B.E.-COMPUTER SCIENCE AND TECHNOLOGY

Regulations – 2019 CHOICE BASED CREDIT SYSTEM

COLLEGE VISION

- To impart value based education in Engineering and Technology to empower young women to meet the societal exigency with a global outlook.

COLLEGE MISSION

- To provide holistic education through innovative teaching learning practices
- To instill self confidence among rural students by supplementing with co-curricular and extra-curricular activities
- To inculcate the spirit of innovation through training, research and development
- To provide industrial exposure to meet the global challenges
- To create an environment for continual progress through lifelong learning

DEPARTMENT VISION

- To impart quality education in the field of Computer Science and Technology and to produceglobally competent engineers with research experience to serve the society.

DEPARTMENT MISSION

- To impart knowledge in cutting edge technologies in par with current industrial standards

- To create a platform for strong communication skills and possess the ability to design computing systems individuals as well as part of a multidisciplinary terms

- To instill societal, safety and ethical responsibilities in professional activities

- To collaborate with industries to uplift innovative research and development

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) :

PEO 1: Able to perform in technical/managerial roles ranging from design, development, problem solving, support software industries and R&D sectors

PEO 2: The ability to adapt, contribute and innovative new technologies and systems in the key domains of Computer Science and Technology

PEO 3: To Societal responsible solution provider and entrepreneur in Computer Science and Technology

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PROGRAMME SPECIFIC OUTCOMES (PSOS):

PSO1	**Ideal Solutions:** Demonstrate basic knowledge of computer real applications and applystandard practices in software project development.
PSO2	**Research Capability:** Students at the time of graduation will be able to apply domain knowledge and expertise for enhancing research capability to transform innovative ideasinto reality.

PROGRAMME OUTCOMES (POs):

Undergraduate engineering programmes are designed to prepare graduates to attain the following program outcomes:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write

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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 andleader 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

Mapping of Program Educational Objectives with Program Outcomes

A broad relation between the program objective and the outcomes is given in the following table

Programme Educational Objectives	Programme Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
I	√	√	√		√	√		√	√			
II		√		√			√	√	√	√		
III		√	√		√		√		√	√	√	√

BSC - Basic Science Courses, ESC- Engineering Science Courses, PCC- Professional core courses, PEC- Professional Elective courses, OEC- Open Elective courses, MC- Mandatory courses, HS- Humanities and Social Sciences, EEC- Employability Enhancement Courses, SI- Summer Industry Internship, PROJ-IT- Project, CA- Continuous Assessment, ESE - End Semester Examination.

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CURRICULUM BREAKDOWN STRUCTURE

Summary of Credit Distribution

Category	Semester								Total
	SEM 1	SEM 2	SEM 3	SEM 4	SEM 5	SEM 6	SEM 7	SEM 8	No.of Credits
HS	3	4							7
BS	9	9	4	4	4				30
ES	8	11							19
PC			17	16	13	16	8		70
PE					3	3	6	6	18
OE					3	3	3		9
EC						1	4	8	13
Semester wise total	20	24	21	20	23	23	21	14	166

HS-HUMANITIES AND SOCIAL SCIENCE , **BS** –BASIC SCIENCES , **ES-**ENGINEERING SCIENCES,**PC-**PROFESSIONAL CORE, **PE-**PROFESSIONAL ELECTIVES, **OE-**OPEN ELECTIVES, **EEC-**EMPLOYABILITY ENHANCEMENT COURSES.

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Programme	**B.E.**	Programme Code	107	Regulation	**2019**
Department	**COMPUTER SCIENCE ANDTECHNOLOGY**			Semester	**I**

CURRICULUM
(Applicable to the students admitted from the academic year 2019 - 2020 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19MA101	Calculus*	BSC	3	1	0	4	40	60	100
U19EN101	English For Communication- I *	HSC	3	0	0	3	50	50	100
U19PH105	Engineering Physics @	BSC	3	0	0	3	50	50	100
U19CS101	Programming for Problem Solving*	ESC	3	0	0	3	50	50	100
U19GE101	Engineering Graphics*	ESC	2	0	3	3	50	50	100
PRACTICAL									
U19PH106	Physics Laboratory@.	BSC	0	0	4	2	50	50	100
U19CS102	Computer Practices Laboratory*	ESC	0	0	4	2	50	50	100
MANDATORY COURSES									
	Mandatory course - I	MC	3	0	0	0	100	-	100
					Total	**20**	**450**	**350**	**800**

