objects, exploring basic Kubernetes objects, function ofkubectl command, Leveraging Kubernetes. Deploying a simple application in Kubernete.

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Explore the container technology	AN
2	Formulate and Design containers using Docker.	AP
3	Categorize and demonstrate the concept of containerization using Docker files and Composing files	AP
4	Categorize and design an Orchestration of nodes.	AN
5	Create Kubernete objects	E

TEXT BOOKS:
1. Antonopoulos, Nick, and Lee Gillam. Cloud computing. London: Springer, 2010.
2. Comer, Douglas E. The Cloud Computing Book: The Future of Computing Explained. Chapman and Hall/CRC,2021.
3. Raj, Pethuru, Jeeva S. Chelladhurai, and Vinod Singh. Learning Docker. Packt Publishing Ltd, 2015.
4. Luksa, Marko. Kubernetes in action. Simon and Schuster, 2017.

REFERENCES:
1. Foster, Ian, and Dennis B. Gannon. Cloud computing for science and engineering. MIT Press, 2017.
2. Chaudhary, Sanjay, Gaurav Somani, and RajkumarBuyya, eds. Research advances in cloud computing. SpringerSingapore, 2017.
3. Turnbull, James. The Docker Book: Containerization is the new virtualization. James Turnbull, 2014.
4. Sayfan, Gigi. Hands-On Microservices with Kubernetes: Build, deploy, and manage scalable microservicesonKubernetes. Packt Publishing Ltd, 2019.
5. Protechgurus, Dockers containers ultimate beginners guide, independently published.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3	2	1	2	3	1	2	3	3	2
2.	3	3	3	3	3	2	1	2	3	2	2	3	3	3
3.	3	3	3	3	3	2	1	2	3	1	2	3	3	3
4.	3	3	3	3	3	3	2	2	3	2	2	3	3	3
5.	3	3	3	3	3	3	2	2	3	2	2	3	3	3

	L	T	P	C

IT22024   **BIO INFORMATICS**

L   T   P   C
3   0   0   3

Objectives:
- To provide fundamental knowledge to the student in the field of biological research.
- To make students know about recent sequence analysis methods and its applications.
- To learn about the basics of protein structure and do phylogenetic studies.
- To educate the students about applications of machine learning in bioinformatics.

Unit 1   Introduction to Bioinformatics   9
Introduction to Bioinformatics:- Definition- History of Bioinformatics-Concept of bioinformatics- Objectives & components of bioinformatics- Applications-Limitations-Branches of Bioinformatics-DNA Sequencing process-Biological databases-Genome specific databases- Pairwise sequencealignment-Dynamic programming method.

Unit 2   Algorithms for Sequence Analysis   9
Multiple sequence alignment- types - Methods for multiple sequence alignment - Algorithms for Multiple sequence alignment, Generating motifs and profiles, Needleman and Wunsch algorithm, Smith Waterman algorithm- BLAST, PSIBLAST and PHIBLAST algorithms- Functional Annotation.

Unit 3   Next Generation Sequencing, Data Analysis and Applications   9
Genome sequencing, assembling the genome, Next Generation Sequencing -Data formats, Single cell sequencing-Exome sequencing-RNA-seq and its applications - MethylomeSequence Data and Analysis.

Unit 4   Phylogenetics and Molecular Modelling   9
Introduction to phylogenetics, Distance based trees UPGMA trees, Molecular clock theory, Ultrametric trees, Parsimonious trees, Neighbour joining trees, trees based on morphological traits, Bootstrapping, Protein Structure Basics, Visualization, Prediction of Secondary Structure and Tertiary Structure, Homology Modeling, abinitio approaches, Threading, Critical Assessment of Structure Prediction

Unit 5   Machine Learning, other Bioinformatics Applications   9
Machine learning techniques: Artificial Neural Networks for protein secondary structure prediction, Hidden Markov Models for gene finding, Support Vector Machines. Introduction to Systems Biology, Microarray analysis, DNA computing, Bioinformatics approaches for drug discovery.

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Gain depth knowledge for students in the field of Biological research.	U
2	Understand concepts in biological sequence analysis.	U
3	Analyze next generation sequencing data and interpret results.	AN
4	Analyze in depth knowledge in protein structures and prediction.	AN
5	Acquainted with machine learning techniques in Bio informatics applications	AP

TEXT BOOKS:

1. Mohammad Yaseen Sofi, Afshana Shaf and Khalid Z. Masoodi, :Bioinformatics for Everyone‖, Academic Press, Elsevier, 2022
2. Introduction to Bioinformatics by Arthur K. Lesk, Oxford University Press. ,4 th edition 2014
3. Algorithms on Strings, Trees and Sequences by Dan Gusfield, Cambridge University Press. 1999
4. Biological Sequence Analysis Probabilistic Models of proteins and nucleic acids by R.Durbin, S.Eddy, A.Krogh, G.Mitchison, Cambridge University Press. 2013
5. Bioinformatics Sequence and Genome Analysis by David W. Mount, Cold Spring Harbor Laboratory Press. 2nd edition, 2004.

REFERENCES:

1. Bioinformatics The Machine Learning Approach by Pierre Baldi and Soren Brunak, Cambridge University Press 2001

2. RNA-seq Data Analysis: A Practical Approach, by EijaKorpelainen, JarnoTuimala, PanuSomervuo, Mikael Huss and Garry Wong. CRC Press 2014

3. Next Generation Sequencing Data Analysis, by Xinkun Wang CRC Press 2016

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	1	-	1	1	1	-	1	1	1	1	2	1
2	3	3	2	3	2	1	1	1	2	1	-	1	2	1
3	1	2	2	2	1	1	-	-	1	1	1	1	1	2
4	2	3	2	2	2	1	1	1	1	1	1	1	2	2
5	2	2	2	3	2	1	-	1	1	1	1	1	2	2

	L	T	P	C
IT22025 GREEN COMPUTING TECHNOLOGY

L T P C
3 0 0 3

Objectives:
- To learn the fundamentals of Green Computing.
- To familiarize green modeling, architecture and framework.
- To understand the issues related with Green compliance.
- To study and develop various case studies and Deep future of Green Computing.

Unit 1   FUNDAMENTALS   9
Green IT Fundamentals : Business, IT and the Environment – Green Computing: Carbon Foot Print - Scoop on Power – Green IT Strategies: Drivers - Dimensions and Goals – Environmentally Responsible Business: Policies – Practices and Metrics.

Unit 2   GREEN ASSETS and MODELING   9
Assets: Buildings - Data Centers - Networks and Devices –Business Process Management: Modeling – Optimization and Collaboration –Enterprise Architecture – Environmental Intelligence – Supply Chains –Information Systems: Design and Development Models.

Unit 3   FRAMEWORK   9
Role of Electric Utilities - Buying a Green Computer - Recycling Your Computer - Optimize Your Computer Power Management – Virtualization of IT systems - Telecommuting - Teleconferencing and Teleporting –Green PC - Green Servers and Data Centers.

Unit 4   GREEN COMPLIANCE   9
Socio cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols - Standards and Audits – Emergent Carbon Issues - Technologies and Future.

Unit 5   CASE STUDIES   9
The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home – Hospital - Packaging Industry and Telecom Sector - The Future: Deep Green Computing.

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.	AP
2	Prepare Green Assets, Green Process Management towards optimization and collaboration	AP
3	Analyze the Green Computing Frameworks	AN
4	Illustrate cultural aspects, protocols and standards of green computing	AN
5	Analyze Green IT Strategies to various sectors to create green society	AN

TEXT BOOKS:

1. BhuvanUnhelkar ―Green IT Strategies and Applications‖ Using Environmental Intelligence, CRC Press, June 2014.

2. Woody Leonhard, Katherine Murray ―Green Home computing for dummies‖, August 2012.

REFERENCES:

1. Bud E. Smith ― Green Computing Tools and Techniques for Saving Energy, Money and Resources‖, CRC Press, 2014.

2. Alin Gales, Michael Schaefer, Mike Ebbers, ―Green Data Center: steps for the Journey‖, Shroff IBM/rebook, 2011.

3. John Lamb, ― The Greening of IT‖ Pearson Education, 2009.

4. Jason Harris ―Green Computing and Green IT Best Practices on regulations & industry‖, Lulu.com, 2008

5. Carl Speshocky ―Empowering Green Initiatives with IT‖ John Wiley & Sons, 2010.

6. Wu Chun Feng (editor) ―Green computing: Large Scale energy efficiency‖ CRC Press.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	1	1	1	-	1	2	1	1	1	2	1	1	1
2	2	1	3	1	1	1	2	1	2	-	1	1	1	1
3	2	1	1	1	2	2	2	1	1	-	1	2	3	2
4	2	2	3	2	1	1	1	1	2	-	2	1	2	3
5	2	2	3	3	1	1	3	2	1	-	1	2	2	2

	L	T	P	C
IT22026 **COGNITIVE COMPUTING**	3	0	0	3

Objectives:

- To understand various concepts of cognitive computingand its paradigms.
- To understand inference design principles for cognitive systems.
- To applymachine learning design principles in cognitive computing.
- To evaluate advanced analytical concepts with cognitive computing.
- To know about the business and commercial applications of Cognitive Computing.

Unit 1   Introduction To Cognitive Science And Cognitive Computing With AI   9

Cognitive Computing, Cognitive Psychology, The Architecture of the Mind, The Nature of Psychology, Architecture, Processes, The Cognitive Modeling Paradigms, Declarative / Logic based Computational cognitive modeling, connectionist models –Bayesian models. Introduction to Knowledge-Based AI – Human Cognition on AI – Cognitive Architectures

Unit 2   Cognitive Computing With Inference And Decision Support Systems   9

Intelligent Decision making, Fuzzy Cognitive Maps, learning algorithms: Nonlinear Hebbian Learning, Data-driven NHL, Hybrid learning, Fuzzy Grey cognitive maps, Dynamic Random fuzzy cognitive Maps

Unit 3   Cognitive Computing with Machine Learning: 9

Machine learning Techniques for cognitive decision making – Hypothesis Generation and Scoring - Natural Language Processing - Representing Knowledge - Taxonomies and Ontologies - Deep Learning.

Unit 4   Advanced Analytics and cloud computing in Cognitive computing   9

Advanced Analytics - Machine Learning in the Analytics Process - Predictive Analytics - Text Analytics - Advanced Analytics - Characteristics of Cloud Computing - Cloud Computing Models - Delivery Models of the Cloud - Security and Governance.

Unit 5   CASE STUDIES: 9

Cognitive Systems in health care, Assistant for visually impaired – AI for cancer detection, Predictive Analytics, Text Analytics, Image Analytics, Speech Analytics – IBM Watson – Introduction to IBM's Power AI Platform - Introduction to Google's TensorFlow Development Environment.

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Examine the various concepts of cognitive computing and its paradigms	AN
2	Experiment with inference design principles for cognitive systems	AN
3	Apply machine learning design principles in cognitive computing.	AP
4	Evaluate advanced analytical concepts with cognitive computing.	AN
5	Develop cognitive computing related applications, like Chabot.	AP

TEXT BOOKS:

1. Hurwitz, Kaufman, and Bowles, ―Cognitive Computing and Big Data Analytics‖, Wiley, Indianapolis.

2. Masood, Adnan, Hashmi, Adnan,Cognitive Computing Recipes-Artificial Intelligence Solutions Using Microsoft Cognitive Services and TensorFlow, 2015.

REFERENCES:

1. Jerome R. Busemeyer, Peter D. Bruza, ―Quantum Models of Cognition and Decision‖, Cambridge University Press.
2. Emmanuel M. Pothos, Andy J. Wills, ―Formal Approaches in Categorization‖, Cambridge University Press.
3. Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press.
4. Neil Stillings, Steven E. Weisler, Christopher H. Chase and Mark H. Feinstein, ―Cognitive Science: An Introduction‖, MITPress.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	2	3	1	3	1	2	1	0	1	1	1	3
2	2	2	2	2	2	3	0	1	1	1	1	1	2	1
3	1	2	1	0	2	2	2	1	1	1	2	2	2	1
4	0	3	1	1	3	2	1	3	0	1	3	2	3	2
5	2	2	0	1	3	1	2	3	1	2	2	1	1	2

IT22027   VIRTUALIZATION TOOLS AND TECHNIQUES

L	T	P	C
3	0	0	3

Objectives:
- To understand the fundamental concepts and principles of virtualization.
- To explore different virtualization technologies and tools in IT environment.
- To learn virtualization management and cloud-based storage.

Unit 1   Introduction To Virtualization   9

Introduction To Virtualization, System Architectures – Virtual Machine Basics – Process Virtual Machines – System Virtual Machines – Taxonomy of Virtual Machines – Emulation: Basic and Threaded Interpretation, Pre-Coded and Direct Interpretation – Binary Translation – Full and ParaVirtualization – Types of Hypervisor – Types of Virtualization.

Unit 2   Migrating Into A Cloud   9

Broad approaches to migrating into cloud- Seven step model of migration into a cloud VM migration-Cloud middleware and best practices-Storage virtualization, Virtualization structures/tools and mechanism, Datacenter, virtual clusters, cluster management, and benefits of virtualized data centers.

Unit 3   Network Virtualization   9

Design of Scalable Enterprise Networks –WAN Design, Architecture andVirtualization – Virtual Enterprise Transport Virtualization – VLANs and Scalability – Network Device Virtualization Layer 2 –VFIs Virtual Firewall Contexts, Network Device Virtualization – Routing Protocols – VRF- Aware Routing – Multi-Topology Routing.

Unit 4   Applying Virtualization   9

Virtualization Technologies: Guest OS, Host OS, Hypervisor, Emulation, Kernel Level – Shared Kernel – Enterprise Solutions: Vmware Server, ESXi, Citrix Xen Server, Microsoft Virtual PC, Microsoft Hyper-V, Virtual Box – Server Virtualization: Desktop Virtualization, Network and Storage Virtualization: VPN, VLAN, SAN and VSAN, NAS.

Unit 5   Working With Cloud-Based Storage   9

Measuring the digital universe, provisioning cloud storage, exploring backup plan solutions, Data management in cloud Cloud security: Risks and threats, Security mechanisms, Vulnerability checklist, security of offline and dormant VMs, Lack of visibility and control over virtual networks.

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Explain key technologies and mechanisms of virtualization	E
2	Examine the appropriate technologies, algorithms, and approaches for provisioning resources	AP
3	Categorize and demonstrate the concept of network virtualization.	AP
4	Ability to Deploy and Manage Virtualized Environments	AN
5	Assess virtualization Security risk, threats and best Practices	E

TEXT BOOKS:
1. Rishabhsharma : 1st edition Wiley India Pvt Ltd
2. **Cloud Computing Bible** : Barrie Sosinsky : 1st Edition, Wiley India Pvt Ltd
3. **MasteringCloud Computing** :RajkumarBuyya, ChritianVecchiola, S.ThamaraiSelvi : 3rd Edition Tata Mcgraw hill
4. Chris Wolf, Erick M. Halter, ―Virtualization: From the Desktop to the Enterprise‖, APress, 2005.
5. James E. Smith, Ravi Nair, ―Virtual Machines: Versatile Platforms for Systems and Processes‖, Elsevier/Morgan Kaufmann, 2005.
6. David Marshall, Wade A. Reynolds, ―Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center‖, Auerbach Publications, 2006.

REFERENCES:
1. William von Hagen, ―Professional Xen Virtualization‖, Wrox Publications, January, 2008.
2. Kumar Reddy, Victor Moreno, ―Network virtualization‖, Cisco Press, July, 2006.
3. Amy Newman, Kenneth Hess, ―Practical Virtualization Solutions: Virtualization from the Trenches‖, Prentice Hall, October 2009.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3	2	1	2	3	-	2	3	3	2
2.	3	3	3	3	3	2	1	2	3	2	2	3	3	3
3.	3	3	3	3	3	2	1	2	3	1	2	3	3	3
4.	3	3	3	3	3	3	2	2	3	2	2	3	3	3
5.	3	3	3	3	3	3	2	2	3	2	2	3	3	3

IT22020   **ADVANCED CLOUD COMPUTING**   L   T   P   C
                       TECHNOLOGIES LABORATORY   0   0   4   2

Objectives:

The student should be made to:

- Be exposed to open source tools cloud environment.
- Be familiar with developing web services/Applications in cloud framework
- Learn to run virtual machines of different configuration.
- Learn to use Hadoop
- Learn about Hypervisors

List of Experiments

1. CloudSim-run one cloudlet by creating a datacenter with one host and a network topology.
2. Installation of Eucalyptus tool.
3. Find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time.
4. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
5. Installation of Openstack/Opennebulla
6. Sample application program using Openstack/Opennebula
7. Installation of Dockers
8. Sample application using Dockers
9. Installation of Kubernetes
10. Sample application of Kubernetes
11. Single node Hadoop Installation and to set up one node hadoop cluster
12. To write a program to demonstrate the Hadoop MapReduce WordCount in Eclipse
13. Mount the one node Hadoop cluster using FUSE.
14. Configure Hyper-V and manage virtual machine High availability
15. Installation of KVM

Total :60 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Configure various virtualization tools such as Virtual Box, VMware workstation	AP
2	Design and deploy a web application in a PaaS environment.	C
3	Learn how to simulate a cloud environment by using different open source tools.	C
4	Install and use a generic cloud environment that can be used as a private cloud.	AP
5	Manipulate large data sets in a parallel environment.	AN

TEXT BOOKS:

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, ―Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet‖, First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.
2. Thomas Erl , Ricardo Puttini, Zaigham Mahmood,‖ Cloud Computing: Concepts, Technology& Architecture‖, First Edition, Prentice Hall,2013.

REFERENCES:

1. Jason Venner, ―Pro Hadoop- Build Scalable, Distributed Applications in the Cloud‖, A Press, 2009
2. Tom White, ―Hadoop The Definitive Guide‖, First Edition. O‘Reilly, 2009.
3. Tim Master, Subra Kumaraswamy, Shahed Latif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, O‘ Reily Media, Sep 2009.

EQUIPMENT'S REQUIRED
SOFTWARE:
Java, C, C++ or any Open Source tool
HARDWARE:
Standalone desktops 60 Nos
Pentium P5, 3 GHz or higher
8 GB (or higher) RAM,
100 GB (or higher) HD
Windows 8 or 10 (or higher)

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3		3	3	3	3					3	3		
2.	3	2	3	3	3	3		3	3		3		3	3
3.	3	2	3	3	3	3	3	3		3		3		
4.	3		3	3	3	3	3	3	3		3	3	3	3
5.	3		3	3	3	3	3	3	3				2	2

	L	T	P	C

IT22031   **NETWORK DESIGN**

L   T   P   C
3   0   0   3

Objectives:
- Learn about networking principles.
- To learn the design methodology used by network designers
- To explore various networking devices and protocols required for network design
- To learn several architectural models to use as a starting point in developing a network architecture
- To study two novel networking technologies: SDN and DTN management

Unit 1   NETWORKING PRINCIPLES   9

Advanced multiplexing – Code Division Multiplexing, DWDM and OFDM – Shared media networks– Collision detection and collision avoidance, Hidden and Exposed Terminals – Switched networks – Wireless Networks – Infrastructure based, ad hoc and hybrid – End to end semantics, Wireless Scenarios –Applications, Quality of Service.

Unit 2   NETWORK DESIGN CONCEPTS   9

Design Concepts – Design Process-Network Layout – Design Traceability – Design Metrics - Bridging, Switching and Routing Protocols, Physical Network Design – Selecting Technologies and Devices for Campus and Enterprise Networks – Optimizing Network Design.

Unit 3   PHYSICAL NETWORK DESIGN   9

LAN cabling topologies – Ethernet Switches – High speed and Gigabit and 10Gbps – Building cabling topologies and Campus cabling topologies – Routers, Firewalls and L3 switches –Remote Access Technologies and Devices – Modems and DSLs – SLIP and PPP - WAN Design and Enterprise.

Unit 4   NETWORK ARCHITECTURE   9

Architecture and design – Component Architectures – Reference Architecture – Architecture Models – System and Network Architecture – Addressing and Routing Architecture –Addressing Mechanisms – Addressing Strategies – Routing Strategies – Network Management Architecture

Unit 5   INNOVATIVE NETWORKS   9

Software Defined Networks – Evolution of switches and control planes – Centralized and distributed data and control planes – Network Function Virtualization – SDN solutions for data centres - Delay Tolerant Networks – Overlay architecture – Bundle Protocol – Opportunistic routing and Epidemic routing.