* Common for all branches

@common for CSE,CST,IT,BT

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Programme	**B.E.**		Programme Code	107	Regulation	**2019**
Department	**COMPUTER SCIENCE AND TECHNOLOGY**				Semester	**II**

CURRICULUM
(Applicable to the students admitted from the academic year 2019 - 2020 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19MA202	Linear Algebra and Ordinary Differential Equations*	BSC	3	1	0	4	50	50	100
U19EN202	English For Communication- II *	HSC	3	0	0	3	50	50	100
U19CH207	Engineering Chemistry@	BSC	3	0	0	3	50	50	100
U19EE201	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	50	50	100
U19GE202	Basic Civil and Mechanical Engineering*	ESC	3	0	0	3	50	50	100
U19CS203	Python Programming	ESC	2	0	2	3	50	50	100
PRACTICAL									
U19CH208	Chemistry Laboratory @	BSC	0	0	4	2	50	50	100
U19GE203	Engineering Practices Laboratory*	ESC	0	0	4	2	50	50	100
MANDATORY COURSES									
	Mandatory course - II	MC	3	0	0	0	100	-	100
					Total	23	500	400	1000

CA- Continuous Assessment, ESE - End Semester Examination.
* Common for all branches
@common for CSE,CST,IT,BT

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Programme	**B.E.**		Programme Code	**107**	Regulation	**2019**
Department	**COMPUTER SCIENCE AND TECHNOLOGY**				Semester	**III**

CURRICULUM
(Applicable to the students admitted from the academic year 2020 - 2021 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19MA304	Discrete Mathematics#	BSC	4	1	0	4	50	50	100
U19CT301	Data Structures and Algorithms	PCC	3	0	0	3	50	50	100
U19CT302	Data Base Management Systems	PCC	3	0	0	3	50	50	100
U19IT304	Computer Organization & Architecture^	PCC	3	0	0	3	50	50	100
U19CS307	Object Oriented Programming!	PCC	3	0	2	4	50	50	100
PRACTICAL									
U19CT303	Data Structures Laboratory	PCC	0	0	4	2	50	50	100
U19CT304	DBMS Laboratory	PCC	0	0	4	2	50	50	100
MANDATORY COURSES									
	Mandatory course - III	MC	3	0	0	0	100	-	100
					Total	21	450	350	800

#common for CSE, CST, IT
^common for CST,IT
! common for CSE, CST

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Programme	**B.E.**		Programme Code	**107**	Regulation	**2019**
Department	**COMPUTER SCIENCE AND TECHNOLOGY**				Semester	**IV**

CURRICULUM

(Applicable to the students admitted from the academic year 2020 - 2021 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19MA405	Statistics and Numerical Methods#	BSC	4	0	0	4	50	50	100
U19CS411	Design and Analysis of Algorithm!	PCC	3	0	0	3	50	50	100
U19CT405	Computer Networks	PCC	3	0	0	3	50	50	100
U19IT408	Operating Systems^	PCC	3	0	0	3	50	50	100
U19CT406	Foundation of Artificial Intelligence	PCC	3	0	0	3	50	50	100
PRACTICAL									
U19CT407	Computer Networks Lab	PCC	0	0	4	2	50	50	100
U19IT411	Operating Systems Laboratory^	PCC	0	0	4	2	50	50	100
MANDATORY COURSES									
	Mandatory course – IV	MC	3	0	0	0	100	-	100
					Total	**20**	**450**	**350**	**800**

Common to CSE, IT and CST

^ Common to IT and CST

! Common to CSE and CST

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous Institution, Affiliated to Anna University, Chennai)Elayampalayam, Tiruchengode – 637 205

Programme	**B.E.**		Programme Code	**107**	Regulation	**2019**
Department	**COMPUTER SCIENCE AND TECHNOLOGY**			Semester		**V**