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Apply the networking principles to design a network	**AP**
2	Choose appropriate networking devices and protocols	E
3	Develop network applications in various platforms	AP
4	Analyze the various network architectures	**AN**
5	Apply SDN in computing paradigms	**AP**

TEXT BOOKS:

1. Larry Peterson and Bruce Davie, "Computer Networks: A Systems Approach", 5th edition, Morgan Kauffman, 2011.

2. Paul Goransson, Chuck Black, "Software Defined Networks: A Comprehensive Approach", Morgan Kauffman, 2014.

3. https://iopscience.iop.org/article/10.1088/1742-6596/1169/1/012058/pdf.

4. James D. McCabe, Morgan Kaufmann, ―Network Analysis, Architecture, and Design‖, Third Edition, 2007.ISBN-13: 978-0123704801.

REFERENCES:

1. Ying Dar Lin, Ren-Hung Hwang and Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill, 2011.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3		3	3	3	2						3	3	3
2.	3		3	3	3	2						3	3	3
3.	3		3	3	3	2						3	3	3
4.	3		3	3	3	2						3	3	3
5.	3		3	3	3	2						3	3	3

IT22032   MALWARE THREATS IN CYBER SECURITY

L	T	P	C
3	0	0	3

Objectives:

- Identify the nature of malware and its capabilities
- Examine the scientific and logical limitations on ability to combat malware.
- Inspect social, economic and historical context in which malware occurs.
- Dissect static and dynamic analysis techniques to synthetic and real-life example
- Discover suitable measures based on the context to detect and mitigate popular infection methods

Unit 1   Introduction: 9

The taxonomy of malware and its capabilities: viruses, Trojan horses, rootkits, backdoors, worms, targeted malware; History of malware The social and economic context for malware: crime, anti-malware companies, legal issues, the growing proliferation of malware, static malware analysis, dynamic malware analysis

Unit 2   Static Analysis   9

X86 Architecture- Main Memory, Instructions, Opcodes and Endianness, Operands, Registers, Simple Instructions, The Stack, Conditionals, Branching, Rep Instructions, C Main Method and Offsets. Antivirus Scanning, Fingerprint for Malware, Portable Executable File Format, The PE File Headers and Sections, The Structure of a Virtual Machine, ReverseEngineering- x86 Architecture, recognizing c code constructs in assembly, c++ analysis, Analyzing Windows programs, Anti-static analysis techniquesobfuscation, packing, metamorphism, polymorphism.

Unit 3   Dynamic Analysis   9

Live malware analysis, dead malware analysis, analyzing traces of malware- system-calls, api-calls, registries, network activities. Anti-dynamic analysis techniquesanti-vm, runtime-evasion techniques, , Malware Sandbox, Monitoring with Process Monitor, Packet Sniffing with Wireshark, Kernel vs. User-Mode Debugging, OllyDbg, Breakpoints, Tracing, Exception Handling, Patching

Unit 4   Malware Analysis   9

Downloader, Backdoors, Credential Stealers, Persistence Mechanisms, Privilege Escalation, Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection.

Unit 5   Malware Detection Techniques   9

Malware Detection Techniques: Signature-based techniques: malware signatures, packed malware signature, metamorphic and polymorphic malware signature Non-signature-based techniques: similarity-based techniques, machine-learning methods, invariant inferences. Android Malware -Malware Characterization, Case Studies – Plankton, DroidKungFu, AnserverBot, Smartphone (Apps) Security

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Identify the nature of malware, its capabilities, and how it is combated through detection and classification	AP
2	Examine the tools and methodologies used to perform static and dynamic analysis on unknown executables	AN
3	Discover an intimate understanding of executable formats, Windows internals and API, and analysis techniques.	AN
4	Analyze the techniques and concepts to unpack, extract, decrypt, or bypass new anti-analysis techniques in future malware samples	AN
5	Survey the underlying scientific and logical limitations on society's ability to combat malware?	AN

TEXT BOOKS:

1. Practical malware analysis The Hands-On Guide to Dissecting Malicious Software by Michael Sikorski and Andrew Honig ISBN-10: 159327-290-1, ISBN-13: 978-1-59327-290-6, 2012

REFERENCES:

1. Computer viruses: from theory to applications by Filiol, Eric Springer Science & Business Media, 2006
2. Android Malware by Xuxian Jiang and Yajin Zhou, Springer ISBN 978-1-4614-7393-0, 2005
3. Hacking exposed™ malware & rootkits: malware & rootkits security secrets & Solutions by Michael Davis, Sean Bodmer, Aaron Lemasters, McGraw-Hill, ISBN: 978-0-07-159119-5, 2010
4. Windows Malware Analysis Essentials by Victor Marak, Packt Publishing, 2015

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3	2	2	2	1	1	1	2	3	3
2.	2	2	2	2	2	2	2	2	1	1	2	3	3	3
3.	3		2	2	2	2	2	1				2	3	3
4.	2		3	3	3	2	2	1	1	1	2	3	3	3
5.	2	3	2	2	2	2	2	1	2	1	1	2	3	3

	L	T	P	C

IT22033 **BLOCKCHAIN FOR FINANCE**

L T P C
3 0 0 3

Objectives:

- Understand various layers and components of blockchain
- Analyze implementations of IoT systems with examples, including use cases and deployments.
- Identify challenges in edge computing
- Explore optimization problems in fog and edge computing.
- Examine network security solutions for IoT systems.

Unit 1 Blockchain Foundations 9

Introduction to Blockchain – Centralized Vs. Decentralized Systems – Layers of Blockchain – Need for Blockchain – Blockchain uses and Use Cases - Blockchain foundation – Cryptography – Game Theory – Merkle Trees – Properties of Blockchain solutions – Blockchain Transactions – Distributed Consensus Mechanisms – Blockchain Applications – Scaling Blockchain

Unit 2 Blockchain for Enterprises 9

Blockchain Vs Distributed Databases, Viewing blockchain in an an enterprise, Types of blockchain technology, Blockchain for business – Business benefits of blockchain, Example use cases, Challenges in enterprise adoption, Hyperledger, Corda, Example Enterprise Applications.

Unit 3 Bitcoin and Decentralization 9

Decentralized networks and technology (serverless) - How traditional Electronic Payment Systems work DLT Technical Concepts Continued - Mining - Distributed Consensus - Incentives - Proof of Work - Cryptosystems in practice - Distributed Networks - Attacks - Introduction to Smart Contracts - Altcoins Electricity Use

Unit 4 Ethereum and Smart Contracts 9

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 - Layer 2 and Payment Channel Networks (Lightning)

Unit 5 Decentralized Finance 9

NFTs and ERC-721 Tokens Stablecoins and other ERC-20 Tokens Decentralized Finance (DeFi) - Societal Impacts. - The promise vs. the practice - Energy Usage - Crypto Exchanges - Cybersecurity Considerations - Illicit Content - Money laundering – Governance - DAO - Digital & Fractional Ownership - Central Bank Digital Currency (CBDC) Regulatory Discussions - Emerging Risks

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Relate blockchain to various real-time use cases	AN
2	Illustrate the components and underlying architectures of blockchain	AN
3	Develop business blockchain using ethereum	AP
4	Apply various blockchain concepts to analyze examples, proposals, case studies, and preliminary blockchain system design discussions.	AN
5	Perform and defend blockchain analysis of real world systems and present relevant findings and arguments in a structured, logical and compelling manner	E

TEXT BOOKS:

1. Beginning Blockchain – A Beginner's Guide to Building Blockchain Solutions, Authors :Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda, Apress Publication

2. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Narayanan, Arvind, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Princeton University Press, 2016.

REFERENCES:

1. Blockchain for the Enterprise: The definitive guide to adoption of blockchain in the enterprise, Author &Publisher : Manav Gupta, ISBN-10: 1999387104

2. Imran Bashir, ―Mastering Blockchain‖, Packt Publishing 2017.

3. https://www.heinz.cmu.edu/current-students/courses/95-810/282599/

4. The Truth Machine – The Blockchain and the Future of Everything, Authors: Michael J. Casey and Paul Vigna, St.Martin's Press

5. Mastering Bitcoin – Programming the Open Blockchain, Author: Andreas M. Antonopoulos, O'Reilly Publication

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3	2	2	2	1	1	1	2	3	3
2.	2	2	2	2	2	2	2	2	1	1	2	3	3	3
3.	3		2	2	2	2	2	1				2	3	3
4.	2		3	3	3	2	2	1	1	1	2	3	3	3
5.	2	3	2	2	2	2	2	1	2	1	1	2	3	3

IT22034	**DIGITAL AND MOBILE FORENSICS**	L	T	P	C
		3	0	0	3

Objectives:
- To understand evidence-handling procedures
- To comprehend the general rules of evidence
- To Utilize digital forensic tools in suitable scenarios.
- To acquire practical knowledge of mobile forensic techniques.
- To develop technical skills to conduct Android data extraction

Unit 1   Basics of Digital Forensics   9

The Role of Digital Forensics - the history and purpose, criminal investigations and cybercrime, civil investigations and the nature of e-discovery , The role and challenges of digital forensic practitioners , case studies, Digital Forensics Environment – Nature of digital information, Operating systems , Describing and locating evidence in file systems , password security, encryption, and hidden files , linking the evidence to the user.

Unit 2   Introduction to Digital Evidence   9

Information Technology Act 2000 - Digital evidence – Usage, Characteristics, technical complexities, determining the value and admissibility of digital evidence, Recovering and Preserving Digital Evidence - chain of custody, physical acquisition and safe keeping, Recovery - forensic imaging process, live recovery process.

Unit 3   Forensic Tools   9

Forensic Tools - Standards, Need, forensic imaging tools, Enhanced forensic tools - The Event Analysis tool ,The Cloud Analysis tool ,The Lead Analysis tool, Analyzing e-mail datasets ,Detecting scanned images ,Volume Shadow Copy analysis tools ,Timelines and other analysis tools, Case study : Interrogating large datasets , Selecting and Analyzing Digital Evidence- Structured processes to locate and select digital evidence ,Locating digital evidence, Selecting digital evidence , Case study : recovery of deleted evidence held in volume shadows.

Unit 4   Fundamentals of Mobile Forensics and iOS Data Acquisition   9

Understanding Mobile Forensics - The need for Mobile Forensics , Challenges in Mobile Forensics , The mobile phone evidence extraction process , Practical mobile forensic approaches , Good Forensic practices - iOS Forensics - Data acquisition from iOS devices operating modes of iOS devices, Password protection and potential bypasses, Logical acquisition, Filesystem acquisition.

Unit 5   Android Forensics   9

Architecture of Android   - Android Security - Android File Hierarchy, Android File System - Android Forensic Setup and Pre-Data Extraction Techniques - Android Data Extraction Techniques - Android Data Analysis and Recovery.

TOTAL : 45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Apply the fundamental computer theory in the context of computer forensics practices	AP
2	Appropriately apply the laws and procedures associated with identifying, acquiring, examining and presenting digital evidence	AP
3	Examine the acquired data, recover the deleted data, use appropriate digital forensic tool and manage a case.	AN
4	Apply various methods for evidence extraction and analysis using industry-standard tools.	AP
5	Develop critical thinking skills to assess evidence validity, identify anomalies.	AP

TEXT BOOKS:

1. Richard Boddington, ‖Practical Digital Forensics‖, Packt Publishing, 2016
2. Rohit Tamma, Oleg Skulkin, Heather Mahalik and Satish Bommisetty, ―Practical Mobile Forensics‖, Fourth Edition, April 2020, Packt Publishing Ltd.
3. Bill Nelson, Amelia Phillips, Christopher Steuart, ―Guide to Computer Forensics and Investigations‖,5th Edition. 2016.

REFERENCES:

1. Michael Graves, ―Digital Archaeology: The Art and Science of Digital Forensics‖, Addison-Wesley Professional, 2014.
2. Albert J. Marcella and FredericGuillossou, ―Cyber Forensics: From Data to Digital Evidence,Wiley, 2015.
4. Bill Nelson,Amelia Phillips and Christopher Steuart, ―Guide to Computer Forensics and Investigations,Fourth Edition, Cengage, 2013

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3	3	3	3	3	3	2	3	3	3
2.	3	3	3	3	3	3	3	3	3	3	2	3	3	3
3.	3	3	3	3	3	3	3	3	3	3	2	3	3	3
4.	3	3	3	3	3	3	3	3	3	3	2	3	3	3
5.	3	3	3	3	3	3	3	3	3	3	2	3	3	3

**IT22035   ETHICAL LAWS AND POLICIES ON CYBER   L   T   P   C
                         SECURITY   3   0   0   3**

Objectives:
1. To provide students with an understanding of ethical laws and policies related to cyber security.
2. To develop the ability to analyze and evaluate the ethical implications of cyber security incidents.
3. To cultivate an awareness of the legal and ethical responsibilities of cyber security professionals.
4. To enable students to apply ethical frameworks and policies to real-world cyber security scenarios.

Unit 1   Introduction to Ethical Laws and Policies in Cyber Security   9

Introduction to cyber security and its ethical implications, Overview of the legal and regulatory frameworks governing cyber security, Case studies highlighting ethical dilemmas in the field of cyber security, Privacy Laws and Policies-Exploration of privacy laws and regulations relevant to cyber security, Analysis of ethical issues related to data collection, storage, and disclosure, Discussion on privacy by design principles and privacy-enhancing technologies.

Unit 2   Ethical Hacking and Offensive Security   9

- Understanding ethical hacking and its ethical boundaries, Examining the legal framework surrounding offensive security practices, Ethical hacking tools and methodologies. Ethical Responsibilities of Cyber Security Professionals - Exploration of the ethical responsibilities of cyber security professionals, Understanding professional codes of conduct and ethical guidelines, Examination of the role of ethics in decision-making processes.

Unit 3   Intellectual Property Rights and Digital Piracy   9

- Introduction to intellectual property rights and their significance in cyber security, Discussion on copyright, patents, design and trademarks, Analysis of ethical challenges surrounding digital piracy and unauthorized use of intellectual property.

Unit 4   Cyber Ethics and Social Engineering   9

- Introduction, Discussion on the ethical implications of social engineering attacks, Case studies on social engineering incidents and ethical considerations, Legal and Ethical Response to Cyber Attacks- Understanding the legal and ethical response to cyber attacks, Analysis of incident response frameworks and guidelines, Examination of legal considerations in breach notification and data breach incidents.

Unit 5   Ethical Considerations in Cyber Security Policies   9

- Development, implementation, analysis of ethical cyber security policies in policy-making processes, Techniques for resolving ethical conflicts in cyber security scenarios, Role-playing exercises to practice ethical decision making. Ethical Challenges in Emerging Cyber Technologies, Exploration of ethical challenges in emerging technologies and its analysis, Future trends and challenges in ethical cyber security practices.

TOTAL : 45 PERIODS

OUTCOMES:

CO	Course Outcomes	RBT Level
1	Demonstrate an importance of ethical laws and policies in the field of cyber security.	AP
2	Demonstrate an understanding of the legal and ethical responsibilities of cyber security professionals.	AP
3	Apply ethical frameworks and policies to real-world cyber security scenarios.	AP
4	Analyze and evaluate the ethical implications of cyber security incidents.	AN
5	Defend intellectual property rights and protect the ownership of data	E

TEXT BOOKS:
1. Alfreda Dudley & James Braman & Giovanni Vincenti, Investigating Cyber Law and Cyber Ethics: Issues, Impacts and Practice, 2011.
2. Zeinab Karake Shalhoub & Lubna Al Qasimi , Cyber Law and Cyber Security in Developing and Emerging Economies.

REFERENCES:

1. Amos N. Guiora Cybersecurity: Geopolitics, Law, and Policy, 2017.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	2	3	3	2	3	2	2	2	2	2	2
2.	3	3	2	2	3	3	2	3	2	2	2	2	3	2
3.	3	3	2	3	3	3	2	3	2	2	2	2	2	2
4.	3	2	2	3	3	2	2	3	2	2	2	3	3	2
5.	3	2	2	3	3	2	2	3	2	2	2	3	3	2

IT22036   **SOFTWARE DEFINED NETWORKING**   L   T   P   C
                            TECHNIQUES   3   0   0   3

Objectives:
- Differentiate between traditional networks and software defined networks
- Understand advanced and emerging networking technologies
- Obtain skills to do advanced networking research and programming
- Expand upon the knowledge learned and apply it to solve real world problems

Unit 1   Introducing SDN   9
SDN Origins and Evolution – Introduction –Centralized Control planes, Centralized Data planes , Distributed Control planes, Distributed Data planes - The Genesis of SDN

Unit 2   SDN Abstractions   9
How SDN Works - Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor- Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts

Unit 3   SDN Programming   9
Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications

Unit 4   SDN Data centers   9
Multitenant and Virtualized Multitenant Data Center –SDN Solutions for the Data Center Network – VLANs – Types and Communication within VLAN, EVPN – Features, Components, Life of a packet, Casestudy: VxLAN , NVGRE

Unit 5   Applications   9
Juniper SDN Framework – IETF SDN Framework – Open Day light Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration - SDN in IoT -Addressing Security issues in SDN applications.

                                                      TOTAL : 45 PERIODS

OUTCOMES:

CO	Course Outcomes	RBT Level
1	Interpret the concepts of Software Defined Networks	E
2	Apply various SDN Principles with different Architectures	AP
3	Infer the SDN programming knowledge and tools	AN
4	Apply concepts of Virtualization, Framework solutions on Data Centres	AP
5	Analyse a given scenario and implement Social Defined Networks	AN

TEXT BOOKS:

1. Paul Goransson and Chuck Black, ―Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.

2. Thomas D. Nadeau, Ken Gray, ―SDN: Software Defined Networks, O'Reilly Media, 2013.

REFERENCES:

1. Software Defined Networking with OpenFlow by SiamakAzodolmolky, PacktPublishing, 2013
2. Feamster, Nick, Jennifer Rexford, and Ellen Zegura. "The road to SDN: anintellectual history of programmable networks." ACM SIGCOMM ComputerCommunication Review 44.2 (2014): 87-98.
3. Kreutz, Diego, et al. "Software-defined networking: A comprehensive survey."Proceedings of the IEEE 103.1 (2015): 14-76.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3							2					
2.	2	2	2	2							2			
3.	1	2	2	3					1				1	
4.	3	2		3										
5.		1												

IT22037   EDGE AND MOBILITY NETWORK SECURITY   L T P C
SOLUTIONS   3 0 0 3

Objectives:
- Understand the fundamental concepts of IoT architecture and core IoT modules within a connected ecosystem.
- Analyze implementations of IoT systems with examples, including use cases and deployments.
- Identify challenges in edge computing
- Explore optimization problems in fog and edge computing.
- Examine network security solutions for IoT systems.

Unit 1   IoT and Edge Computing Definition and Use Cases   9

IoT Architecture and Core IoT Modules-A connected ecosystem,IoT versus machine-to-machine versus, SCADA, The value of a network and Metcalfe's and Beckstrom's laws, IoT and edge architecture, Role of an architect, Understanding Implementations with examples-Example use case and deployment, Case study – Telemedicine palliative care, Requirements, Implementation, Use case retrospective.

Unit 2   Challenges in Edge Computing   9

Introduction to Edge Computing - Fog and Edge Computing Completing the Cloud - Advantages of FEC: SCALE - How FEC AchievesThese Advantages: SCANC - Hierarchy of Edge Computing - Opportunities and Challenges - Networking Challenges in a Federated Edge Environment - Management Challenges in a Federated Edge Environment - The Modeling Challenge

Unit 3   Optimization Problems in Fog and Edge Computing   9

Preliminaries - The Case for Optimization in Fog Computing – Metrics - Mobile Edge Computing - Slicing Management and Orchestration - Network Slicing Management in Edge and Fog - Need for Fog and Edge Computing Middleware - State-of-the-Art Middleware Infrastructures

Unit 4   Network Security Solutions   9

Security Management & Cryptology- Security Controls - Authentication, Confidentiality, Integrity; Access Control, Key Management and Protocols, Cipher – Symmetric Key Algorithms, Public Private Key Cryptography; Attacks – Dictionary and Brute Force, Lookup Tables, Reverse Look Tables, Rainbow Tables, Hashing – MDS, SHA256. SHA 512, Ripe MD, WI, Data Mining

Unit 5   Case Studies   9

Case Studies and Discussion: Smart Agriculture, Cities, Grid, Healthcare, Homes, Supply Chain, and Transportation, Application of Security Concepts to Create IoT system, Pharmaceutical applications.

Total:45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Explain IoT architecture and identify core IoT modules.	AN
2	Correlate the concept of edge architecture in IoT systems.	AN
3	Apply optimization concepts to edge computing scenarios.	**AP**
4	Analyze the state-of-the-art middleware infrastructures for fog and edge computing.	**AN**
5	Evaluate different encryption algorithms such as symmetric key and public-private key cryptography.	**E**

TEXT BOOKS:

1. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, Satish Narayana Srirama, wiley publication, 2019, ISBN: 9781119524984

2. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packt Publishing, 2020, ISBN: 9781839214806

3. Practical Internet of Things Security, Brian Russell & Drew Van Duren – 2016

REFERENCES:

1. Security and the IoT ecosystem, KPMG International, 2015

2. Internet of Things: Privacy & Security in a Connected World, Federal Trade Comission, 2015

3. Internet of Things: IoT Governance, Privacy and Security Issues by European Research Cluster

4. David Jensen, ―Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge, MICROSOFT AZURE

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	2	3	3	2	3	2	2	2	2	2	2
2.	3	3	2	2	3	3	2	3	2	2	2	2	3	2
3.	3	3	2	3	3	3	2	3	2	2	2	2	2	2
4.	3	2	2	3	3	2	2	3	2	2	2	3	3	2
5.	3	2	2	3	3	2	2	3	2	2	2	3	3	2

IT22030 **ETHICAL HACKING LABORATORY**   L T P C
                                                0 0 4 2

Objectives: The students will be able to
- Understand the basics of Ethical Hacking
- Learn various Hacking tools

List of Experiments

1. Basic Linux Commands
2. Advanced Linux commands
3. Foot printing
4. Reconnaissance
5. Scanning networks
6. Enumeration and sniffing
7. Malware Threats: Worms, viruses, Trojans
8. Developing and implementing malwares
9. Hacking web servers, web applications
10. Sql injection and Session hijacking
11. Wireless network hacking, cloud computing
12. Penetration testing using Metasploit and Metasploitable
13. VM-WARE
14. Reverse Engineering

Total :60 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Test various Linux commands	AP
2	Apply information gathering techniques through various tools	AP
3	Infer enumeration and sniffing techniques	AN
4	Experiment various hacking techniques	AN
5	Assess reverse engineering and hacking tools	E

EQUIPMENT'S REQUIRED
SOFTWARE:
Java, C, C++ or any Open Source tool
HARDWARE:
Standalone desktops 60 Nos
Pentium P5, 3 GHz or higher
8 GB (or higher) RAM,
100 GB (or higher) HD
Windows 8 or 10 (or higher)

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3	3	2	3	1	2	3	3	3	2
2.	3	3	3	3	3	3	2	3	1	2	3	3	3	2
3.	3	3	3	3	3	3	2	3	1	2	3	3	3	2
4.	3	3	3	3	3	3	2	3	1	2	3	3	3	2
5.	3	3	3	3	3	3	2	3	1	2	3	3	3	2

IT22041   **DATA SCIENCE USING PYTHON**   L   T   P   C
                                                      3   0   0   3

Objectives:
- Understand the basic concepts of data science
- Exhibit proficiency with statistical analysis of data
- Learn the tools and packages in Python for data science
- Acquire knowledge in visualization techniques
- Build data science applications using Python based toolkits.

Unit 1   Introduction   9
Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications

Unit 2   Working with Data   9
Frequency distributions – Outliers –interpreting distributions – graphs – averages - describing variability – interquartile range – variability for qualitative and ranked data Normal distributions – z scores –correlation – scatter plots – regression – regression line – least squares regression line – standard error of estimate – interpretation of r2 – multiple regression equations – regression toward the mean.

Unit 3   Python for Data handling   9
Basics of Numpy arrays – aggregations – computations on arrays – comparisons, masks, boolean logic – fancy indexing – structured arrays. Data manipulation with Pandas – data indexing and selection – operating on data – missing data – hierarchical indexing – combining datasets – aggregation and grouping – pivot tables.

Unit 4   Statistics   9
Populations – samples – random sampling – Sampling distribution- standard error of the mean -Hypothesis testing –decision rule – calculations – decisions – interpretations - one-tailed and two-tailed tests – Estimation – point estimate – confidence interval – level of confidence – effect of sample size.

Unit 5   Python for Data Visualization   9
Visualization with matplotlib – line plots – scatter plots – visualizing errors – density and contour plots – histograms, binnings, and density – three dimensional plotting – geographic data – visualization with seaborn.

                                                      Total:45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Demonstrate the need and technical understanding of the data science concepts	AP
2	Assess the proficiency of data with statistics	E
3	Use Numpy and Pandas to handle data	AP
4	Apply visualization Libraries in Python to interpret data	AP
5	Recommend models to devise solutions to data science tasks using Python	E

TEXT BOOKS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, ―Introducing Data Science‖, Manning Publications, 2016.
2. Robert S. Witte and John S. Witte, ―Statistics‖, Eleventh Edition, Wiley Publications, 2017.
3. Jake VanderPlas, ―Python Data Science Handbook‖, O'Reilly, 2016.
4. Data Science From Scratch: First Principles with Python, Second Edition by Joel Grus, 2019

REFERENCES:

1. Chirag Shah, ―A Hands-On Introduction to Data Science‖, Cambridge University Press, 2020.
2. Vineet Raina, Srinath Krishnamurthy, ―Building an Effective Data Science Practice: A Framework to Bootstrap and Manage a Successful Data Science Practice‖, Apress, 2021.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	2	3	3	2	3	2	-	-	1	1	2	3	3	3
2.	3	3	3	3	2	1	-	-	1	2	2	2	3	3
3.	2	2	3	2	3	1	-	-	2	1	2	3	3	3
4.	2	2	1	2	3	1	-	-	1	2	2	3	3	3
5.	3	3	3	2	3	2	2	2	2	3	3	3	3	3

IT22042   PATTERN RECOGNITION TECHNOLOGIES AND   L   T   P   C
APPLICATIONS   3   0   0   3

Objectives:
- Identify the major techniques in pattern recognition.
- Discover the Concepts and techniques for data classification, feature selection, and dimensionality reduction.
- Develop the artificial neural network-based pattern recognition
- Categorize the various pattern recognition techniques into supervised and unsupervised.
- Examine the applications of pattern recognition using advanced techniques

Unit 1   Introduction to Pattern Recognition   9

Importance and applications of pattern recognition in modern society, Features and feature extraction techniques, Supervised, unsupervised, and semi-supervised learning, Introduction to deep learning for pattern recognition, Bayesian Decision Theory and its applications in classification ,Gaussian Mixture Models and Expectation-Maximization algorithm

Unit 2   Data Transformation and Dimensionality Reduction   9

Principal Component Analysis (PCA) and its applications, on-linear dimensionality reduction techniques: t-Distributed Stochastic Neighbor Embedding (t-SNE), Locally Linear Embedding (LLE), and Isomap,Manifold learning for high-dimensional data visualization, Autoencoders and their role in feature learning and data compression, Deep learning-based dimensionality reduction methods

Unit 3   Estimation of Probability Density Functions: 9

Maximum Likelihood Estimation (MLE) and Maximum a Posteriori Estimation (MAP),Bayesian inference for parameter estimation, Kernel Density Estimation (KDE) and its applications, Mixture models: Gaussian Mixture Models (GMM), Hidden Markov Models (HMM),Naive-Bayes classifiers and their use in text and image classification

Unit 4   Linear and Non-linear Classifiers   9

Linear discriminant analysis (LDA) and support vector machines (SVM),Introduction to neural networks for classification tasks,Convolutional Neural Networks (CNNs) for image classification, Recurrent Neural Networks (RNNs) for sequence classification, Transfer learning and fine-tuning pre-trained models for pattern recognition tasks

Unit 5   Advanced Topics in Pattern Recognition   9

Generative Adversarial Networks (GANs) for data augmentation and synthesis, Attention mechanisms in deep learning models for sequence and image processing, Explainable AI techniques for understanding and interpreting model decisions, Reinforcement learning for adaptive pattern recognition systems, Emerging trends and future directions in pattern recognition research

Total:45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Articulate the fundamental concepts, theories, and applications of pattern recognition in various domains.	AP
2	Apply feature extraction techniques to preprocess and enhance raw data for pattern recognition tasks.	AP
3	Perform dimensionality reduction using linear and non-linear techniques to reduce the complexity of high-dimensional data..	AN
4	Utilize deep learning models, such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), for image and sequence classification.	AN
5	Explore advanced topics in pattern recognition, including Generative Adversarial Networks (GANs) and Explainable AI techniques.	E

TEXT BOOKS:

1. Pattern Recognition and Machine Learning" by Christopher M. Bishop – First Edition, Springer

2. "Pattern Classification" by Richard O. Duda, Peter E. Hart, and David G. Stork –Second Edition‖, Wiley

3. Information Theory, Inference, and Learning Algorithms" by David J.C. MacKay – First Edition, Cambridge Press

4. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurelian Géron – Second Edition,O'Reilley,2019

5. Pattern Recognition and Machine Learning" by Sergios Theodoridis and Konstantinos Koutroumbas – First Edition, Academic Press

6. "Deep Learning for Computer Vision" by Rajalingappaa Shanmugamani – First Edition,Packt Publishing ,2018

REFERENCES:

1. The Elements of Statistical Learning: Trevor Hastie, Springer-Verlag New York, LLC (Paper Back), 2009.

2. Pattern Classification: Richard O. Duda, Peter E. Hart, David G. Stork. John Wiley & Sons, 2012.

3. Pattern Recognition and Image Analysis Earl Gose: Richard Johnsonbaugh, Steve Jost, ePub eBook.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	2	2	2	2	3		2	2		1	3	3
2.	3	3	3	3	3	3	3	2		2	2	2	3	3
3.	3	3	3	3	3	2	3					3	3	3
4.	3	3	3	3	3	3	3	2	2	2	2	3	3	3
5.	2	3	3	3	3	3	3	2	2	2	2	3	3	3

IT22043   **DEEP LEARNING AND ITS APPLICATION**   L   T   P   C
                                                          3   0   0   3

Objectives:
- To learn feed forward deep networks
- To understand convolutional networks and sequence modeling
- To study probabilistic models and auto encoders
- To expose the students to various deep generative models
- To implement the various applications of deep learning

Unit 1   Applied Math and Machine Learning Basics   9
Linear Algebra - Norms, Singular Value Decomposition, The Moore-Penrose Pseudoinverse, Probability and Information Theory, Machine Learning Basics, Pearson Correlation.

Unit 2   Introduction To Deep Networks: Modern Practices   9
Deep Feedforward Networks, Regularization for Deep Learning, Optimization for Training Deep Models - Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates.

Unit 3   Modern Practices   9
Convolutional Networks, Sequence Modeling: Recurrent and Recursive Nets, Practical Methodology, Linear Factor Models, Autoencoders, Representation Learning, Monte Carlo methods, Confronting the Partition Function.

Unit 4   Introduction To Deep Generative Models   9
Approximate Inference, Deep Generative Models - Boltzmann Machines, Restricted Boltzmann Machines, Deep Belief Networks, Deep Boltzmann Machines, Convolutional Boltzmann Machines, Back-Propagation through Random Operations, Directed Generative Nets, Generative Stochastic Networks, Evaluating Generative Models.

Unit 5   Deep Learning Applications   9
Object Recognition and Computer Vision,Natural Language Processing, Deep Reinforcement Learning for Vision-Based Environments in Robotics Applications, Selected Applications in Information Retrieval.

TOTAL :45 PERIODS

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Apply fundamental concepts of linear algebra in machine learning	AP
2	Analyze the core principles that drive deep learning.	AN
3	Evaluate various neural network architectures and their modeling aspects	E
4	Asses deep generative models in terms of functionality, and applicability	AN
5	Evaluate deep learning techniques applied to real-world datasets	E

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, ―Deep Learning‖, MIT Press, 2016.

2. Gopal M, ―Deep Learning Core Concepts, Methods and Applications‖, 1st Edition, Pearson, 2022.

REFERENCES:

1. Li Deng, Dong Yu, ―Deep Learning: Methods and Applications‖, Now publishers, 2014.

2. Special Issue on deep learning for speech and language processing, IEEE Transaction on Audio, Speech and Language Processing, vol. 20, iss. 1, pp. 7 – 54, 2012**.**

COURSE ARTICULATION MATRIX

Cos	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	2	2	1	1	-	-	-	-	3	3	1
2.	3	3	3	2	2	2	2	-	-	-	-	3	3	1
3.	3	3	3	3	2	2	3	-	1	1	1	3	3	1
4.	3	3	3	3	2	2	3	-	1	1	1	3	3	1
5.	3	3	3	3	2	2	3	-	1	1	1	3	3	1

IT22044   **INTELLIGENT DECISION MAKING**   L T P C
                                                              3 0 0 3

Objectives:

- Understand the fundamentals of Decision Making
- Explore Intelligent Technologies
- Apply Decision Support Systems
- Incorporate Uncertainty and Risk
- Domain-Specific decision making applications

Unit 1   Introduction   9

Overview of decision making process - Role of intelligence in decision making- Characteristics of DSS - DSS vs MIS - Categorizing DSS Applications – DSS Framework- Building DSS- Benefits, Limitations, And Risks- Decision Process Model

Unit 2   Decision Analysis and Modeling   9

Decision analysis framework - Decision trees and influence diagrams - Utility theory and risk assessment - Sensitivity analysis and scenario planning - Combining scenario planning with decision making

Unit 3   Data-Driven Decision Making   9

Importance of data in decision making - Data-Driven DSS Subcategories - Data-Driven DSS Architecture – Statistical techniques for decision support - Standard deviation, Hypothesis Testing, Regression

Unit 4   Decision making under uncertainty   9

Uncertainty -Representing Uncertainty with Probability Theory -Representing Uncertainty with Certainty Factors-Handling uncertainty in decision models- Bayesian decision theory-Bayesian Network.

Unit 5   Case study   9

Deploying Decision making Process in real time applications - specification of objectives, decision making process, implementation and analysis, healthcare finance, business, e-commerce, Supply chain.

                                                              Total:45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Interpret the basics of decision making process	AP
2	Apply quantitative modeling and decision analysis techniques	AP
3	Assess the functionalities of decision making process	E
4	Analyze the uncertainty in decision models	AN
5	Evaluate decision making in various scenarios	E

TEXT BOOKS:

1. Paul Goodwin, George Wright ―Decision Analysis for Management Judgment‖, 5th Edition, John Wiley & Sons, 2014.(II unit)
2. Thorsten Heilig, Ilhan Scheer ―Decision Intelligence‖, Wiley, 2023.

REFERENCES:

1. Stuart Russel and Peter Norvig ―AI – A Modern Approach‖, 2nd Edition, Pearson Education, 2007.(IV unit)
2. Power, Daniel J., "Decision Support Systems: Concepts and Resources for Managers" (2002)
3. Vicki L. Sauter, ―Decision Support Systems for Business Intelligence‖, 2nd Edition, Wiley

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	2	2	1	2	-	-	1	2	1	2	3	3
2.	3	3	3	3	2	3	1	1	2	1	1	3	3	3
3.	3	3	3	3	2	3	1	1	1	2	1	3	3	3
4.	3	3	3	3	1	3	2	1	1	1	2	3	3	3
5.	3	3	3	3	3	3	2	2	1	2	2	3	3	3

IT22045   **SOCIAL NETWORK INFORMATION ANALYSIS**   L   T   P   C
                                                       3   0   0   3

Objectives:

- Understand the concepts of Social networks and Web Social Networks
- Appreciate the modelling and visualizing techniques associated withSocial Networks
- Apply mining tools and methods
- Analyze the user opinion social media using Algorithms

Unit 1   Introduction to Social Network Analysis   9

Introduction to Web - Limitations of current Web – Development of Semantic WebEmergenceof the Social Web – Statistical Properties of Social Networks -Network analysis – Developmentof Social Network Analysis - Key concepts and measures in network analysis – Discussionnetworks - Blogs and online communities - Web-based networks.

Unit 2   Modeling and Visualization   9

Visualizing Online Social Networks - A Taxonomy of Visualizations - GraphRepresentation -Centrality- Clustering - Node-Edge Diagrams - Visualizing Social Networks with MatrixBasedRepresentations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregatingsocial network data – 6 degree of freedom – Barabas algorithm- RandomWalks and their Applications -Use of Hadoop and MapReduce

Unit 3   Extraction and Mining Communities in Web Social Networks   9

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining – Text mining in social networks - Keyword search - Classification algorithms.

Unit 4   Evolution in Social networks   9

Evolution in Social Networks – Framework - Tracing Smoothly Evolving Communities – Modelsand Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarityand Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for ExpertLocation in Social Networks – Expert Team Formation - Link Prediction in Social Networks.

Unit 5   Applications   9

Classification of Tweets- A new linguistic approach to assess the opinion of users in Social networks- Explaining scientific and Technical emergence forecasting - Product review mining

Total :45 Periods

OUTCOMES:

CO	Course Outcomes	RBT Level
1	Build a social network data set from existing social networking sites	AP
2	Identify the components of a web social network	AP
3	Apply different algorithms for web social network mining	AP
4	Perform text and opinion mining in social network	AN
5	Design Models and Algorithms for Social Influence Analysis	E

TEXT BOOKS:

1. Charu C. Aggarwal, ―Social Network Data Analytics‖, Springer; 2011

2. Peter Mika, ―Social Networks and the Semantic Web‖, Springer, 1st edition 2007

3. Przemysław Kazienko, Nitesh Chawla, ―Applications of Social Media and Social Network Analysis‖, Springer 2015

4. Stephen P. Borgatti,Martin G. Everett, Jeffrey C. Johnson,―Analyzing Social Networks Using R‖, 1st Edition 2022.

REFERENCES:

1. Borko Furht, ―Handbook of Social Network Technologies and Applications‖,Springer, 1st edition, 2010.

2. GuandongXu ,Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications‖, Springer, 1st edition, 2011.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	2	2	3	1					1		1			
2.	3	2			1						1		2	1
3.	2	1	1	2										
4.	1	1	1		1									
5.						2	2	2					1	1

IT22046   **RECOMMENDATION SYSTEM TECHNIQUES**   L   T   P   C
                                                                   3   0   0   3

Objectives:
- To understand the foundations of the recommender system.
- To learn the significance of machine learning and data mining algorithms forRecommender systems
- To learn about collaborative filtering
- To design and implement a recommender system.

Unit 1   Introduction to Recommender system   9
Recommender system functions, Linear Algebra notation: Matrix addition, Multiplication, transposition, and inverses; covariance matrices, Understanding ratings, Applications of recommendation systems, Issues with recommender system.

Unit 2   Collaborative filtering   9
User-based nearest neighbor recommendation, Item based nearest neighbor recommendation, Model based and pre-processing based approaches, Attacks on collaborative recommender systems

Unit 3   Content-based recommendation   9
High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, Discovering features of documents, Obtaining item features from tags, Representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.

Unit 4   Knowledge based recommendation and Attack-Resistant   9
          Recommender Systems
Knowledge representation and reasoning, Constraint based recommenders, Case based recommenders. Types of Attacks in recommendation system-Detecting attacks on recommender systems - Individual attack - Group attack - Strategies for robust recommender design - Robust recommendation algorithms

Unit 5   Evaluation of Recommendation systems   9
Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design- Design Issues – Accuracy metrics – Limitations of Evaluation measures Case study: Evaluation of Google and Amazon web pages.

                                                                   Total:45 Periods

OUTCOMES:

CO	Course Outcomes	RBT Level
1	Infer the basic techniques and problems in the field of recommender systems	AN
2	Evaluate Types of recommender systems: non-personalized, content based, collaborative filtering	E
3	Apply algorithms and techniques to develop Recommender Systems that are widely used in the Internet industry	AP
4	Analyze the knowledge-based recommendation system and the attacks in it	AN
5	Develop state-of-the-art recommender systems	AP

TEXT BOOKS:

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge UniversityPress(2011), 1st ed.
2. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.

REFERENCES:

1. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook,Springer (2011), 1st edition.
2. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013),1st edition.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3							2					
2.	2	2	2	2	2						2			
3.	1	1	1	1	1				1				1	
4.	3	3		3										
5.		3			2	2	2	2	2	1				

IT22047   **AI FOR SOCIAL GOOD**   L   T   P   C
                                                                       3   0   0   3

Objectives:
- Explore the concepts of machine intelligence
- Demonstrate the Artificial Intelligence Business Model
- Inspect Best Practices in AI for Digital Marketing
- Apply models for robotic surgery and neuroprosthetics
- Analyze models in precision medicine and medical record keeping

Unit 1   Machine Intelligence   9
Artificial Intelligence: Algorithms, Neural Networks— Importance of Data. Super Intelligence: Forms of Intelligence – Paths to Super intelligence – Intelligence Explosion. Use cases of Machine Intelligence

Unit 2   AI in Digital Marketing - Framework And Maturity Model   9
Methods and Technologies – Framework and Maturity Model– AI Framework—The 360° Perspective – AI Maturity Model – Algorithmic Business – Algorithmic Marketing – Algorithmic Market Research – New Business Models Through Algorithmic and AI.

Unit 3   AI Best Practices   9
Reloaded Sales and Marketing – Digital Labor – Artificial Intelligence and Big Data in Customer Service – Customer Engagement with Chatbots and Collaboration Bots – Bot Revolution Change in Content Marketing Alexa – Relaxa.