CURRICULUM
(Applicable to the students admitted from the academic year 2020 - 2021 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19MA509	Probability, Queueing Theory & Game theory	BSC	4	0	0	3	50	50	100
U19EC528	Embedded Systems Design	PCC	3	0	0	3	50	50	100
U19CT508	Artificial Intelligence and its Applications	PCC	3	0	0	3	50	50	100
U19CT509	Internet Programming	PCC	3	0	0	3	50	50	100
	Professional Elective – I	PEC	3	0	0	3	50	50	100
	Open Elective – I	OEC	3	0	0	3	50	50	100
PRACTICAL									
U19CT510	Internet Programming Laboratory	PCC	0	0	4	2	50	50	100
U19EC526	Embedded System s Design Laboratory	PCC	0	0	4	2	50	50	100
MANDATORY COURSES									
	Mandatory Course –V	MC	3	0	0	0	100	-	100
					Total	**23**	**500**	**400**	**900**

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Programme	**B.E.**		Programme Code	**107**	Regulation	**2019**
Department	**COMPUTER SCIENCE AND TECHNOLOGY**				Semester	**VI**

CURRICULUM
(Applicable to the students admitted from the academic year 2020 - 2021 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CT611	Foundations of Data Science	PCC	3	0	0	3	50	50	100
U19CT612	Machine Learning Techniques	PCC	3	0	0	3	50	50	100
U19CT613	Cloud Computing	PCC	3	0	0	3	50	50	100
U19IT620	Software Engineering^	PCC	3	0	0	3	50	50	100
	Professional Elective – II	PEC	3	0	0	3	50	50	100
	Open Elective – II	OEC	3	0	0	3	50	50	100
PRACTICAL									
U19CT614	Data Science Laboratory	PCC	0	0	4	2	50	50	100
U19CT615	Machine Learning Laboratory	PCC	0	0	4	2	50	50	100
U19EN603	Communication Skills Laboratory	EEC	0	0	3	1	100	-	100
MANDATORY COURSES									
	Mandatory Course - VI	MC	3	0	0	0	100	-	100
					Total	**23**	**450**	**350**	**800**

^ Common to IT and CST

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous Institution, Affiliated to Anna University, Chennai)Elayampalayam, Tiruchengode – 637 205

Programme	**B.E.**		Programme Code	**107**	Regulation	**2019**
Department	**COMPUTER SCIENCE AND TECHNOLOGY**				Semester	**VII**

CURRICULUM
(Applicable to the students admitted from the academic year 2020 - 2021 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CT716	Internet of Things	PCC	3	0	0	3	50	50	100
U19CT717	Block Chain Technology	PCC	3	0	0	3	50	50	100
	Professional Elective – III	PEC	3	0	0	3	50	50	100
	Professional Elective – IV	PEC	3	0	0	3	50	50	100
	Open Elective-III	OEC	3	0	0	3	50	50	100
PRACTICAL									
U19CT718	Internet of things Laboratory	PCC	0	0	4	2	50	50	100
U19IT719	Internship Training / Mini Project	EEC	0	0	8	4	50	50	100
					Total	21	450	350	800

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Programme	**B.E.**	Programme Code	107	Regulation	**2019**
Department	**COMPUTER SCIENCE AND TECHNOLOGY**			Semester	**VIII**

CURRICULUM
(Applicable to the students admitted from the academic year 2020 - 2021 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	**T**	**P**	**C**	**CA**	**ESE**	**Total**
THEORY									
	Professional Elective – V	PEC	3	0	0	3	50	50	100
	Professional Elective – VI	PEC	3	0	0	3	50	50	100
PRACTICAL									
U19CT820	Project Work	EEC	0	0	16	8	50	50	100
					Total	**14**	**150**	**150**	**300**

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Type of Courses

PCC	Professional Core Courses
PEC	Professional Elective Courses
OEC	Open Elective Courses
ITSP	Internship Training and Summer Project
EEC	Employability Enhancement Course
MC	Mandatory Courses
HSC	Humanities And Sciences
ESC	Engineering Sciences
BSC	Basic Sciences

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous Institution, Affiliated to Anna University, Chennai)
Elayampalayam, Tiruchengode – 637 205

Programme	**B.E.**		Programme Code	**107**		Regulation	**2019**	
Department	**COMPUTER SCIENCE AND TECHNOLOGY**				Semester		**V**	

CURRICULUM

Professional Elective – I

S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	Maximum Marks		
								CA	ESE	Total
1.	U19CTE01	Cryptography and Network Security	PEC	3	0	0	3	50	50	100
2.	U19CTE02	Pattern Recognition Techniques	PEC	3	0	0	3	50	50	100
3.	U19CTE03	Fundamentals of Virtualization	PEC	3	0	0	3	50	50	100
4.	U19CTE04	Mobile Computing	PEC	3	0	0	3	50	50	100
5.	U19CTE05	Socket Programming	PEC	3	0	0	3	50	50	100

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Programme	**B.E.**		Programme Code	**107**		Regulation	**2019**
Department	**COMPUTER SCIENCE AND TECHNOLOGY**					Semester	**VI**

CURRICULUM

Professional Elective -II

S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	Maximum Marks		
								CA	ESE	Total
1.	U19CTE06	Open Source Systems	PEC	3	0	0	3	50	50	100
2.	U19CTE07	Network Programming and Protocol	PEC	3	0	0	3	50	50	100
3.	U19CTE08	Wireless Sensor Networks	PEC	3	0	0	3	50	50	100
4.	U19CTE09	Distributed Systems	PEC	3	0	0	3	50	50	100
5.	U19CTE10	Computer Graphics and Multimedia	PEC	3	0	0	3	50	50	100

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Programme	**B.E.**		Programme Code	**107**		Regulation		**2019**
Department	**COMPUTER SCIENCE AND TECHNOLOGY**					Semester		**VII**

CURRICULUM

Professional Elective – III&IV

S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	Maximum Marks		
								CA	ESE	Total
1.	U19CTE11	Deep Learning	PEC	3	0	0	3	50	50	100
2.	U19CTE12	Software Performance Testing	PEC	3	0	0	3	50	50	100
3.	U19CTE13	Information Storage Management	PEC	3	0	0	3	50	50	100
4.	U19CTE14	High Performance Computing	PEC	3	0	0	3	50	50	100
5.	U19CTE15	Big Data Tools and Techniques	PEC	3	0	0	3	50	50	100
6.	U19CTE16	Inspired Computing Techniques	PEC	3	0	0	3	50	50	100
7.	U19CTE17	Database Security and Privacy	PEC	3	0	0	3	50	50	100
8.	U19CTE18	Business Intelligent Analytics	PEC	3	0	0	3	50	50	100

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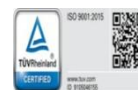
Programme	**B.E.**		Programme Code	**107**		Regulation	**2019**
Department	**COMPUTER SCIENCE AND TECHNOLOGY**					Semester	**VIII**

CURRICULUM

Professional Elective – V&VI

S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	Maximum Marks		
								CA	ESE	Total
1.	U19CTE19	Data Visualization	PEC	3	0	0	3	50	50	100
2.	U19CTE20	Software Defined Network	PEC	3	0	0	3	50	50	100
3.	U19CTE21	Biometrics Systems	PEC	3	0	0	3	50	50	100
4.	U19CTE22	Natural Language Processing	PEC	3	0	0	3	50	50	100
5.	U19CTE23	Forensic and Incident Response	PEC	3	0	0	3	50	50	100
6.	U19CTE24	Geographical Information Systems	PEC	3	0	0	3	50	50	100
7.	U19CTE25	Neuro Fuzzy and Genetic Programming	PEC	3	0	0	3	50	50	100
8.	U19CTE26	Knowledge Based Decision Support Systems	PEC	3	0	0	3	50	50	100

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LIST OF OPEN ELECTIVES

Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTOE1	Fundamentals of Artificial Intelligence	3	0	0	3	50	50	100
U19CTOE2	Fundamentals of Information Security	3	0	0	3	50	50	100
U19CTOE3	Fundamentals of Data Science	3	0	0	3	50	50	100
U19CTOE4	Fundamentals of Machine Learning	3	0	0	3	50	50	100
U19CTOE5	Fundamentals of Data Visualization	3	0	0	3	50	50	100
U19CTOE6	Computer Forensics	3	0	0	3	50	50	100

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MANDATORY COURSE

Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MCFY1	Environmental Science andEngineering	3	0	0	0	100	-	100
U19MCFY2	Indian Constitution and Universal Human values	3	0	0	0	100	-	100
U19MCSY3	Numerical Ability	3	0	0	0	100	-	100
U19MCSY4	Verbal Ability	3	0	0	0	100	-	100
U19MCTY5	Logical Reasoning	3	0	0	0	100	-	100
U19MCTY6	Personality Development	3	0	0	0	100	-	100
U19MCFY7	Comprehension on Electricity-Theoryand Practice-I	3	0	0	0	100	-	100
U19MCFY8	Comprehension on Electricity-Theoryand Practice-II	3	0	0	0	100	-	100