Unit 4   AI in Healthcare   9
Robotics and artificial intelligence-powered devices: Minimally Invasive Surgery, Neuroprosthetics Machine vision for diagnosis and surgery: Machine vision for diagnosis and surgery, Deep learning and medical image recognition, Augmented reality and virtual reality in the healthcare space.

Unit 5   Applications in Precision Medicine & Assisted Living   9
Precision medicine – drug discovery and development, genetics-based solutions, drug property and activity prediction, drug target interactions , phenotype and clinical/bio-marker discovery, relevance to personalized medicine Ambient assisted living – smart home, wearables, assistive robots, cognitive assistants, natural language processing intelligent medical records management.

                                                           Total:45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Demonstrate the concepts of AI and machine learning.	AP
2	Design of business model in AI	AP
3	Examine the AI best practices in Digital Marketing	AN
4	Apply models for robotic surgery and neuroprosthetics	AP
5	Analyze the models for precision medicine and medical record keeping	AN

TEXT BOOKS:

1. Yves Hilpisch,―Artificial Intelligence in Finance – A Python-Based Guide‖, O'Reilly Media, Inc. First Edition, 2020
2. Peter Gentsch, ―AI in Marketing, Sales and Service - How Marketers without a Data Science Degree can use AI, Big Data and Bots‖ Springer, First Edition, 2019.
3. Adam Bohr, Kaveh Memarzadeh, ―Artificial Intelligence in Healthcare‖, Academic Press, ISBN: 9780128184394, 2020.

REFERENCES:

1. Jim Sterne, ―Artificial Intelligence for Marketing‖ John Wiley & Sons , First Edition, 2017.
2. Michael C. Melvin, ―Artificial Intelligence in Digital Marketing‖ Michael C. Melvin Publishers, First Edition 2020.
3. Maria Johnsen ―The Future of Artificial Intelligence in Digital Marketing: The Next Big Technological Break‖ Create space Independent Pub, First Edition 2017.
4. Artificial Intelligence in Healthcare A Complete Guide – 2021 Edition Published by: Emereo ISBN: 186745629X.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	1	1	2	2	-	1	-	1	-	-	3	3	-
2.	2	3	2	3	3	-	1	-	2	3	2	3	3	-
3.	2	3	2	3	3	-	1	-	2	3	3	3	3	2
4.	3	2	3	3	3	2	1	-	3	3	3	3	3	1
5.	3	2	3	3	2	2	1	-	2	3	3	3	3	1

IT22040   **DATA SCIENCE EXPLORATION LABORATORY**   L   T   P   C
                                                            0   0   4   2

Objectives:

- Understand the Python packages- Numpy, Scipy, Matplotlib, Pandas, seaborn.
- Exposure on data processing using Numpy and Pandas
- Perform data analysis through understanding its distribution.
- Acquire knowledge in plotting using visualization tools.
- Develop a mini project for solving real world problems

List of Experiments

1. Working with Numpy arrays
2. Working with Pandas data frames
3. Data preprocessing
4. Frequency distributions
5. Averages
6. Variability
7. Basic plots using Matplotlib
8. Normal curves
9. Correlation and scatter plots
10. Correlation coefficient
11. Visualization with seaborn
12. Mini project

Total:60 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Use Numpy and Pandas to handle data	AP
2	Demonstrate preprocessing of data using python	AP
3	Discover knowledge of data analysis techniques	AP
4	Interpret data using visualization tools	AP
5	Develop a model for implementing real-world application	AP

TEXT BOOKS:

1. Jake VanderPlas, ―Python Data Science Handbook‖, O'Reilly, 2016.
2. Data Science From Scratch: First Principles with Python, Second Edition by Joel Grus, 2019

REFERENCES:

1. Chirag Shah, ―A Hands-On Introduction to Data Science‖, Cambridge University Press, 2020.

Equipment's Required (List hardware and software needed for 60 no's)

Tools**:** Python, Numpy, Scipy, Matplotlib, Pandas, seaborn

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
1.	2	2	3	2	3	1	-	-	2	1	2	3	3	3
2.	1	3	3	2	3	1	-	-	2	1	1	3	3	3
3.	3	3	3	2	3	2	-	-	1	1	2	3	3	3
4.	2	2	1	2	3	1	-	-	1	2	2	3	3	3
5.	3	3	3	2	3	2	2	2	2	3	3	3	3	3

IT22051   **EMBEDDED AND REAL TIME SYSTEMS**

L   T   P   C
3   0   0   3

Objectives:

The student should be made to:
- Understand the concepts of embedded system design and analysis
- Learn the architecture and programming of ARM processor
- Be exposed to the basic concepts of embedded programming
- Learn the real time operating systems
- Facilitate the understanding of multiple processes and multi rate systems
- Design real-time applications using embedded system concepts

Unit 1   INTRODUCTION TO EMBEDDEDSYSTEM DESIGN   9

Complex systems and microprocessors– Embedded system design process –Design example: Modeltraincontroller-Designmethodologies-Designflows-RequirementAnalysis– Specifications-System analysis and architecture design – Quality Assurance techniques - Designing with computing platforms –consumer electronics architecture – platform-level performance analysis.

Unit 2   PROCESSES AND OPERATING SYSTEMS   9

Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real time operating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems-POSIX-Windows CE. - Distributed embedded systems – MPSoCs and shared memorymultiprocessors. – Design Example - Audio player, Engine control unit – Video accelerator

Unit 3   EMBEDDED PROGRAMMING   9

Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size-Program validation and testing, Embedded C

Unit 4   REAL TIME SYSTEMS   9

Concept of Real time system, Hard vs soft RTS, Structure of a Real Time System — Estimating program run times – Task Assignment and Scheduling –Fault Tolerance Techniques – Reliability, Evaluation, Dependencies.

Unit 5   ARM PROCESSOR AND PERIPHERALS   9

ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features ofthe LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – BlockDiagram of ARM9 and ARM Cortex M3 MCU.

Total:45 Periods

OUTCOMES:

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

CO#	Course Outcomes	RBT Level
1	Interpret the concepts of embedded system design and analysis.	˙E
2	Develop the application programs with the knowledge of ARM Processor Architecture.	AP
3	Analyze the performance and optimization techniques of embedded programming components.	AN
4	Apply the basic concepts of Real Time System for Embedded system design.	AP
5	Evaluate the Real time operating system performance and power optimization strategies for embedded system process.	E

TEXT BOOKS:

1. MarilynWolf,―ComputersasComponents-PrinciplesofEmbeddedComputingSystemDesign,Third Edition ―Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (UNIT I, II, III, V)
2. JaneW.S.Liu,RealTimeSystems,PearsonEducation,ThirdIndianReprint,2003.(UNITIV)

REFERENCES:

1. Lyla B.Das, ―Embedded Systems: An Integrated ApproachPearson Education, 2013.
2. JonathanW.Valvano,―EmbeddedMicrocomputerSystemsRealTimeInterfacing,ThirdEdition Cengage Learning, 2012.
3. David.E.Simon,―AnEmbeddedSoftwarePrimer,1stEdition,FifthImpression,Addison WesleyProfessional, 2007.
4. Raymond J.A. Buhr, Donald L.Bailey, ―An Introduction to Real-Time Systems- From Design toNetworking with C/C++, Prentice Hall, 1999.
5. C.M. Krishna, Kang G. Shin, ―Real-Time Systems, International Editions, Mc Graw Hill 1997
6. K.V.K.K.Prasad,―EmbeddedReal-TimeSystems:Concepts,Design&Programming,DreamTechPress, 2005.
7. Sriram V Iyer, Pankaj Gupta, ―Embedded Real Time Systems Programming, Tata Mc Graw Hill, 2004.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	2	2	2	2					3	3	1	3
2.	1	2	3	2	3	1					2	2	1	3
3.	1	1	2	1	2						3	2	1	3
4.	1	2	2	1	3						2	1	1	3
5.	2	1	1	1	1						2	1	1	2

	L T P C
IT22052 **WEARABLE COMPUTING**	3 0 0 3

Objectives:

The student should be made to:

- To know the hardware requirement of wearable systems
- To understand the communication and security aspects in the wearable devices
- To know the applications of wearable devices in the field of medicine

Unit 1   Introduction To Wearable Systems And Sensors   9

Wearable Systems- Introduction, Need for Wearable Systems, Drawbacks of Conventional Systems for Wearable Monitoring, Applications of Wearable Systems, Types of Wearable Systems, Components of wearable Systems. Sensors for wearable systems-Inertia movement sensors, Respiration activity sensor, Impedance plethysmography, Wearable ground reaction force sensor.

Unit 2   Signal Processing And Energy Harvesting For Wearable Devices   9

Wearability issues -physical shape and placement of sensor, Technical challenges - sensor design, signal acquisition, sampling frequency for reduced energy consumption, Rejection of irrelevant information. Power Requirements- Solar cell, Vibration based, Thermal based, Human body as a heat source for power generation, Hybrid thermoelectric photovoltaic energy harvests, Thermopiles.

Unit 3   Wireless Health Systems   9

Need for wireless monitoring, Definition of Body area network, BAN and Healthcare, Technical Challenges- System security and reliability, BAN Architecture – Introduction, Wireless communication Techniques.

Unit 4   Smart Textile   9

Introduction to smart textile- Passive smart textile, active smart textile. Fabrication Techniques- Conductive Fibres, Treated Conductive Fibres, Conductive Fabrics, Conductive Inks.Case study- smart fabric for monitoring biological parameters - ECG, respiration.

Unit 5   Applications Of Wearable Systems   9

Deploying Wearable Systems in real time application - sensors, signal processing, energy, system integration, communications, and user interfaces. Case study - Medical Diagnostics, Medical Monitoring-Patients with chronic disease, Hospital patients, Elderly patients, neural recording, Gait analysis, Sports Medicine.

Total :45 Periods

OUTCOMES:

On successful completion of this course, the student will be able to

CO#	Course Outcomes	RBT Level
1	Describe the concepts of wearable system.	AP
2	Explain the energy harvestings in wearable device.	AP
3	Use the concepts of BAN in health care.	AP
4	Illustrate the concept of smart textile	AP
5	Compare the various wearable devices in healthcare system	AP

TEXT BOOKS:

1. Annalisa Bonfiglo and Danilo De Rossi, Wearable Monitoring Systems, Springer, 2011.
2. Zhang and Yuan-Ting, Wearable Medical Sensors and Systems,Springer, 2013.
3. Edward Sazonov and Micheal R Neuman, Wearable Sensors: Fundamentals, Implementation and Applications, Elsevier, 2020.
4. Mehmet R. Yuce and JamilY.Khan, Wireless Body Area Networks Technology, Implementation applications,Pan Stanford Publishing Pte.Ltd, Singapore, 2012

REFERENCES:

1. Sandeep K.S, Gupta, Tridib Mukherjee and Krishna Kumar Venkatasubramanian, Body Area Networks Safety, Security, and Sustainability, Cambridge University Press, 2013.
2. Guang-Zhong Yang, Body Sensor Networks, Springer, 2006.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	1									3	3
2.	3	2	2										2	3
3.	3	2	2	2									3	2
4.	3	2	2										2	2
5.	2	2	2										2	2

IT22053	**INDUSTRIAL AND MEDICAL IoT**	L	T	P	C
		3	0	0	3

Objectives:

- To provide students with good depth of knowledge of Designing Industrial IOT Systems for various application.
- Knowledge for the design and analysis of Industry 4.0Systems and Internet of medical things forEngineering students.

Unit 1   Introduction to Industrial IoT (IIoT)   9

The Various Industrial Revolutions, Role of Internet of Things (IoT) & Industrial Internet of Things (IIoT) in Industry, Industry 4.0 revolutions, Support System for Industry 4.0, Smart Factories, IIoT Applications - Healthcare, Power Plants, Quality Control, Plant Safety and Security, Inventory and Facility Management.

Unit 2   Implementation Systems for IIoT   9

Sensors and Actuators for Industrial Processes, Sensor networks, Process automation and Data Acquisitions on IoT Platform, Microcontrollers and Embedded PC roles in IIoT, Wireless Sensor nodes with Bluetooth, WiFi, and LoRa Protocols and IoT Hub systems.

Unit 3   IIoT Data Monitoring & Control: 9

IoT Gate way, IoT Edge Systems and It's Programming, Cloud computing, Real Time Dashboard for Data Monitoring, Data Analytics and Predictive Maintenance with IIoT technology.

Unit 4   Internet of Medical Things Introduction and system architecture   9

Introduction, IoMT Devices-On-Body Devices, In-Home Devices, Community Devices, In-Clinic Devices, In-Hospital Devices, IoMT System Architecture - Data Collection Layer,Data Management Layer, Medical Server Layer.

**Unit 5   Internet of Medical Things Security Threats, Security Challenges and   9
              Potential Solutions**

IoMT Attack Types, Challenges in IoMT Security Schemes, Current Security Plans for IoMT, Potential Solutions for Security Vulnerabilities. Casestudy - Blockchain in IoMT, security issues and solutions for precision health in Internet-of-Medical-Things systems

Total:45 Periods

OUTCOMES:

CO #	Course Outcomes	RBT Level
1	Understand the basics of Industrial IOT and Medical IOT	U
2	Identify the technical and industrial requirement procedures for IIOT applications	AP
3	Develop various applications using IIOT architectures	AP
4	Choose selected IOT devices for understanding the system architecture of medical IOT	AP
5	Analyze privacy and security measures for industry and medical standard solutions	AN

TEXT BOOKS:

1. Veneri, Giacomo, and Antonio Capasso- Hands-on Industrial Internet of Things: Create aPowerful Industrial IoT Infrastructure Using Industry 4.0, 1stEd., Packt Publishing Ltd,2018.
2. D.JudeHemanthandJ.AnithaGeorgeA.Tsihrintzis- InternetofMedicalThingsRemoteHealthcareSystems and Applications, covered byScopus.

REFERENCES:

1. Alasdair Gilchrist-Industry4.0: The Industrial Internet of Things, 1stEd., Apress,2017.
2. Reis,CatarinaI.,andMarisadaSilvaMaximiano,eds.-Internet of Things and advanced application in Healthcare, 1st Ed.,IGIGlobal, 2016.
3. Embedded System: Architecture, Programming and Design by Rajkamal, TMH3.
4. Dr. OvidiuVermesan, Dr. Peter Friess, ―*Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems*‖, River Publishers

e-Resources&otherdigitalmaterial:

1. https://www.coursera.org/specializations/developing-industrial-iot#courses
2. https://www.coursera.org/learn/industrial-internet-of-things.
3. https://www.coursera.org/learn/internet-of-things-sensing-actuation

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	2													
2.	3													
3.	3		3										3	3
4.	3													
5.		3												

	L	T	P	C

IT22054 **CYBER PHYSICAL SYSTEM** L T P C
3 0 0 3

Objectives:

- To study the basic concepts, requirements, principles, and techniques in emerging cyber physical systems.
- To provide students hands-on experience in prototyping a cyber-physical system
- To address real-world problems through Cyber Physical Systems
- The objective of this course is to develop an exposition of the challenges in implementing a cyber-physical system from a computational perspective.
- The course also aims to provide students of different disciplinary background with necessary knowledge to understand the fundamentals of cyber physical systems.

Unit 1   Computational foundation of Cyber Physical Systems   9

Cyber Physical Systems in Real world, Basic Principle of Cyber Physical Systems, Industry 4.0, IIoT, Cyber Physical Systems Design Recommendations, CPS system requirements, Cyber Physical System Application, Case study of Cyber Physical Systems.

Unit 2   Cyber Physical System Platforms   9

CPS HW platforms: Processors, Sensors, Actuators, CPS Network, CPS SW stack RTOS, Scheduling Real Time control tasks, Wireless Technologies for Cyber Physical Systems, Agile, eXtensible, fast I/O Module.

Unit 3   Cyber Physical System – Models and Dynamics Behaviours   9

Continuous Dynamics, Discrete dynamics, Hybrid Systems, Structure of Models, Synchronous Reactive models, Dataflow models of computation, Timed models of computation.

Unit 4   Formal Methods for Safety Assurance of Cyber-Physical Systems   9

Advanced Automata based modelling and analysis: Basic introduction and examples Timed and Hybrid Automata, Definition of trajectories, zenoness, Formal Analysis: Flow pipe construction, reachability analysis, Analysis of CPS Software, Weakest Pre-conditions, Bounded Model checking

Unit 5   Security and Privacy in Cyber Physical Systems   9

Security and Privacy Issues in CPSs, Local Network Security for CPSs, Internet-Wide Secure Communication, Security and Privacy for Cloud-Interconnected CPSs, Case Study: Cybersecurity in Digital Manufacturing/Industry 4.0, Contemporary issues,

Case study: Vehicle ABS hacking, Power Distribution , Attacks on Smart grid.

Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Develop the ability to interact with Cyber Physical System	AN
2	Designing a new system and with which a product can be made	AP
3	Classify the various system architectures and abstraction.	AN
4	Develop the ability to interact with cyber-physical systems protocols	AP
5	Analyze common methods used to secure cyber-physical systems	AN

TEXT BOOKS:

1. Principles of Cyber Physical Systems, Rajeev Alur, MIT Press, 2015 2.

2. E. A. Lee, Sanjit Seshia , "Introduction to Embedded Systems – A Cyber–Physical Systems Approach", Second Edition, MIT Press, 2017, ISBN: 978-0-262-53381-2.

REFERENCES:

1. Guido Dartmann, Houbing song, Anke schmeink, ―Big data analytics for Cyber Physical System‖, Elsevier, 2019

2. Houbing song, Danda B Rawat, Sabina Jeschke, Christian Brecher, ―Cyber Physical Systems Foundations, Principles and Applications‖, Elsevier, 2017 R. Alur, ―Principles of Cyber-Physical Systems,‖ MIT Press, 2015.

3. T. D. Lewis ―Network Science: Theory and Applications‖, Wiley, 2009.

4. P. Tabuada, ―Verification and control of hybrid systems: a symbolic approach‖, Springer-Verlag 2009.

5. C. Cassandras, S. Lafortune, ―Introduction to Discrete Event Systems‖, Springer 2007.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3	2	2	2	1	2	2	2	3	3
2.	3	3	3	3	3	1	2	2	1	2	2	2	3	3
3.	3	3	3	3	3	2	2	2	1	2	2	2	3	3
4.	3	3	3	3	3	1	2	2	1	2	2	2	3	3
5.	3	3	3	3	3	2	2	2	1	2	2	2	3	3

	L	T	P	C

IT22055   **UNMANNED VEHICLE SYSTEM**   L T P C
3 0 0 3

Objectives:
- To provide a general overview of technologies and engineering methods in UVS
- To develop and deploy Unmanned Vehicle Systems.

Unit 1   Introduction   9

Introduction to UVS (Unmanned Vehicle Systems) such as UAS (Unmanned Aircraft Systems), UGS (Unmanned Ground System) and UMS (Unmanned Maritime System), their history, missions, capabilities, types, configurations, subsystems, and the disciplines needed for UVS development and operation.

Unit 2   Mobile platforms and control   9

Introduction- vehicle design, system dynamics, and vehicle structures. **Guidance, Navigation, & Control**: Vehicle guidance and path planning, navigation, vehicle control, and mission planning.Mobile control system - ZALA

Unit 3   Path planning and sensor fusion   9

Classes of sensors on unmanned vehicle systems. Sensors -mobility platform control. Introduction to automated path planning methods. Sensor Fusion- Kalman Filters, UAV patrol path planning, Obstacle Avoidance

Unit 4   Communication and system anatomy   9

Creation and maintenance of communications channels within the UVS. Networks, protocols, security, and architectures. Introduction- systems autonomy-vehicle control architectures.

Unit 5   Human operator interface and Integrative infrastructure   9

Operator's intent to the unmanned vehicle-Methods and Technologies-data displays, mission input, and the man-mission interface. Complex electromechanical systems - computing architectures, common software, and modular hardware.

Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Describe the common types, missions and roles of Unmanned Vehicle Systems	AN
2	Identify and list the common subsystems and technologies deployed in UVS	AN
3	Use programming toolsets to model unmanned systems	AN
4	Discuss the various types of sensors used within UVS and describe suitable sensor fusion methods	AP
5	Describe the common methods used by UVS to perform Guidance, Navigation, & Control functions	AP

TEXT BOOKS:

1.Randall K. Nichols; J. J.C.H. Ryan; Hans C Mumm; Wayne D Lonstein; Candice M Carter; Jeremy Shay; Randall Mai; John P. Hood; and Mark Jackson UNMANNED VEHICLE SYSTEMS & OPERATIONS ON AIR, SEA, LAND

REFERENCES:

1. Dushantha Nalin K Jayakody, P. Muthuchidambaranathan, Rui Dinis, Stefan Panic Integration of Unmanned Aerial Vehicles in Wireless Communication and Networks,2023.