BSC - Basic Science Courses, ESC- Engineering Science Courses, MC -Mandatory courses, HSC-Humanities and Social Sciences, CA- Continuous Assessment, ESE - End Semester Examination.
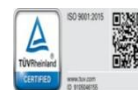

α Common for all branches
* Common for CSE, CST, IT, BT & Common for CSE, CST & EEE
$ Common for BME, CSE, CST, IT, ECE, BT

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Programme	**B.E.**		Programme Code	**101**		Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**					Semester	**-**

CURRICULUM
(Applicable to the students admitted from the academic year 2019- 2020 onwards)

LIST OF OPEN ELECTIVES

S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	Maximum Marks		
								CA	ESE	Total
1.	U19CSOE1	Introduction to IOT	OEC	3	0	0	3	50	50	100
2.	U19CSOE2	Ethical Hacking	OEC	3	0	0	3	50	50	100
3.	U19CSOE3	Smart Sensor Technologies	OEC	3	0	0	3	50	50	100
4.	U19CSOE4	Web Designing	OEC	3	0	0	3	50	50	100
5.	U19CSOE5	Data Analytics	OEC	3	0	0	3	50	50	100
6.	U19CSOE6	Enterprise Java	OEC	3	0	0	3	50	50	100
7.	U19CSOE7	Open Source Software	OEC	3	0	0	3	50	50	100
8.	U19CSOE8	Python Programming	OEC	3	0	0	3	50	50	100

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Programme	B.E.	Programme Code	**102**	Regulation	**2019**
Department	ELECTRICAL AND ELECTRONICS ENGINEERING			Semester	**-**

CURRICULUM
(Applicable to the students admitted from the academic year 2019- 2020 onwards)

LIST OF OPEN ELECTIVES

S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	Maximum Marks		
								CA	ESE	Total
1.	U19EEOE1	Electron Devices	OEC	3	0	0	3	50	50	100
2.	U19EEOE2	Electrical Safety	OEC	3	0	0	3	50	50	100
3.	U19EEOE3	Energy Auditing	OEC	3	0	0	3	50	50	100
4.	U19EEOE4	Energy Storage Technologies	OEC	3	0	0	3	50	50	100
5.	U19EEOE5	Biomass Energy Systems	OEC	3	0	0	3	50	50	100
6.	U19EEOE6	Energy Efficient Lighting System	OEC	3	0	0	3	50	50	100
7.	U19EEOE7	Soft Computing techniques	OEC	3	0	0	3	50	50	100
8.	U19EEOE8	Electrical Systems in industry	OEC	3	0	0	3	50	50	100

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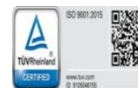</table>

		VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205		

Programme	B.E.	Programme Code	**103** Regulation	**2019**
Department	**ELECTRONICS AND COMMUNICATION ENGINEERING**		Semester	**-**

CURRICULUM

(Applicable to the students admitted from the academic year 2019- 2020 onwards)

LIST OF OPEN ELECTIVES

S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	CA	ESE	Total
								Maximum Marks		

S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	CA	ESE	Total

Maximum Marks

S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	CA	ESE	Total
OPEN ELECTIVE-I									
1.	U19ECOE1	Speech Processing	OE	3	0	0	3	50	50	100
2.	U19ECOE2	Biomedical Instrumentation	OE	3	0	0	3	50	50	100
3.	U19ECOE3	Automotive Electronics	OE	3	0	0	3	50	50	100
OPEN ELECTIVE-II									
1.	U19ECOE4	Satellite Communication	OE	3	0	0	3	50	50	100
2.	U19ECOE5	VLSI Design and Its Applications	OE	3	0	0	3	50	50	100
3.	U19ECOE6	Digital Image Processing	OE	3	0	0	3	50	50	100
OPEN ELECTIVE-III									
1.	U19ECOE7	Basics of Communication Systems	OE	3	0	0	3	50	50	100
2.	U19ECOE8	Wireless Sensor Networks	OE	3	0	0	3	50	50	100
3.	U19ECOE9	PCB Design and Fabrication	OE	3	0	0	3	50	50	100

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Programme	**B.Tech.**	Programme Code	**104**	Regulation		**2019**
Department	**INFORMATION TECHNOLOGY**			Semester		**-**