2. Shuo Wang , Yu Wang , Min Tan , Rui Wang , Xiang Dong , Qingping Wei Underwater Biomimetic Vehicle-Manipulator System,2023.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3	2	2	2	1	2	2	2	3	3
2.	3	3	3	3	3	1	2	2	1	2	2	2	3	3
3.	3	3	3	3	3	2	2	2	1	2	2	2	3	3
4.	3	3	3	3	3	1	2	2	1	2	2	2	3	3
5.	3	3	3	3	3	2	2	2	1	2	2	2	3	3

	L	T	P	C

IT22056   **EXTENDED IOT**   L T P C
                                                                  3 0 0 3

Objectives:

- To introduce Internet of Things (IoT) environment and its technologies for designing smart systems
- To learn embedded programming constructs and real time systems
- To understand the Privacy Preservation and Trust Models in Internet of Things
- To study the Internet of Things (IoT) Security protocols and Security frameworkTo be familiar with IoT integration with Cloud.

Unit 1   IoT Ecosystem   9

Challenges and Levels of implementation - Enabling Technologies - Overview of Processing Elements and Peripherals Environment: Board, IDE, shields – Programming: syntax, variables, types, operators, constructs and functions – Sketch: skeleton, compile and upload, accessing pins – debugging: UART communication protocol and serial library

Unit 2   Embedded Programming and RTOS   9

MCU – GPIO – WDT - timers/counters - I/O - A/D - D/A – PWM – Interrupts – Memory - serial communication UART - I2C – SPI - Peripheral Interfacing OS – basics – types – tasks – process - threads (POSIX Threads) - thread preemption - Preemptive Task Scheduling Policies - Priority Inversion - Task communication - Task Synchronization issues - racing and deadlock - binary and counting semaphores (Mutex example) - choosing RTOS

Unit 3   IoT and Cloud   9

IoT with Cloud – Challenges – Cloud Service Provider for IoT Applications – Fog Computing – Cloud Computing Security – Case Studies - Emerging Communication Technologies, Integration of IoT applications in Private cloud

Unit 4   Blockchain Technology in IoT   9

. Technical Aspects - Integrated Platforms for IoT Enablement - Intersections between IoT and Distributed Ledger - Testing at scale of IoT Blockchain Applications - Access Control Framework for Security and Privacy of IoT - Blockchain Applications in Healthcare.

Unit 5   Security Protocols for IoT Access Networks   9

Time Based Secure Key Generation -Security Access Algorithm: Unidirectional, Bidirectional Transmission - Cognitive Security - IoT Security Framework - Secure IoT Layers - Secure Communication Links in IoT - Secure Resource Management, Secure IoT Databases.

                                                            Total:45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Investigate various challenges and explore open source hardware prototyping platforms for designing IoT devices	AN
2	Assess embedded programming constructs and constraints in real time systems for real world socio-economic problems	E
3	Comprehend integration of IoT in Cloud	AN
4	Assess the need for Privacy and security model for the Internet of Thing.	AP
5	Explore various Trust Model for IoT and customize real time data for IoT applications.	AP

TEXT BOOKS:

1. Yamanoor, Sai, and Srihari Yamanoor. Python Programming with Raspberry Pi, 2017, 1st edition, Packt Publishing Ltd,. UK

2. Hu, Fei. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations, 2016, 1st edition, CRC Press, USA.

REFERENCES:

1. Donald Norris, The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, and BeagleBone Black, 2015, 1st edition, McGraw Hill Education, India

2. Marco Schwartz, Home Automation with Arduino, 3rd edition, Open Home Automation 2014. Schwartz, Marco. Internet of things with arduino cookbook, 2016, 1st edition, Packt Publishing Ltd., UK

3. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-on Approach, First Edition, Universities Press, 2015.

4. Russell, Brian and Drew Van Duren. Practical Internet of Things Security, 2016,1st edition, PACKT Publishing Ltd, UK .

Kim, S., Deka, G. C., & Zhang, P. (2019). Role of blockchain technology in IoT applications. Academic Press..

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3	2	2	2	1	2	2	2	3	3
2.	3	3	3	3	3	1	2	2	1	2	2	2	3	3
3.	3	3	3	3	3	2	2	2	1	2	2	2	3	3
4.	3	3	3	3	3	1	2	2	1	2	2	2	3	3
5.	3	3	3	3	3	2	2	2	1	2	2	2	3	3

	L	T	P	C

IT22057   **IOT FOR SMART APPLICATIONS**

L T P C
3 0 0 3

Objectives:
- To analyze and identify the optimal hardware and software components for effective implementation of IoT applications.
- Construct IoT hardware by integrating components such as processors, memory, and peripherals.
- Implement applications across diverse industries like manufacturing and automotive by employing appropriate communication protocols in design and deployment.
- Design and implement a client software on smart devices.
- Effectively manage, analyze, and handle data, including Big Data, within IoT systems

Unit 1   Technology and Applications of IoT   9
Introduction to IoT& Cyber-Physical Systems, IoT Enabling Technologies – Physical End points, Network Services, Cloud. Different Levels of IoT Applications. Design Methodology & Life Cycle. IoT Platforms & End Devices.

Unit 2   IoT Hardware Frameworks   9
Microprocessors & Microcontrollers for IoT- ISA & Micro-architecture, IoT Platforms, ARM architecture- Scalar, Superscalar.Memory, Clocking & Clock gating, Timers, Interrupt, Buses, I/O, Power Consumption and Management. Case Study: Optimize speed vs. power in IoT applications.

Unit 3   Networking and Communication Technologies within IoT   9
Introduction to Networking- Communication & Networking Requirements in IoT, TCP/ IP Stack and Wired & Wireless Networks. Network Models & Architecture- Communication Models, NS2, Ad Hoc.Common Network Standards- 802.11, Bluetooth, 802.15.4. Network Security & Privacy- Issues & Challenges.Case Study- Fitness Tracking System.

Unit 4   IoT Software Development and Programming   9
IoT Software Architectures, Introduction to operating system, Android Client development,Server-side Application Development,Developing Applications on Raspberry Pi,Sensors, Actuators and Signal Processing. Case Study :Transportation and Logistics.

Unit 5   IoT Data Governance and Management   9
Data in IoT, Challenges in managing IoT Data, Process of Data Analytics, Python Basics, Data Acquisition and Preparation, Data Analytics-Exploratory Data Analysis, Predictive Data Analytics. Real-time Analytics-Streaming data, Processing streaming data. Data visualization, Big data analytics-Offline analysis, Real-time stream analysis.
Case Study :Smart Environments - Industrial application, Home automation.

Total:45 Periods

OUTCOMES:

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

CO#	Course Outcomes	RBT Level
1	Illustrate the building blocks of IoT technology and explore the vast spectrum of IoT applications.	AN
2	Use processors & peripherals to design & build IoT hardware Adopting incremental development approach using Agile processes	AP
3	Assess, select and customize technologies for IoT applications to Connect the cyber world with the physical world of humans, automobiles and factories	AP
4	Integrate geographically distributed devices with diverse capabilities	AN
5	Design and implement IoT applications that manage big data	AN

TEXT BOOKS:
1. Internet of Things, Jeeva Jose, (ISBN: 978-93-86173-591), Khanna Publishing House
2. Internet of Things, Arsheep Bahga and Vijay Madisetti

REFERENCES:
1. Bahga, Internet of Things, University Press
2. Raj Kamal, Internet of Things, TMH
3. ―Industry 4.0: The Industrial Internet of Things‖, by Alasdair Gilchrist (Apress)2. 2016, ISBN13 (pbk): 978-1-4842-2046-7

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	2	1	-	1	1	--	-	-	1	1	1	1
2.	2	3	2	2	1	-	-	-	1	-	2	1	-	1
3.	2	2	2	1	-	1	-	-	-	1	2	1	-	1
4.	2	2	2	1	-	-	-	-	1	1	1	1	1	1
5.	2	2	2	1	1	-	1	-	1	1	1	2	-	2

IT22050	OPEN SOURCE PROGRAMMING FOR IOT LABORATORY	L	T	P	C
		0	0	4	2

Objectives:
- To build a simple IoT application and to perform the predictive analysis on gathered data.
- Develop, prototype, and analyze fully functional IoT systems.
- Integrate various sensors with Arduino or Raspberry Pi boards.
- Demonstrate proficiency in wireless data transmission between IoT devices.
- Upload and download sensor data to/from cloud platforms and servers.
- Examine and execute SQL queries from MySQL databases.

List of Experiments
1. Study the fundamental of IOT softwares and components. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when _1'/'0′ is received from smartphone using Bluetooth.
9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
11. To install MySQL database on Raspberry Pi and perform basic SQL queries.
12. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.
13. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.

Total:60 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Utilize the acquired knowledge and skills to develop, prototype, program, and analyze data in a fully functional IoT system.	AP
2	Execute the integration of different sensors with Arduino or Raspberry Pi	AP
3	Showcase proficiency in wireless data transmission between diverse devices.	AP
4	Demonstrate the capability to upload and download sensor data to and from both cloud platforms and servers.	AP
5	Examine various SQL queries from MySQL database.	AP

TEXT BOOKS:

1. Vijay Madisetti, ArshdeepBahga, Internet of Things, _A Hands on Approach', University Press.

2. Dr. SRN Reddy, RachitThukral and Manasi Mishra, _Introduction to Internet of Things: A practical Approach', ETI Labs.

3. Pethuru Raj and Anupama C. Raman, _The Internet of Things: Enabling Technologies, Platforms, and Use Cases', CRC Press

REFERENCES:

1. Jeeva Jose, _Internet of Things', Khanna Publishing House, Delhi

2. Adrian McEwen, _Designing the Internet of Things', Wiley

3. Raj Kamal, _Internet of Things: Architecture and Design', McGraw Hill

Equipment's Required

(List hardware and software needed for 60 no's)

1. IOT Pro Kit   20
2. Arduino UNO Board R3 (SMD) with cable 20
3. GSM/GPRS Shield Modem – SIM800 10
4. Arduino Ethernet Shield 10
5. ArduinoWiFi Shield 20
6. Arduino 37 in 1 Sensor pack 10
7. Relay Board 20
8. Power Supply Adapter for ESP – 5V/1A 20
9. Raspberry Pi 3 module with Cable 30
10. HDMI Cable 30
11. USB Keyboard & USB Mouse 30
12. Interface Board 20
13. Desktop 30 with windows 10 & above version.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	-	-	-	3	-	-	-	-	-	-	3	3	2
2.	3	3	3	3	3	2	-	-	3	3	1	3	3	2
3.	3	3	3	3	3	2	-	-	3	3	1	3	3	2
4.	3	3	3	3	3	2	-	-	3	3	1	3	3	2
5.	3	3	3	3	3	2	-	-	3	3	1	3	3	2

IT22061   **GRAPHICS AND MULTIMEDIA**   **L   T   P   C**

                                                          3   0   0   3

Objectives:
- To explore the fundamental concepts in 2D and 3D computer graphic models.
- To understand 2D raster graphics techniques, 3D modeling, geometric transformations, 3D viewing and rendering.
- To learn about multimedia building blocks of text, images, sound, animation, and video.
- To develop an understanding of the process of developing multimedia.

Unit 1   Introduction to Graphics systems   9

Introduction - Overview of graphics systems – Raster scan, Random scans - Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms.

Unit 2   Two Dimensional Transformation And Viewing   9

2D geometric transformations – Matrix representations and Homogeneous Coordinates, Composite transformations; 2D viewing – Viewing pipeline, Viewing coordinate reference frame; Window-to-Viewport coordinate transformation, Clipping operations- Point, Line, Polygon, Curve and Text clipping.

Unit 3   Three Dimensional Transformation And Viewing   9

3D concepts; 3D object representations – Polygon surfaces- Polygon tables- Plane equations – Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects. 3D geometric and modeling transformations - 3D viewing – viewing pipeline, viewing coordinates, Projections - Visible surface detection methods - Color Models.

Unit 4   Multimedia Basics   9

Types of Multimedia – Multimedia Data Streams – Applications of Multimedia – Multimedia Authoring – Digital Audio: Audio Sampling – audio compression - audio standards and file formats – Digital Video: compression – video standards and file formats.

Unit 5   Multimedia Development   9

Software Life cycle, Addie Model, Conceptualization, Content collection and processing, flow line, script, storyboard, implementation, Authoring metaphors, Testing and feedback, final delivery, Case Study: study of CBT on sound in multimedia.

                                                          Total:45 Periods

OUTCOMES:

CO	Course Outcomes	RBT Level
1	Apply output primitive algorithms to design 2D objects.	**AP**
2	Effectively and creatively solve 2D graphic design problems	AṔ
3	Effectively and creatively solve 3D graphic design problems	AP
4	Apply different compression techniques to compress audio and Video.	**AP**
5	Analyze the techniques and technologies used in the development of multimedia solutions.	**AN**

TEXT BOOKS:
1. Donald Hearn, M.Pauline Baker, ―Computer Graphics, PHI, 2014.
2. Malay k Pakhira, ―Computer graphics, Multimedia and Animation‖, Prentice Hall India, 2 nd Edition, 2010.

REFERENCES:
1. Prabhat K Andleigh, Kiran Thakrar, ―Multimedia systems design, First Edition, PHI, 2015.
2. F .S. Hill, ―Computer Graphics using OPENGL, Second edition, Pearson Education 2014.
3. John F. Hughes , Andries van Dam, Morgan McGuire , David F. Sklar, James D. Foley , Steven K. Feiner , Kurt Akeley , ―Computer Graphics: Principles and Practice, 3rd Edition, Addison Welsey Professional, 2013.
4. Ze-Nian Li and Mark S.Drew, ―Fundamentals of Multimedia, Third Edition, Pearson Education, 2021.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
1	3	3	3	3	2	1		1		1	2		3	3
2	3	3	3	1	2			1			2		3	3
3	3	3	3	1	2			1			2		3	3
4	2	2	3		2		2	3		3	3		2	3
5	3	2	3		3		3	3		3	3		2	3

		L	**T**	**P**	**C**

IT22062   **MACHINE VISION**   **L T P C**
                                                            3 0 0 3

Objectives:
1. Identify the need and significance of Machine Vision
2. Explore basics of image processing
3. Identify the components of Machine Vision System
4 .Develop application using machine Vision
5. Analyze the machine vision algorithms and software

Unit 1   Introduction to Machine Vision   9
Overview of machine vision systems and their applications, Human and machine vision systems: a comparison, Image acquisition techniques and hardware components, Basics of image processing and analysis

Unit 2   Image Processing Techniques   9
Image enhancement: spatial domain and frequency domain methods, Image segmentation: thresholding, region-based methods, and edge detection, Morphological operations: erosion, dilation, opening, and closing, Feature extraction and representation in images

Unit 3   Machine Vision Hardware   9
Image sensors: types, characteristics, and selection criteria, Cameras and optics: types, parameters, and calibration, Illumination techniques: types of lighting, illumination sources, and control methods, Machine vision systems: components, interfaces, and integration with industrial setups

Unit 4   Machine Vision Algorithms and Software   9
Introduction to machine vision algorithms: pattern recognition, object detection, and classification, Feature-based matching techniques: template matching, corner detection, and scale-invariant feature transform (SIFT),Machine learning algorithms for machine vision tasks: supervised and unsupervised learning methods, Overview of machine vision software libraries and platforms

Unit 5   Applications of Machine Vision   9
Quality inspection and defect detection in manufacturing processes, Object tracking and recognition in surveillance and security systems, Automated visual inspection in robotics and automation, Medical imaging applications: diagnosis, analysis, and treatment, Emerging trends and future directions in machine vision technology

                                                        Total:45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Identify the principles and concepts of machine vision technology.	AP
2	Develop Applications using image Processing Techniques	AP
3	Familiarize with machine vision hardware components and their functions.	AP
4	Develop proficiency in implementing machine vision algorithms for various applications.	AN
5	Explore real-world applications of machine vision in industry and research.	E

TEXT BOOK

1. "Machine Vision Algorithms and Applications" by Carsten Steger, Markus Ulrich, and Christian Wiedemann,Year: 2018 (Second Edition),Publisher: Wiley-VCH

2. Machine Vision in Quality Control‖, Taylor & Francis Inc, Imprint CRC Press Inc, Dec 2019

3. Digital Image Processing" by Rafael C. Gonzalez and Richard E. Woods, 2017 (Fourth Edition),Pearson.

REFERENCES:

1. "Image Processing and Machine Vision: Fundamentals and Applications" by Milan Sonka, Vaclav Hlavac, and Roger Boyle,Year: 2014 (Fourth Edition),Publisher: Cengage Learning

2. "Introduction to Machine Vision" by Mubarak Shah, Year: 2018,Publisher: CRC Press

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	3	1	3	3	3	2	1		2	3	3	3
2.	3	3	2	3	2	3	3	2	2	1	3	3	3	3
3.	3	2	2	2	3	3	3	2		2	2	3	3	3
4.	3	2	2	2	3	3	3	2	2	2	2	3	3	3
5.	3	2	2	2	3	3	3	2	3	2	3	3	3	3

	L	**T**	**P**	**C**

IT22063   **DIGITAL IMAGE PROCESSING**

L T P C
3 0 0 3

Objectives:

- To get exposed to different image enhancement techniques
- To learn about image transformation and color image analysis
- To learn about image classification
- To study various applications of image processing

Unit 1   INTRODUCTION   9

Introduction-Origins, Examples of Fields, fundamental steps, Components, Fundamentals-Elements of Visual Perception, Image Sensing & Acquisition, Sampling and Quantization, Relationship between Pixels, Mathematical Tools – Spatial , Vector and Matrix operations.

Unit 2   IMAGE ENHANCEMENT   9

Histogram Processing, Fundamentals of Spatial Filtering- Smoothing, Sharpening, Frequency domain Smoothing and Sharpening, Filters – Homo-morphic Filtering, Noise Models, Inverse filtering, Wiener filtering, Geometric Mean Filter.

Unit 3   IMAGE TRANSFORMATION   9

Transforms: Matrix-based - correlation, Fourier related, Walsh- Hadamard, Slant, Haar, Wavelet, Color: Models, Transformations, Image smoothing and sharpening, Noise in color images.

Unit 4   MIDDLE &HIGH LEVEL IMAGE PROCESSING   9

Basic Morphological algorithms: Hole filling, Convex hull, Pruning, Edge Detection-Basic, Thresholding-Foundation and Segmentation - Region Growing and Region Splitting & Merging, Active contours- image segmentation using Snakes, Feature Extraction-Preprocessing, Feature descriptors - Boundary, Region and Principal components, Pattern classification: Statistical classifiers –Bayes classifier, Neural Networks and Deep learning: Multilayer Feedforward Neural Networks , Deep Convolutional Neural Networks.

Unit 5   APPLICATIONS   9

Face Recognition, Finger Print Recognition, Gait Recognition, Location of Dark Contaminants in Cereals, Recent Developments in In-Vehicle Vision Systems.

Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Enumerate general terminology of digital image processing.	AN
2	Experiment various image processing operation.	AP
3	Interpret image segmentation and representation techniques.	AN
4	Implement different feature extraction techniques for image analysis and recognition.	AN
5	Develop real time image processing applications.	AP

TEXT BOOKS:

1. Rafael C.Gonzalez and Richard E.Woods, ―Digital Image Processing, Fourth Edition, Pearson Education, 2017.

2. E. R. Davies, ―Computer & Machine Vision‖, Fourth Edition, Academic Press, 2012.

REFERENCES:

1. S.Sridhar, ―Digital Image Processing‖, Oxford University Press, 2011.
2. Anil K.Jain, ―Fundamentals of Digital Image Processing‖, Prentice Hall of India, 2011.

COURSE ARTICULATION MATRIX

Cos	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	1	1	1	1	1	-	-	-	-	2	3	1
2.	3	3	2	2	2	1	1	-	1	-	1	3	3	1
3.	3	3	2	2	2	1	1	-	1	-	1	3	3	1
4.	3	3	2	2	2	1	1	-	1	-	1	3	3	1
5.	3	3	2	2	2	1	1	-	1	-	1	3	3	1

	L	**T**	**P**	**C**
IT22064 **GAME DESIGN**	**3**	**0**	**0**	**3**

Objectives:

- Provide a foundation of game theory to help students apply game theory to problem solving in a rigorous way.
- Gain proficiency in identifying and interpreting Nash equilibria, which are key solutions in game theory where no player has an incentive to unilaterally change their strategy.
- Develop the ability to think strategically, considering the potential actions and reactions of others, and apply game theory concepts to real-world decision-making scenarios, including business strategy, negotiations, and public policy.

Unit 1   Introduction   9

Elements of Game theory, examples, Strategic Games, 2 Player Strategy Games, payoffs, Minimax, Weak and Strong Domination, Saddle Points, Nash Equilibrium, Prisoner's Dilemma, Stag Hunt, Matching pennies, BOS, Multi NE, Cooperative and Competitive Games, Strict and Non Strict NE, Best response functions for NE.

Unit 2   Noncooperative Game Theory   9

Strategic form games, dominant strategyequilibria, pure strategy nashequilibrium, mixed strategy Nash equilibrium, existence of Nash equilibrium, computation of Nash equilibrium, matrix games, minimax theorem, extensive form games, subgame perfect equilibrium, games with incomplete information, Bayesian games

Unit 3   Variants and Extensions   9

Combinatorial games, Winning and losing positions, Subtraction Game, 3-Pile and K-Pile Games, Proof of Correctness, Variations of K-Pile Games, Graph Games, Construction, Proof of finiteness, SG theorem for sum of games.

Unit 4   Games with Perfect Information   9

Cournot's Oligopoly, Bertrand's Oligopoly, Electoral Competition, Median Voter Theorem, Auctions, role of knowledge, Decision making and Utility Theory, Mixed Strategy Equilibrium, Extensive Games with Perfect Information, Stackelberg's model of Duopoly, Buying Votes, Committee Decision making, Repeated Games, Prisoner's Dilemma, Supermodular Game and Potential games

Unit 5   Cooperative Game Theory   9

Correlated equilibrium, two person bargaining problem, Steak Pricing Game coalitional games, The core, The Shapley value, Convex cooperative games, other solution concepts in cooperative game theory, Corporate strategic decisions through cooperative game theory.

Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Interpret the basics of strategic gaming and extensive games.	E
2	Analyze gaming strategies on real-time incidence.	AP
3	Designing models of gaming on real-time incidence.	AP
4	Apply game theory in Economics, Political Science and Corporate world.	AN

TEXT BOOKS:

- An Introduction to Game Theory, Martin Osborne, Oxford University Press, First Indian Edition, 2009, 7th impression, ISBN – 0195128958.

- Jennifer Firkins Nordstrom,‖ Introduction to Game Theory:a Discovery Approach‖, First Edition, Ennifer Firkins Nordstrom publications, 2020

REFERENCES:

- Thomas Ferguson, Game Theory, World Scientific, 2018.
- An Introduction to Game Theory, Joel Watson; Strategy, 2nd Edition, 2007, W.W. Norton &Company, ISBN – 9780393929348.
- Analysis of Conflict Game Theory, Roger B. Myerson, Re-print Edition, 2008, Harvard University Press, ISBN – 978-0674341166

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.		1	1	1		1		1				2	1	
2.	2	1	2		1						2	2	1	
3.		2	1	2								2		2
4.	1	2	2	1	1	2	2		2	2		2		2

	AUGUMENTED AND VIRTUAL REALITY :	L	T	P	C
CS22068	**THEORY AND PRACTICES**	2	0	2	3
	(Common to CS & IT)				

Objectives:
- To gain the knowledge of historical and modern overviews and perspectives on virtual reality
- To learn the fundamentals of sensation, perception, and perceptual training.
- To have the scientific, technical, and engineering aspects of augmented and virtual reality systems.
- To learn the Evaluation of virtual reality from the lens of design.
- To learn the technology of augmented reality and implement it to have practical knowledge.

Unit 1   Introduction   9
Introduction : Introduction to Augmented-Virtual and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR ,VR and MR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for AR.

Unit 2   VR systems   9
Basic features of VR systems, Architecture of VR systems, VR hardware : VR input hardware: tracking systems, motion capture systems, data gloves, VR output hardware: visual displays. Page Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection.

Unit 3   Stereoscopic Vision & Haptic rendering   9
Fundamentals of the human visual system, Depth cues, Stereopsis, Retinal disparity, Haptic sense, Haptic devices, Algorithms for haptic rendering and parallax, Synthesis of stereo pairs, Pipeline for stereo images.

Unit 4   VR /AR software development   9
Master/slave and Client/server architectures, Cluster rendering, Game Engines and available sdk to develop VR applications for different hardware (HTC VIVE, Oculus, Google VR). AR software, Camera parameters and camera calibration, Marker-based augmented reality, AR Toolkit.

Unit 5   3D interaction techniques & Applications of VR   9
3D interaction techniques: 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation. Application of VR in Digital Entertainment: VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games.

Total(L:30+P:30):60 Periods

OUTCOMES:

CO	Course Outcomes	RBT Level
1	Examine, and develop software that reflects fundamental techniques for the design and deployment of VR and AR experiences.	E
2	Examine how VR and AR systems work.	AP
3	Developand defend the use of particular designs for AR and VR experiences.	C
4	Evaluate the benefits and drawbacks of specific AR and VR techniques on the human body.	E
5	Examine state-of-the-art AR and VR design problems and solutions from the industry and academia	AN

TEXT BOOKS:

1. George Mather, Foundations of Sensation and Perception: Psychology Press; 2 edition
2. The VR Book: Human-Centered Design for Virtual Reality, by Jason Jerald .

REFERENCES:

1. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.
2. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3		3					2	2				3	
2.	3							3	2				3	
3.	2		3					3	2				3	
4.								2					3	
5.	3		3			3		3	2				3	

		L	T	P	C
IT22066	**3D GAME MODELLING AND RENDERING**	3	0	0	3

Objectives:

- Understand the 3D Modelling
- Learn about 3D computer graphics program.
- Understand 3D modeling in simple objects with lines and connect with compound objects.
- Learn different types of lighting, camera and rendering.
- Utilize 3D surface and 3D solid modeling tools to create and edit more complex designs.

Unit 1 Introduction To 3D Modelling 9

3D Projections, Modelling of Objects, Concept of 3D Modeling, User Interface – Components and Features, Polygon Primitives- torus-plane –pyramid-sphere , Modeling techniques- Polygonal modeling- spline Modeling –subdivision surface modeling -Tools- Blender- Zbrush -Autodesk 3ds Max Deformers, Inorganic Modeling, Organic Modeling - Characteristics.

Unit 2 The MAYA User Interface 9

The Maya interface Creating, manipulating, and viewing objects Creating a new scene, Primitive objects, and Transformation tools. Viewing the Maya 3D scene - Workflow overview, viewing objects in shaded mode, Grouping objects, Hyper graph Selection modes and masks, Pivot points Components and attributes Template display Components, Attribute Editor Surface materials.

Unit 3 NURBS Modeling 9

Revolving a curve to create a surface Creating a profile curve, Creating a revolve surface Editing a revolve surface Sculpting a NURBS surface Preparing a surface for sculpting, Basic sculpting techniques, Additional sculpting techniques. Sculpting a nose, Sculpting eye sockets, Sculpting eyebrows, Sculpting a mouth Sculpting other facial features, Dynamic Vs Static Sculpting.

Unit 4 3D STUDIO MAX 9

Exploring the Max Interface, Creating & Editing Standard Primitive Objects, Creating & Editing Extended Primitive Objects, Working with Files, Importing & Exporting, Understanding 2D Splines & Shape, Convert 2D to 3D object using extrude, bevel, loft, terrain. Using Morph, Scatter, conform, connect compound objects, Using Boolean, Pro boolean & Procutter

Unit 5 Lighting And Rendering 9

Lighting & Camera Configuring & Aiming Cameras, Using Camera Motion Blur & Depth of Field, Using Basic lights, Using Light tracing, radiosity, Video Post, Mental Ray Lighting. Rendering with V-Ray - Introduction to Scene, Preparing the Scene, Basic Settings for Texturing, Create & Assign Textures, Light Setup, V-Ray Rendering Settings, Fine-Tuning.

Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Examine the different types of modeling.	AN
2	Apply 3 D Modeling Techniques	AP
3	Apply different types of lighting effects in real word scene.	AP
4	Design a real-world application using rendering concepts.	AP
5	Design 3D modeling with 3d objects and scene.	AP

TEXT BOOKS:

1.Mortenson, Michael E, 3D Modeling, Animation, and Rendering: An Illustrated LexiconBlack and White Edition, 2010.

2.Boris Kulagin, ―3ds Max 8 from Modeling to Animation, BPB,2006.

REFERENCES

1.King R., 3D Animation for the Raw Beginner Using Autodesk Maya 2e, CRC Press; 2019.

2. Ami Chopine, 3D Art essentials, Taylor & Francis 2012.

3. Sergio Paez& Anson Jew, Professional Storyboarding, Focal Press 2013.

COURSE ARTICULATION MATRIX

COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	1	2		2	2								1	
2.	1	2		2	2								1	
3.	1	2		2	2								1	
4.	1	2		2	2								1	
5.	1	2		2	2								1	

IT22067   **HUMAN COMPUTER INTERFACE DESIGN**

L	T	P	C
3	0	0	3

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

Unit 1   FOUNDATIONS OF HCI   9
The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

Unit 2   DESIGN & SOFTWARE PROCESS   9
Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

Unit 3   MODELS AND THEORIES   9
HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Task Analysis, Dialog notation and Design, Models of the system, Modelling Rich Interaction, Multimedia and WWW.

Unit 4   MOBILE HCI   9
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies

Unit 5   WEB INTERFACE DESIGN   9
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies - Online store, Branding, Learning Management System, Voice User Interface

                                                        Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Illustrate the concepts of interaction framework models and its paradigms.	AN
2	Illustratethe effective HCI based software process and design guidelines.	AN
3	Demonstrate the HCI models and its principles for operative HCI.	AP
4	Evaluate the competent and effective HCI for mobile based system	AN
5	Analyze the web Interfaces using appropriate tools and techniques	AN

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, —Human Computer Interaction‖, Third Edition, Pearson Education, 2009.
2. Brian Fling, —Mobile Design and Development‖, First Edition, O_Reilly Media Inc., 2009 .

3. Bill Scott and Theresa Neil, —Designing Web Interfaces‖, First Edition, O_Reilly, 2009.

REFERENCES:

1. Andrew Sears, Julie A. Jacko —The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications‖, SecondEdition, CRC Press, 2010.
2. Martin Helander,T.K. Landauer, P. Prabhu, —Handbook of Human-Computer Interaction‖, Second Edition, Elsevier Science Ltd.

COURSE ARTICULATION MATRIX

Cos	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	1	2	2	2	-	-	-	-	3	3	1
2.	3	3	3	2	2	2	2	-	1	-	-	3	3	1
3.	3	3	3	2	2	2	2	-	1	-	1	3	3	1
4.	3	3	3	2	2	2	2	-	1	-	1	3	3	1
5.	3	3	3	2	2	2	2	-	1	-	1	3	3	1

IT22060	MULTIMEDIA TOOLS LABORATORY	L	T	P	C
		0	0	4	2

Objectives:

- To acquire the basics of multimedia hardware system and software tools.
- To explore the various multimedia editing tools like Photoshop, GIMP, Audacity, Garageband, iMovie, Adobe Premiere Pro, DaVinci Resolve, Final Cut Pro, Adobe Dreamweaver etc.
- To explore various animation and game development tools like Adobe animate, Blender, Autodesk Maya, Cinema 4D, UNITY etc.

List of Experiments

1. Study the multimedia hardware system.

2. Study the multimedia basic software tools.

3. Image editing using Adobe Photoshop/ GIMP (GNU Image Manipulation Program)/Affinity Photo.

    a. Basic Image Manipulation - Resize, Crop, Rotate

    b. Apply Image filters - Blur, Sharpen, Grayscale etc.

    c. Add Text overlays and annotations

    d. Combine multiple images to create a collage.

4. Video Editing using Adobe Premiere Pro/ DaVinci Resolve/ Final Cut Pro.

    a. Trim and split video clips.

    b. Add transitions between video segments.

    c. Incorporate audio tracks.

    d. Apply video effects (color correction, slow motion).

5. Audio Editing using Adobe audition / Audacity/ Garageband.

    a. Record and edit voiceovers.

    b. Mix multiple audio tracks.

    c. Apply audio effects (equalization, reverb).

    d. Remove background noise.

6. Design a brochure using any multimedia tools.

7. Create a 2D animation to indicate a ball bouncing on steps using Adobe Animate.

8. Create a 2D animated cartoon scene using any multimedia tool.

9. Create 3D objects and scenes using Blender / Autodesk Maya / 3D MAX/ Cinema 4D.

10. Design a basic webpage using Adobe Dreamweaver / Sublime Text etc.

11. Develop a simple 2D game using UNITY software tool.

12. Mini Project.

Total: 60 PERIODS

OUTCOMES:

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

CO#	Course Outcomes	RBT Level
1	Apply fundamental multimedia concepts in practical scenarios.	AP
2	Demonstrate proficiency in using multimedia software tools for editing, creation, and manipulation of various media elements.	AP
3	Enhance problem-solving abilities by troubleshooting issues and errors encountered while working with multimedia tools.	AP
4	Create 2D and 3D animations.	C
5	Design and implement multimedia projects that integrate different media elements effectively.	C

TEXT BOOKS:

1. Ranjan Parekh, ―Principles of Multimedia, Second Edition, Mcgraw Hill, 2012.
2. Prabhat K Andleigh, Kiran Thakrar, ―Multimedia systems design‖, First Edition, PHI, 2015

REFERENCES:

https://helpx.adobe.com/animate/view-all-tutorials.html
https://unity.com/learn/get-started

Equipment's Required
Hardware:
Standalone desktops 60 Nos. (or) Server supporting 60 terminals or more.
Software tools:
Adobe photoshop, Audacity, Adobe Premiere Pro, Adobe Dreamweaver, Adobe animate, Blender, Unity.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	3		2		2			3				1	3	3
2	3		2		3			3					3	3
3	3	3	3		3	2		3			3	2	3	3
4	3		2		3			3					3	3
5	3	3	3	2	3	2	3	3			3	2	3	3

	L	T	P	C
IT22071 **FREE AND OPEN SOURCE SOFTWARE**	3	0	0	3

Objectives:

- To explore in-depth knowledge on the principles, practices, and implications of free and open source software (FOSS).
- To learn about open source philosophy, licensing, development methodologies, and collaborative practices.
- To be exposed to the context and operation of free and open source software (FOSS) communities and associated software projects.
- To be familiar with participating in a FOSS project.

Unit 1   INTRODUCTION   9

Open Source Licensing, Contract, and Copyright Law - Basic Principles of Copyright Law - Contract and Copyright - Open Source Software Licensing -Issues with Copyrights and Patents - The Open Source Definition – Warranties.

Unit 2   OPEN SOURCE LICENSES   9

The MIT, BSD, Apache, and Academic Free Licenses - The MIT (or X) License - The BSD License - The Apache License, v1.1 and v2.0, The GPL, LGPL, and Mozilla Licenses - GNU General Public License - The Mozilla Public License 1.1 (MPL 1.1).

Unit 3   LEGAL IMPLICATIONS IN OPEN SOURCE PROJECTS.   9

Legal Impacts of Open Source and Free Software Licensing - Entering Contracts - Statutory Developments Related to Software Contracts - The Self-Enforcing Nature of Open Source and Free Software Licenses - The Global Scope of Open Source and Free Software Licensing.

Unit 4   COLLABORATIVE DEVELOPMENT USING PLATFORMS   9

Git Basics - Getting a Git Repository - Recording Changes - Viewing the Commit History - Undoing Things, Git Branching - Branches in a Nutshell - Basic Branching and Merging - Branch Management - Branching Workflows - Remote Branches, GitHub, Git Tools.

Unit 5   FOSS CASE STUDIES   9

Open Source Software Development - Case Study – Apache web server, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, wordpress, GCC, GDB, github, Open Office. Libreoffice – Samba, FOSS in Government, FOSS in Education.

Total (L:45)

OUTCOMES:

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

CO#	Course Outcomes	RBT Level
1	Recognize the significance of the Open Source Definition and Analyze issues related to copyrights and patents.	AP
2	Analyze the implications of different open source licenses.	AN
3	Evaluate the global scope of open source licensing.	E
4	Apply Git branching strategies.	AP
5	Synthesize insights from FOSS case studies.	E

TEXT BOOKS:

1. "Understanding Open Source and Free Software Licensing" by Andrew M. St. Laurent.

2. "Pro Git" by Scott Chacon and Ben Straub (available online).

REFERENCES:

1. "Producing Open Source Software: How to Run a Successful Free Software Project" by Karl Fogel.
2. "Open Sources: Voices from the Open Source Revolution" edited by Chris DiBona, Sam Ockman, and Mark Stone.
3. Version control system URL: http://git-scm.com/.
4. Samba: URL :http://www.samba.org/.
5. Libre office: http://www.libreoffice.org/.
6. https://en.wikibooks.org/wiki/FOSS_A_General_Introduction/Case_Studies.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	3	3	3	2	1	1	2	3	2	2	2	3	3	3
2	3	3	3	2	1	1	2	3	2		2	3	3	3
3	3	3	3	3	1	1	2	3	2		2	3	3	3
4	3	2	2	2	2	1	1	3	3		3	3	3	3
5	3	3		3	1	1	1	3	2		3	3	3	3

IT22072   FUNCTIONAL PROGRAMMING USING SCALA

L	T	P	C
3	0	0	3

Objectives:

- To understand the principles of functional programming.
- To learn how to model real-world entities and their interactions using classes and objects.
- To design immutable data structures.
- To understand generic types for functional programs.
- To write purely functional programs using pattern matching and higher-order functions.

Unit 1   INTRODUCTION   9

Introduction to functional programming – Need for scala – Scala interpreter - Defining variables and functions - Writing scripts – Loops – Arrays – tuples- sets – maps – arrays – File manipulations – Case studies.

Unit 2   CLASSES   9

Classes and Objects – Basic types and Operators –Wrappers – Functional objects – constructors – polymorphism -method overloading – this keyword -implicit conversions - Case studies.

Unit 3   INHERITANCE   9

Built-in Control Structures - Functions and Closures- Control Abstraction - Composition and Inheritance – Abstract classes – Overriding methods and fields – polymorphism and dynamic binding - Case studies.

Unit 4   HIERARCHY OF SCALA   9

Primitives – Bottom types – Traits- Thin vs rich interfaces – Packages and Imports - Putting code in packages - Access modifiers – Package imports - Assertions and Unit Testing - Case studies.

Unit 5   PATTERN MATCHING   9

Pattern Matching – pattern guards – pattern overlaps - Sealed classes - Working with Lists – types, operations and pattern –Parallel programming: Collections – sequence and maps – mutable and immutable collections - Stateful Objects - Case studies.

Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Examine the principles of functional programming.	AN
2	Develop functional programs using objects and classes.	AP
3	Apply class and object concepts to model real world entities.	AP
4	Apply inheritance concepts to real-world software development projects.	AP
5	Design purely functional programs using pattern matching and higher order functions.	AP

TEXT BOOKS:

1. Martin Odersky, Lex Spoon and Bill Venners , Programming in Scala, A comprehensive step-by-step guide‖, Third Edition, Artima press, 2010.

REFERENCES:

1. Dean Wampler,Alex Payne,Programming Scala, 2nd Edition ,O'Reilly Media, 2014.
2. Paul Chiusano and Runar Bjarnason, ―Functional Programming in Scala‖, Manning, 2014.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	2					1					2	
2.	3	2	3					1	2		3	2	3	2
3.	3	2	3					1	2		3	2	3	3
4.	3	2	3					1	2		3	2	3	3
5.	3	2	3					1	2		3	2	3	3

IT22073	**SOFTWARE TESTING TOOLS AND TECHNIQUES**	L	T	P	C
		3	0	0	3

Objectives:
- To understand the basics of software testing
- To learn how to do the testing and planning effectively.
- To build test cases and execute them.
- To focus on wide aspects of testing and understanding multiple facets of testing
- To get an insight about test automation and the tools used for test automation.
.

Unit 1   FOUNDATIONS OF SOFTWARE TESTING   9

Software testing fundamentals -Internal and external views of Testing-Software Testing Life Cycle-V-model of Software Testing-Program Correctness and Verification-Failures, Errors and Faults - Software Testing Principles-verification and validation -Stages of Testing: Unit Testing, Integration Testing, System Testing.

Unit 2   TEST CASE DESIGN STRATEGIES   9

Test case Design Strategies-Black Box Approach -White Box Approach -Test Adequacy Criteria-Static testing vs Structural testing - code functional testing - Coverage and Control Flow Graphs-code complexity testing - Additional White box testing approaches- Evaluating Test Adequacy Criteria-Case study.

Unit 3   LEVELS OF TESTING   9

The need for Levels of Testing-Unit Test-Integration tests- Scenario testing - Defect bash elimination System Testing- Acceptance testing – Performance Testing-Regression Testing-Internationalization testing -Ad-hoc testing -Alpha, Beta Tests – Testing OO systems - Configuration testing -Compatibility testing- Case study.

Unit 4   ADVANCED TESTING CONCEPTS   9

Performance Testing: Load Testing, Stress Testing-Volume Testing- Fail-Over Testing, Recovery Testing-Configuration Testing-Compatibility Testing-Usability Testing-Security testing-testing in the Agile Environment- Website testing. - Testing Web and Mobile Applications- Case study.

Unit 5   AUTOMATION TESTING TOOLS   9

Basics of automation testing-functional testing tools- Overview of Test management and defect tracking tools-Selenium Web Driver: architecture, features, commands and methods of interactions-TestNG- Performance Testing using JMeter- Mobile Testing using Appium-Acceptance Testing using Cucumber UF-Test Management using Jira- Case study

Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Identify the basic concepts of software testing and the need for software testing.	AP
2	Design effective test cases that can uncover critical defects in the application.	AP
3	Enumerate different levels of testing	AN
4	Carry out advanced types of testing.	E
5	Automate the software testing using Selenium and TestNG.	AP

TEXT BOOKS:
1. Yogesh Singh, ―Software Testing‖, Cambridge University Press, 2012
2. Srinivasan Desikan and Gopalaswamy Ramesh, ―Software Testing – Principles and Practices‖, Pearson Education, 2006

REFERENCES:
1. UnmeshGundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" - SecondEdition 2018
2. Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, 2012, John Wiley & Sons, Inc.
3. Ron Patton, Software testing, 2nd Edition, 2006, Sams Publishing
4. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Fourth Edition, 2014, Taylor & Francis Group.
5. Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing.
6. Elfriede Dustin, Thom Garrett, Bernie Gaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc.
7. Satya Avasarala, Selenium WebDriver Practical Guide, 2014, Packt Publishing.
8. Varun Menon, TestNg Beginner's Guide, 2013, Packt Publishing.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	2	1	2				1	1	3	2	2	2
2.	2	3	1	1	1				2	2	1	2	3	2
3.	2	2	2	1	3	1				1	3	1	3	2
4.	2	1	3	2	1				1	1	1	2	2	2
5.	2	2	1	3	1				1	3	2	1	3	3

IT22074   GO PROGRAMMING: THEORY AND PRACTICES   L   T   P   C
                                                         2   0   2   3

Objectives:
- To expose GO programming language
- To develop applications using GO language
- To appraise the concurrency features in GO language
- To learn Client-Sever communication through GO language

Unit 1   Preliminaries   6+6
History of Go –Introduction to Go - Basic Constructs – structural elements – data types – composite types –operators - control statements – decision making and looping statements – Data Collections - arrays – slices – maps – Error handling
Suggested Activities:
- Demonstrate I/O in GO for a Student Management System (SMS)
- Apply control statements and looping in GO for SMS

Unit 2   Interfaces, and Packages   6+6
Strings - Functions – Variadicfunctions – anonymous functions – structures – anonymous structures – nested structures - Methods - interfaces–Packages – syscall – go/scanner – go/parser – go/token packages – context package
Suggested Activities:
- Design use-cases functions for SMS
- Demonstrate packages in Go

Unit 3   Concurrency   6+6
Introduction to Concurrency – Goroutines and Channels – Concurrency Patterns - Processes – Light weightthreads – pipelines -Race conditions – Go scheduler – Shared memory – shared variables – multithreading – Context and Cancellation
Suggested Activities:
- Demonstrate Processes and threads in Go
- Demonstrate race conditions and shared memory concepts suiting SMS

Unit 4   Data structures in Go   6+6
Pointers - Algorithm complexity – Linked lists – doubly linked lists – Binary Trees – Hash tables –- stacks - queues – Heaps- Min heap and Max heap – Heap sort - Containers – matrix calculations
Suggested Activities:
- Identify suitable data structures for the use-cases in SMS
- Demonstrate the operations in SMS using data structures

Unit 5   Testing and HTTP programming   6+6

Code Testing – optimization – Profiling – cross compilation –Calling C code with cgo -
Text/HTML templates – GET – POST – http.Request – http.Response – Testing Http
handlers

Suggested Activities:

- Write suitable test-cases for SMS
- Demonstrate HTTP handler scenarios for SMS

Total (L:30+P:30):60Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Apply the basic constructs of the Go programming language, including data types, composite types, operators, and control statements.	AP
2	Apply advanced language features such as strings, functions, structures, methods, and interfaces to design modular and extensible Go programs.	AP
3	Analyze and evaluate concurrency concepts in Go, including go-routines, channels, and race conditions, to design and implement concurrent and thread-safe programs.	AN
4	Evaluate different data structures in Go, including linked lists, binary trees, hash tables, stacks, and queues, considering algorithmic complexity and suitability for various tasks.	E
5	Apply testing methodologies and HTTP programming techniques in Go, including code testing, optimization, profiling, and handling HTTP requests and responses, to develop robust and efficient web applications.	AP

TEXT BOOKS:

1. MihalisTsoukalos, ‗Mastering GO', second edition, PaktPulications

2. Alan A. A. Donovan, Brian W. Kernighan, ― The GO Programming Language‖, Addison Wesley

REFERENCES:

1. Katherine Cox-Buday ‗Concurrency in Go: Tools and Techniques for Developers', Shroff/O'Reilly, 2017
2. Caleb Doxsey, ‗Introducing Go: Build Reliable, Scalable Programs', O'Reilly, 2016

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	1	2	2	1	2	1		1	3	2		1	1	
2.	1	2	2	1	2	1		1	3	2		1	1	
3.	1	2	2	1	2	1		1	3	2		1	1	
4.	1	2	2	1	2	1		1	3	2		1	1	
5.	1	2	2	1	2	1		1	3	2		1	1	

IT22075   ADVANCED JAVA PROGRAMMING: THEORY   L   T   P   C
**   AND PRACTICES   2   0   2   3**

Objectives:
- To expose Object Oriented Programming paradigms using Java
- To provide advanced Java features to develop sophisticated software applications
- To explore MVC architecture using J2EE framework

Unit 1   Object oriented Programming Concepts   6+6

Java environment: JVM – Programming constructs: operators - conditional constructs – looping constructs – arrays - Objects – Classes – constructors - Access specifiers - Encapsulation – Abstraction - Polymorphism – Inheritance – String and String Buffer classes, Enumerators

Suggested Activities:
- Develop a minimum of 5 use-cases for a Student Management System(SMS)
- Identify Classes applying OOP concepts
- Design Business logic for the use-cases with hard-coding/user-input

Unit 2   Interfaces and File Handling   6+6

Package names – Access class path – imports – Interface concept – abstract classes – inner and outer classes - Dealing with Errors – Exception handling – Exception hierarchy – user defined exceptions - File Handling

Suggested Activities: (for SMS)
- Develop interfaces
- Create Files to store data and replace hard-coding/user-input; Read/Write in Files
- Identify Exception scenarios and create customized Exceptions

Unit 3   Generic Programming and Collections   6+6

Simple Generic class – generic methods – Object class - reflection – Auto-boxing and un-boxing -   Collection framework – Collection interface -   interfaces in Collections framework – Concrete collections - Maps – Algorithms

Suggested Activities: (for SMS)
- Apply Collections and Generic Programming for suitable use-cases

Unit 4   Database Connectivity and Multi threading   6+6

Java Database Connectivity – Connection – Statement – Prepared Statement – Result Set - Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization

Suggested Activities: (for SMS)
- Design tables suiting the use-cases in MySQL
- Establish Connectivity and perform CRUD operations in console mode
- Demonstrate threading in any of the use-case

Unit 5   J2EEProgramming   6+6

Model-view-Controller   architecture   –JSP   Programming   –   JSP   life   cycle   –
HttpServletRequest – HttpServletResponse - web.xml – HttpSession – Attribute scopes –
RequestDispatcher

Suggested Activities: (for SMS)

- Create Web Pages for the user-input and Output display using JSP
- Establish sessions and ensure authentication
- Complete SMS as a Full-Stack application using JSP as View, Java as Controller, and MySQL as Model for SMS

Total (L:30+P:30):60Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Apply object-oriented principles to design and implement Java programs, utilizing core principles	AP
2	Apply interface concepts and file handling techniques in Java to design modular and error-resilient software components.	AP
3	Analyze and evaluate the usage of generic classes and Java collections to implement efficient and type-safe data structures and algorithms.	AN
4	Apply Java Database Connectivity (JDBC) and multi-threading concepts to develop concurrent and database-driven applications in Java.	AP
5	Create dynamic web applications using JavaServer Pages (JSP) and servlets within the Model-View-Controller (MVC) architecture, demonstrating proficiency in web development with Java technologies.	C

TEXT BOOKS:

1. Cay S. Horstmann and Gary Cornell, ―Core Java: Volume II – Advanced Features‖, twelfth Edition, Addison Wesley.
2. Bryan Basham Kathy Seirra, Bert Bates, Head First Servlets and JSP, second edition O'Reilly publications

REFERENCES:

1. Cay S. Horstmann and Gary Cornell, ―Core Java: Volume I – Fundamentals‖, twelfth Edition, Addison Wesley.
2. K. Arnold and J. Gosling, ―The JAVA programming language‖, Third edition, Pearson Education, 2000.
3. Jason Hunter, William Crawford, ―Java Servlet Programming‖, second edition, O'Reilly publications

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	1	2	2	1	2	1		1	3	2		1	1	
2.	1	2	2	1	2	1		1	3	2		1	1	
3.	1	2	2	1	2	1		1	3	2		1	1	
4.	1	2	2	1	2	1		1	3	2		1	1	
5.	1	2	2	1	2	1		1	3	2		1	1	

IT22077	**SERVICE ORIENTED ARCHITECTURE FOR ENTERPRISE AND CLOUD APPLICATIONS**	L	T	P	C
		3	0	0	3

Objectives:

- Understand major software architectural styles, design patterns, and frameworks.
- Illustrate web service and realization of SOA
- Create architectural alternatives for real-world problems and evaluate system's architecture.
- Comprehend the contemporary trends and issues related to Software Architectures in research and industry.
- Discuss RESTful services

Unit 1   SOA BASICS   9

SOA BASICS: Fundamentals of Service Oriented Architecture, Characteristics of SOA, Anatomy and Principles of SOA. EvolutionDrives and Dimension of SOA, Key components, Enterprise-wide SOA; Enterprise-Wide SOA, Strawman Architecture for Enterprise-Wide-SOA-Enterprise, SOA Layers, Application Development Process.

Unit 2   SOA Platforms   9

SOA Platforms: BPEL for Web Services SOA Planning and Analysis – Lifecycle – Capturing Business IT Issues – Determining Non-Functional Requirements – Enterprise Solution Assets – Tools – Implementing SOA. SOA Platform Basics: SOA Support in J2EE, JAX-WS,JAXB, JAX-RPC, WSIT, SOA support in .NET, ASP.NET web services.

Unit 3   SOA Enterprise Applications   9

SOA Enterprise Applications; Solution Architecture and Software platforms for enterprise Applications; Package and Enterprise Application Platforms, Service-oriented-Enterprise Applications; Considerations and Pattern-BasedArchitecture for Service-Oriented Enterprise Applications, Composite Applications, SOA programming models.

Unit 4   SOA Analysis and Design   9

SOA Analysis and Design Need for Models, Principles of Service Design, Design of Activity Services, Design of Dataservices, Design of Client services and Design of business process services, Technologies of SOA; Technologies for Service Enablement, Technologies for Service Integration, Technologies for Service orchestration.

Unit 5   SOA Technologies-PoC   9

SOA Technologies-PoC; Loan Management System (LMS), PoC-Requirements Architectures of LMS SOA based integration; integrating existing application, SOA best practices, Basic SOA using REST. Role of WSDL, SOAP and JAVA/XML Mapping in SOA. Graph Query Language-Introduction, Exploring Graph Query Language APIs.

Total:45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Illustrate SOA Methodology for Enterprise	AN
2	Implement SOA for various platforms	AP
3	Analyze SOA programming models for Enterprise	AN
4	Design client services for business process	AP
5	Apply REST Architecture in existing SOA application	AP

TEXT BOOKS:

1. Thomas Erl, Service-Oriented Architecture: Concepts, Technology, and Design, Pearson Education, 2009.
2. Shankar Kambhampaly, ―Service–Oriented Architecture for Enterprise Applications‖,Wiley Second Edition, 2014.
3. Mark D. Hansen, ―SOA using Java Web Services‖, Practice Hall, 2007.

REFERENCES:

1. WaseemRoshen, ―SOA-Based Enterprise Integration‖, Tata McGraw-HILL, 2009.
2. Newcomer, Lomow, Understanding SOA with Web Services, Pearson Education, 2005.
3. Sandeep Chatterjee, James Webber, Developing Enterprise Web Services: An Architect‘s Guide, Pearson Education, 2005.
4. Samer Buna ,"GraphQL in Action", Manning Publications,2021

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	2	3	3	2	3	2	3	-	3	-	1	3	3	3
2.	2	3	3	2	3	2	3	-	3	-	1	3	3	3
3.	2	3	3	2	3	2	3	-	3	-	1	3	3	3
4.	2	3	3	2	3	2	3	1	3	-	1	3	3	3
5.	2	3	3	2	3	2	3	-	3	-	2	3	3	3

IT22070   **FULL STACK DEVELOPMENT LABORATORY**

L	T	P	C
0	0	4	2

Objectives:
- To design and develop user interface screens for a given scenario.
- To develop the functionalities as web components as per the requirements.
- To implement the database according to the functional requirements .
- To integrate the user interface with the functionalities and data storage.
- To develop full stack applications with clear understanding of user interface, business logic and data storage.

List of Experiments
1. Create a web page with the following using HTML
   a. To embed a map in a web page
   b. To fix the hot spots in that map
   c. Show all the related information when the hot spots are clicked. .
2. Create a web page with the following.
   a. Cascading style sheets.
   b. Embedded style sheets.
   c. Inline style sheets.
   Use our college information for the web pages
3. Develop a web application using JavaScript that enables users to log in and effectively manage their to-do lists by adding and organizing tasks.
4. Craft a program for constructing and developing a password strength checker utilizing jQuery.
5. Generate a program to establish and design a star rating system with the assistance of jQuery.
6. Build a quiz application using Node.js where users can answer multiple-choice questions and receive a score at the end.
7. Develop a book library management system using MongoDB to store book information. Users can add new books, view existing books, and search for books based on different criteria.
8. Develop a web platform using Node.js and MongoDB that allows users to place food orders from a specific restaurant featured on the site.
9. Create an image gallery using React.js. Display a grid of images, and allow users to click on an image to view it in a larger size.
10. Build an organizational leave management system utilizing React.js, enabling users to request diverse leave types like casual and medical leaves, while also providing the ability to access available leave days.
11. Build a user registration form using Angular. Users can input their name, email, and password, and the form should validate the input.
12. Develop a blog post list using Angular. Display a list of blog posts with titles and excerpts, and allow users to click on a post to view the full content.

Total :60 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Design Interactive Web Pages	AP
2	Apply CSS Styling Techniques	AP
3	Create Interactive jQuery Tools	AP
4	Implement Data-Driven Web Systems	AP
5	Develop Interactive Web Applications	AP

TEXT BOOKS:
1. Nate Murray, Felipe Coury, Ari Lerner and Carlos Taborda, ―ng-book, The Complete Book on Angular 4‖, First Edition, CREATESPACE Publishers, 2017.
2. KrasimirTsonev, ―Node.js by Example‖, Packt Publishing, 2015.

REFERENCES:
1. Achyut S Godbole and AtulKahate, ―Web Technologies‖, Second Edition, Tata McGraw Hill, 2012.
2. Thomas A Powell, Fritz Schneider, ―JavaScript: The Complete Reference‖, Third Edition Tata McGraw Hill, 2013
3. David Flanagan, ―JavaScript: The Definitive Guide, Sixth Edition‖, O_Reilly Media, 2011
4. Bear Bibeault and Yehuda Katz, ―jQuery in Action‖, January 2008 4. Web link for Responsive Web Design – https://bradfrost.github.io/this-is-responsive/
5. Ebook link for JavaScript - https://github.com/jasonzhuang/tech_books/tree/master/js
6. Amol Nayak, ―MongoDB Cookbook‖, Second Edition, Packt Publishing, 2016
7. **Sandro Pasquali, "Mastering Node.js", First Edition, Packt Publishing,2013.**
8. **Kristina Chodorow, "MongoDB : The Definitive Guide", Second Edition, O' Reilly Publications, 2013.**
9. **Matt Frisbie, "Angular 2 Cookbook", First Edition, Packt Publishing, 2017.**

EQUIPMENT'S REQUIRED
SOFTWARE:
Dream Weaver or Equivalent, MySQL or Equivalent, IDE: Eclipse Neon
Editor: Notepad++ or Visual Studio Code or Sublime Text
Browsers :IE, Chrome, Mozilla Firefox browsers (Latest Version),
NodeJS (Latest Version)
MongoDB (Latest Version)
Angular (Latest Version)
jQuery and Twitter Bootstrap Library Files
HARDWARE:
Standalone desktops 60 Nos
Pentium P5, 3 GHz or higher
8 GB (or higher) RAM,
100 GB (or higher) HD
Windows 8 or 10 (or higher)

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	3	2	3	3	3	2	2	3	3	2	3	3	3	3
2	3	2	3	3	3	2	2	3	3	2	3	3	3	3
3	3	2	3	3	3	2	2	3	3	2	3	3	3	3
4	3	2	3	3	3	2	2	3	3	2	3	3	3	3
5	3	2	3	3	3	2	2	3	3	2	3	3	3	3

OE22801	IT ESSENTIALS FOR ENGINEERS	L	T	P	C
		3	0	0	3

Objectives:

- To know scripting languages.
- To learn the fundamentals of data models and to conceptualize and depict a database system using E-R diagrams.
- To introduce the concept of Internet, OS and its working principles.
- To understand various applications related to Information Technology.

Unit 1 WEB ESSENTIALS 9

Creating a Website - Working principle of a Website -HTML formatting Elements, Tables, Frames and Forms- CSS, Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server - Database Server.

Unit 2 SCRIPTING ESSENTIALS 9

Need for Scripting languages - Types of scripting languages - Client side scripting - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and MySQL - PHP and HTML - Cookies - Simple PHP scripts – Responsive Design and media queries.

Unit 3 DATABASE ESSENTIALS 9

Purpose of Database System -– Views of data – Data Models – Database System Architecture – Introduction to relational databases - Relational Model - Keys - SQL fundamentals - Triggers- Embedded SQL– Dynamic SQL - Database connectivity - E-R Diagrams.

Unit 4 OS ESSENTIALS 9

Introduction to OS concepts, Boot strapping, Process Management - Process scheduling, Memory Management - Paging and Segmentation, Input –Output management, File System. Case study - Unix, Linux, Windows 8

Unit 5 MOBILE COMMUNICATION ESSENTIALS 9

Cell phone working fundamentals - Cell phone frequencies & channels - Digital cell phone components - Generations of cellular networks - Cell phone network technologies / architecture - Voice calls & SMS- Mobile network Protocols.

Total :45 Periods

OUTCOMES:

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

CO	Course Outcomes	RBT Level
1	Design the web-sites for simple web applications.	AP
2	Develop web based applications using suitable client side and server side web technologies.	AP
3	Examine the database connectivity with an appropriate database.	AN
4	Distinguish the basic features of Unix, Linux and Windows OS.	AN
5	Apply the suitable mobile communications technology for applications.	AP

TEXT BOOKS:

1. Julie Meloni and Jennifer Kyrnin, ―Sams Teach Yourself - HTML, CSS and JavaScript All in One‖, Third Edition, O'REILLY, 2019.
2. Robin Nixon, "Learning PHP, MySQL, JavaScript, with jQuery, CSS & HTML5", Fourth Edition, O'REILLY, 2018.
3. Avi Silberschatz, Henry F. Korth and S. Sudarshan, ―Database System Concepts‖, Seventh edition, MCGraw-Hill 2019.
4. Andrew S. Tanenbaum, ―Modern Operating Systems‖, Fourth Edition, Pearson Education, 2015.

REFERENCES:

1. GottapuSasibhushana Rao, "Mobile Cellular Communication", Pearson, 2012.
2. RamezElmasri, Shamkant B. Navathe, Fundamentals o f Database Systems , Seventh Edition, Pearson Education, 2016.
3. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012.
4. it-ebooks.org

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	3	2	3	1	3			1	2		3		2	3
2	3	2	3	1	3		2	1	2		3		2	3
3	3	2	3	1	2			1		2	2		2	3
4	3	3	3	2	2	1	1	1		2	3	2	2	3
5	3	2	3	1	3	2	2	1	2			2	3	3

	L	T	P	C

OE22802   **PROGRAMMING FOR IOT**   L T P C
3 0 0 3

Objectives:
1. To introduce Internet of Things (IoT) environment and its technologies for designing smart systems.
2. To explore open-source computer hardware/software platform, development and debugging environment, programming constructs and necessary libraries.
3. To learn embedded programming constructs and real time systems.

Unit 1   IoT Ecosystem and Programming for Prototyping Boards   9
Challenges and Levels of implementation - Enabling Technologies - Overview of Processing Elements and Peripherals. Programming-Environment: Board, IDE, shields – Programming: syntax, variables, types, operators, constructs, and functions – Sketch: skeleton, compile and upload, accessing pins – debugging: UART communication protocol and serial library.

Unit 2   Interfacing and Programming for Single Board Computers   9
Circuits: design, wiring, passive components - sensors and actuators: interfacing, read and write. Board schematic – setup - configure and use - OS implications: Linux - basics, file system, and processes - Shell CLI – GUI - Programming APIs - RPi.GPIO - PWM library to access pins -Tkinter.

Unit 3   Interfacing with Single Board Computers   9
Networking - Internet Connectivity - Standard Internet Protocols – MQTT – CoAP - Networking Socket Interface - Cloud - Public APIs and SDKs for accessing cloud services - Social Network APIs - Interfacing - sensors and actuators - Pi Camera - Servo - APIs for data conversion.

Unit 4   Embedded Programming and RTOS   9
MCU – GPIO – WDT - timers/counters - I/O - A/D - D/A – PWM – Interrupts – Memory - serial communication UART - I2C – SPI - Peripheral Interfacing OS – basics – types – tasks – process - threads (POSIX Threads) - thread preemption - Preemptive Task Scheduling Policies - Priority Inversion - Task communication - Task Synchronization issues - racing and deadlock-choosing RTOS.

Unit 5   RTOS and Real World Projects   9
IoT Integrated Primary Health Care - Face Detection by AI - Cloud IoT Systems for Smart Agriculture - Smart Home Gadgets- Autonomous Car Features – speed and horn intensity Control- Estimating program run times – Task Assignment and Scheduling – Fault Tolerance Techniques – Reliability, Evaluation

Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Investigate various challenges and explore open-source hardware prototyping platforms for designing IoT devices.	AN
2	Examine the basic circuits, sensors and interfacing, data conversion process, and shield libraries to interface with the real world.	AN
3	Construct SBC by exploring protocols, data conversion process, API and expansion boards for practical IoT devices using Python.	AP
4	Learn embedded programming constructs and constraints in real-time systems for real-world socio-economic problems.	AP
5	Interpret the different real-world projects in agriculture, healthcare and Automation.	E

TEXT BOOKS:

1. Yamanoor, Sai, and Srihari Yamanoor. Python Programming with Raspberry Pi, 2017, 1st edition, Packt Publishing Ltd,. UK

REFERENCES:

1. Donald Norris, The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, and BeagleBone Black, 2015, 1st edition, McGraw Hill Education, India.

2. Marco Schwartz, Home Automation with Arduino, 3rd edition, Open Home Automation 2014. Schwartz, Marco. Internet of things with arduino cookbook, 2016, 1st edition, Packt Publishing Ltd., UK.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	2	1	-	1	1	--	-	-	1	1	1	1
2.	2	3	2	2	1	-	-	-	1	-	2	1	-	1
3.	2	2	2	1	-	1	-	-	-	1	2	1	-	1
4.	2	2	2	1	-	-	-	-	1	1	1	1	1	1
5.	2	2	2	1	1	-	1	-	1	1	1	2	-	2

	FOUNDATIONS OF MOBILE APPLICATION	L	T	P	C
OE22803	**DEVELOPMENT**	3	0	0	3

Objectives:
- Understand system requirements for mobile applications.
- Generate suitable design using specific mobile development frameworks
- Generate mobile application design.
- Implement the design using specific mobile development frameworks.
- Deploy the mobile applications in market place for distribution.

Unit 1 INTRODUCTION 9

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications - Frameworks and Tools.

Unit 2 BASICDESIGN 9

Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – user interfaces for mobile applications – touch events and gestures.

Unit 3 ADVANCEDDESIGN 9

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

Unit 4 TECHNOLOGY I–ANDROID 9

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications- Android Multimedia - Security and Hacking.

Unit 5 TECHNOLOGY II– IOS 9

Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location-aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. Playing back video and music in iPhone Using camera in iPhone/ Photo library.

Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Identify the requirements for mobile applications.	AP
2	Identify the challenges in mobile application design and development.	**AP**
3	Design mobile applications for specific requirements.	AP
4	Interpret an appropriate design using Android SDK.	**E**
5	Operate mobile applications in Android and iPhone marketplace for distribution.	**AN**

TEXT BOOKS:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2016
2. Charlie Collins, Michael Galpin and Matthias Kappler, ―Android in Practice‖, DreamTech, 2016

REFERENCES:

1. http://developer.android.com/develop/index.html
2. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
3. Charlie Collins, Michael Galpin and Matthias Kappler, ―Android in Practice‖, DreamTech, 2012
4. James Dovey and Ash Furrow, ―Beginning Objective C‖, Apress, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, ―Beginning iOS 6 Development: Exploring the iOS SDK‖, Apress,2013.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3	-	2	1	3	3	1	3	3	3
2.	3	3	3	3	3	-	2	-	3	3	3	3	3	3
3.	3	3	3	3	3	2	3	3	3	3	3	3	3	3
4.	3	3	3	3	3	-	2	2	3	-	1	3	3	3
5.	3	3	3	3	3	2	1	2	3	3	-	3	3	3

		L	T	P	C
OE22804	**DATA ANALYTICS USING R**	3	0	0	3

Objectives:
- Learn the different ways of Data Analysis
- Use R for statistical programming, computation, graphics, and modeling,
- Be familiar with the visualization

Unit 1   INTRODUCTION TO DATA ANALYSIS   9

 Introduction to Data Analytics: Sources and nature of data- classification of data
(Structured- semi-structured- unstructured)- Characteristics of data- Introduction to Big Data platform- Need of data analytics- Evolution of analytic scalability- Analytic process and tools- Analysis vs Reporting- Modern data analytic tools- Applications of data analytics.Data Analytics Lifecycle: Need- key roles for successful analytic projects- various phases of data analytics lifecycle - Discovery- Data preparation- Model planning- Model building-Communicating results- Operationalization

Unit 2   R PROGRAMMING BASICS   9

Overview of R programming- Environment setup with R Studio- R Commands- Variables and Data Types-Control Structures- Array- Matrix- Vectors- Factors- Functions- R packages - R Data Interfaces - R Hadoop Integeration.

Unit 3   DATA VISUALIZATION USING R   9

Value of Visualization- visual perception - External representation- Interactivity - Difficulty in Validation Effective data analysis. Reading and getting data into R (External Data): Using CSV files- XML files- Web Data- JSON files- Databases- Excel files. Working with R Charts and Graphs: Histograms- Box plots- Bar Charts- Line Graphs- Scatter plots- Pie Charts

Unit 4   STATISTICS WITH R   9

 Random Forest- Decision Tree- Normal and Binomial distributions - Classification - Time Series Analysis- Linear and Multiple Regression- Logistic Regression- Survival Analysis - T-test in R, Chi-Square Test.

Unit 5   PRESCRIPTIVE ANALYTICS   9

 Creating data for analytics through designed experiments- Creating data for analytics through active learning- Creating data for analytics through reinforcement learning -Neural Network Model - K-Nearest Neighbor's - Naïve Bayes

<div align="right">Total:45 Periods</div>

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Identify the characteristics of datasets and the concepts of data analytics pipeline	AP
2	Interpret the various data structures such as matrices- lists- factors- and data frames.	E
3	Analyze various file formats and generate graphical displays	AN
4	Develop statistical models for analyzing the data	AP
5	Design theprinciples of predictive analytics and apply them to achieve real-pragmatic solutions.	AP

TEXT BOOKS:
1. James (JD) Long- Paul Teetor- "R Cookbook" - 2nd edition- O Reiley - 2019 2.Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer.

REFERENCES:
1. The Art of R Programming, A K Verma, Cengage Learning.
2. R for Everyone, Lander, Pearson
3. The Art of R Programming, Norman Matloff, No starch Press.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	1	2	-	-	1	-	-	-	1	2	1
2.	3	3	3	2	2	-	-	1	-	-	1	2	1	1
3.	3	3	3	2	2	-	-	1	-	-	1	2	1	1
4.	3	3	3	1	2	-	-	1	-	-	-	1	2	1
5.	3	3	3	2	3	-	-	1	1	1	1	2	2	2

OE22805   **ETHICAL HACKING AND IT SECURITY**   L   T   P   C
                                                      3   0   0   3

Objectives:
- To understand numerous methods of real-world information intelligence
- To learn about vulnerability scanners
- To understand techniques used to sniff traffic across a network
- To familiarize with the methodologies that can be used to hack into a target
- To appreciate the wide variety of attacks that can be performed against a wireless network

Unit 1   Introduction to Hacking   9

Terminologies, Categories of Penetration Test, Writing Reports, Structure of a Penetration Testing Report, Vulnerability Assessment Summary, Risk Assessment, Methodology, Linux Basics: File Structure, Cron Job, Users, Common Applications ,BackTrack, Services.

**Unit 2   Information Gathering, Target Enumeration and Port   9
             Scanning Techniques**

Information Gathering Techniques- Active, Passive and Sources of information gathering, , Intercepting a Response, WhatWeb, Netcraft, Basic Parameters, Xcode Exploit Scanner, Interacting with DNS Servers, Problems with SNMP, Target enumeration and Port Scanning Techniques.

Unit 3   Vulnerability Assessment & Network Sniffing   9

Introduction to Vulnerability Assessment - Pros and Cons, Nessus Vulnerability Scanner, Nessus Integration with Metasploit, Network Sniffing and types, MITM Attacks, ARP Protocol Basics- working, ARP Attacks, DoS Attacks, Dsniff tool, ARP Poisoning, DNS Spoofing, DHCP Spoofing.

Unit 4   Basics of Exploitation   9

Remote Exploitation - Attacking Network Remote Services, Attacking SQL Servers, Client Side Exploitation Methods, Browser Exploitation, Post Exploitation - Cracking the Hashes, Rainbow crack, Windows Exploit Development Basics – Skeleton Exploit.

Unit 5   Wireless & Web Hacking   9

Wireless Hacking, Web Hacking - Attacking the Authentication , Brute Force and Dictionary Attacks , Types of Authentication , Crawling Restricted Links , Testing for the Vulnerability ,Authentication Bypass with Insecure Cookie Handling , SQL injection.

                                                      Total :45 Periods

OUTCOMES:

CO	Course Outcomes	RBT Level
1	Interpret the core concepts related to malware, hardware and software vulnerabilities and their causes	E
2	Correlate ethics behind hacking and vulnerability disclosure	AN
3	Examine the vulnerabilities related to computer system and networks using state of the art tools and technologies	AP
4	Analyse the various adversaries attack in computer networks	AN
5	Appraise the various hacking in wireless and web.	AN

TEXT BOOKS:

      1. Rafay Baloch ,―Ethical Hacking and Penetration Testing Guide‖, CRC Press, 2015.

REFERENCES:

1. Patrick Engebretson, ―The Basics of Hacking and Penetration Testing : Ethical Hacking and Penetration Testing Made Easy‖, Syngress Media, Second Revised Edition, 2013.
2. Michael T. Simpson, Kent Backman, James E. Corley, ―Hands On Ethical Hacking and Network Defense‖, Cengage Learning, 2012.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	2	3	3	2	3	2			2	2	2
2.	3	3	2	2	3	3	2	3	2			2	3	2
3.	3	3	2	3	3	3	2	3	2			2	2	2
4.	3	2	2	3	3	2	2	3	1			3	3	2
5.	3	2	2	3	3	2	2	3	1			3	3	2

	L	T	P	C

OE22806   **AI FOR ANDROID**

L T P C
3 0 0 3

Objectives:
- To learn search strategies
- To understand the concepts of game playing
- To employ AI for Android in projects.

Unit 1   INTRODUCTION TO AI   9
AI problems- Assumptions- Technique- Level of the model- criteria for success- Defining the problem as a state space-Production System- characteristics – problem characteristics-Problem Solving by searching Methods-State Space search, Uninformed Search Methods, Informed Search Methods

Unit 2   GAME PLAYING   9
Local Search algorithms – Hill-climbing search, Simulated annealing, Genetic Algorithm, Adversarial Search: Game Trees and Minimax Evaluation, Elementary two-players games: Tic-Tac-Toe, Minimax with Alpha-Beta Pruning.

Unit 3   Introduction to Android: 9
Android SDK Features-Introduction to manifest-externalizing resources-application lifecycle- User Interface in Android- Building user interfaces-Introduction to layouts-introduction to fragments-creating new views-Introduction to adapters Intents and broadcast receiver,Introduction to intents, creating intents and broadcast receivers.

Unit 4   DESIGNING APPLICATION   9
Introduction- Exception Handling- Sending/Receiving broadcast message- Creating a response application- Monitoring the battery level- Formatting time and date display

Unit 5   CASE STUDY   9
Developing a Chabot – Attendance System – Smart city Traveler- Recommender systems.

Total (L:45)

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Identify appropriate AI methods to solve a given problem	**AP**
2	Implement AI for game-playing concepts	**E**
3	Examine the basics of Android in building user interfaces	**AN**
4	Develop applications using Android	AP
5	Employ AI for developing projects in Android	AP

TEXT BOOKS:

1. Russell, S. and Norvig, P. 2015. Artificial Intelligence - A Modern Approach, 3rd Edition,Prentice Hall.
2. Android:A Programming Guide byJ.F.DiMarzio.

REFERENCES:

1. Kevin Night and Elaine Rich, Nair B., ―Artificial Intelligence (SIE)‖, McGraw Hill-2008.
2. J.F. DiMarzio, ―Android- A Programmer's Guide", McGraw Hill- 2008.
3. Ian F.Darwin, ―Android Cookbook‖, O'Reilly, First Edition, 2011
4. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 3rd Edition, 2009
5. https://www.tutorialspoint.com/android/index.htm
6. https://nevonprojects.com/artificial-intelligence-projects

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	2	2	1	2	3	-	-	-	1	1	2	1	2	3
2.	2	1	3	2	2	-	-	-	3	2	2	3	3	3
3.	2	2	2	1	2	-	-	-	1	1	1	1	1	2
4.	1	3	1	1	3	-	-	-	1	1	3	1	1	2
5.	1	1	3	1	3	-	-	-	1	1	2	1	3	2

OE22807   **USER INTERFACE DESIGN**

L	T	P	C
3	0	0	3

Objectives:

- To understand the concepts and architecture of the World Wide Web.
- To understand and practice HTML5.
- To understand and practice the styling of web pages.
- To understand and practice Client-side scripting.
- To understand and practice Server-side scripting.

Unit 1   WEB ESSENTIALS   9

Creating a Website - Working principle of a Website - Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server - Database Server, Web Development Workflow - Version control with Git - Introduction to web hosting and deployment

Unit 2   INTRODUCTION TO HTML 5   9

HTML5: What is HTML5 – Features of HTML5 – Semantic Tags – New Input Elements and tags – Media tags (audio and video tags) – Designing Graphics using Canvas API – Drag and Drop features – Geolocation API – Web Storage (Session and Local Storage).

Unit 3   INTRODUCTION TO CSS3   9

CSS3: What is CSS3 – Features of CSS3 – Implementation of border radius,box shadow, Image border, custom web font, backgrounds – Advanced text effects(shadow) – 2D and 3D Transformations – Transition to elements – Animations to text and elements.

Unit 4   INTRODUCTION TO CLIENT-SIDE SCRIPTING   9

Introduction – Core features – Datatypes and Variables – Operators, Expressions, and Statements – Functions & Scope – Objects – Array, Date, and Math related Objects – Host Objects: Browsers and the DOM – Introduction to the Document Object Model, DOM History and Levels – Intrinsic Event Handling – Modifying Element Style – The Document Tree – DOM Event Handling.

Unit 5   INTRODUCTION TO SERVER-SIDE SCRIPTING   9

Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and MySQL - PHP and HTML - Cookies - Simple PHP scripts.

Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Demonstrate the functionalities of the World Wide Web.	AP
2	Develop interactive web pages.	**AP**
3	Determine the requirements and build static, dynamic, and interactive Web pages.	**E**
4	Construct web-based applications using suitable client-side web technologies.	AP
5	Construct web-based applications using suitable server-side web technologies.	AP

TEXT BOOKS:

1. Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education.

REFERENCES:

1. Thomas A Powell, Fritz Schneider, ―JavaScript: The Complete Reference‖, Third Edition Tata McGraw Hill, 2013.
2. David Flanagan, ―JavaScript: The Definitive Guide, Sixth Edition‖, O_Reilly Media, 2011.
3. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007.
4. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	2	3	2	1		1	1		2		2	3	2
2.	3	2	2		3			1					2	2
3.	3	2	3	1	3	2	2	1	2			2	3	3
4.	3	2	3	1	3			1	2		3		2	3
5.	3	2	3	1	3		2	1	2		3		2	3

		L	T	P	C
OE22808	**SOFTWARE TESTING**	3	0	0	3

Objectives:
- To Understand the roles of software process
- To introduce the basics and necessity of software testing.
- To Know various testing terminologies and techniques.
- To understand various the levels and types of testing
- To learn to manage automation in testing.

Unit 1   SOFTWARE PROCESS FUNDAMENTALS   9

Generic process model, Process Assessment and Improvement, Prescriptive Process models, Specialized Process models, Personal and Team Process models. Agile Development - Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document

Unit 2   SOFTWARE TESTING FUNDAMENTALS   9

Testing activities in software life cycle, Readiness of a Product: dependability, availability, MTBF, reliability, alpha test, beta test , regression test; Validation and Verification; Basic Principles; Test and Analysis Activities - Within a Software Process: The Quality Process, Planning and Monitoring, Quality Goals, Dependability Properties, Analysis, Testing, Improving the Process;

Unit 3   TESTING TECHNIQUES   9

Using White Box Approach to Test design - Static Testing Vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs –Using Black Box Approaches to Test Case Design – Random Testing – Requirements based testing –Decision tables –State-based testing – Cause-effect graphing – Error guessing.

Unit 4   TEST LEVELS AND METHODOLOGIES   9

Levels of Testing - Unit Testing - Integration Testing - Defect Bash Elimination- System Testing– System and Acceptance Testing – Testing Strategies – White Box and Black Box Approach- Compatibility testing-Performance Testing – Regression Testing - Internationalization Testing – Ad-hoc Testing – Website Testing –Usability and Accessibility Testing – Configuration Testing - Compatibility Testing - MC/DC Testing, Mutation testing, Case study for White box testing and Black box testing techniques.

Unit 5   TEST AUTOMATION AND MANAGEMENT   9

Test plan – Management – Execution and Reporting – Software Test Automation – Test Automation framework - Agile Testing - End-to-end test automation - Automated Testing tools - Hierarchical Models of Software Quality – Configuration Management – Documentation Control.

Total :45 Periods

OUTCOMES:

CO#	Course Outcomes	RBT Level
1	Analyze the various software life cycle models and its roles of software process	AN
2	Compare test activities within a software process	AN
3	Differentiate between different testing techniques	AN
4	Apply suitable types of testing methodologies	AP
5	Perform automated test and configuration management with documentation.	AP

TEXT BOOKS:

1. Roger S. Pressman, ―Software Engineering – A Practitioner's Approach‖, Seventh Edition, Mc Graw-Hill International Edition, 2010.
2. Yogesh Singh, ―Software Testing‖, Cambridge University Press, 2012
3. Srinivasan Desikan, Gopalaswamy Ramesh,‖ Software Testing – Principles and Practices‖, Pearson Education,2006
4. William Perry, ―Effective Methods of Software Testing‖, Third Edition, Wiley Publishing 2007
5. Automated Software Testing: Foundations, Applications and Challenges, Ajay Kumar Jena, Himansu Das, Durga Prasad Mohapatra, I Edition, Springer, 2020.

REFERENCES:

1. Agile Testing: A Practical Guide for Testers and Agile Teams, Crispin Lisa, Gregory Janet, Addison-Wesley Signature Series, 2008
2. Aditya Mathur, ―Foundations of Software Testing‖, Pearson Education, 2008
3. Ron Patton,‖Software Testing‖ , Second Edition, Pearson Education, 2007

COURSE ARTICULATION MATRIX

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	3	3	3	3	3	2	1	1	1	-	2	1	2	2
2.	3	3	2	2	3	2	-	1	2	2	-	1	2	3
3.	3	3	2	2	3	2	-	1	1	1	-	1	2	3
4.	3	3	2	2	3	2	-	1	1	1	2	1	2	3
5.	3	3	2	2	3	2	1	1	2	2	2	1	2	3