CURRICULUM
(Applicable to the students admitted from the academic year 2019- 2020 onwards)

LIST OF OPEN ELECTIVES

Course Code	Course Name	Hours /Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19ITOE1	Mobile application development	3	0	0	3	50	50	100
U19ITOE2	Robotics	3	0	0	3	50	50	100
U19ITOE3	Basics of Cloud Computing	3	0	0	3	50	50	100
U19ITOE4	Introduction to Data Structures	3	0	0	3	50	50	100
U19ITOE5	Cyber Security	3	0	0	3	50	50	100
U19ITOE6	Information Technology Essentials	3	0	0	3	50	50	100
U19ITOE7	Business intelligence and its Applications	3	0	0	3	50	50	100
U19ITOE8	Internet of Things	3	0	0	3	50	50	100
U19ITOE9	Introduction to Java Programming	3	0	0	3	50	50	100
U19ITOE10	Introduction to R Programming	3	0	0	3	50	50	100
U19ITOE11	Ethical Hacking	3	0	0	3	50	50	100
U19ITOE12	Cyber Forensics	3	0	0	3	50	50	100
U19ITOE13	E Learning Techniques	3	0	0	3	50	50	100

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN						
	(Autonomous Institution Affiliated to Anna University, Chennai)						
	Elayampalayam,Tiruchengode–637205						

Programme	**B.Tech.**	Programme Code	**105**		Regulation	**2019**	
Department	**BIOTECHNOLOGY**				Semester	**-**	

CURRICULUM
(Applicable to the students admitted from the academic year2019- 2020onwards)

LISTOFOPENELECTIVES

Course Code	Course Name	Hours /Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
OPEN ELECTIVE-I								
U19BTOE1	Biology for Engineers	3	0	0	3	50	50	100
U19BTOE2	Biofuels and Bioenergy	3	0	0	3	50	50	100
U19BTOE3	Bio-Business	3	0	0	3	50	50	100
OPEN ELECTIVE–II								
U19BTOE4	Basics of Bioinformatics	3	0	0	3	50	50	100
U19BTOE5	Human Health and Nutritional Disorders	3	0	0	3	50	50	100
U19BTOE6	Waste Management	3	0	0	3	50	50	100
OPEN ELECTIVE–III								
U19BTOE7	Food Processing and Preservation Technology	3	0	0	3	50	50	100
U19BTOE8	Forensic Technology	3	0	0	3	50	50	100
U19BTOE9	Biodiversity and Bio proprespecting	3	0	0	3	50	50	100

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Programme	**B.E.**	Programme Code	**106**	Regulation	**2019**
Department	**BIOMEDICAL ENGINEERING**			Semester	**-**

CURRICULUM
(Applicable to the students admitted from the academic year 2019-2020onwards)

LIST OF OPEN ELECTIVES

Course Code	Course Name	Hours /Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
OPEN ELECTIVE-I								
U19BMOE1	Biotelemetry	3	0	0	3	50	50	100
U19BMOE2	Virtual Instrumentation	3	0	0	3	50	50	100
U19BMOE3	Hospital Waste Management	3	0	0	3	50	50	100
OPEN ELECTIVE–II								
U19BMOE4	Medical Robotics	3	0	0	3	50	50	100
U19BMOE5	Healthcare Management Systems	3	0	0	3	50	50	100
U19BMOE6	Biometric Systems and Their Applications	3	0	0	3	50	50	100
OPEN ELECTIVE–II								
U19BMOE7	Basics of Biomedical Instrumentation							
U19BMOE8	Medical Informatics							
U19BMOE9	ICU and Operation Theatre Equipments							

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(Autonomous Institution, Affiliated to Anna University ,Chennai)
Elayampalayam, Tiruchengode – 637 205

Programme	B.E.	Programme Code			107	Regulation	2019
Department	Computer Science & Technology					Semester	I

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MA101	Calculus	3	1	0	4	50	50	100

Course Objective	The Main Objective of the course is to - Provide the information about Review of limits, continuity and differentiability. - Understand maxima and minima of functions of two variables. - Demonstrate Integral calculus. - Identify the problems based on area, surface and volume. - To Recognize the Second order linear differential equations

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Apply Mean value theorem and Taylor's theorem.	K1,K3
	CO2: Analyze Total derivative.	K2,K4
	CO3: Formulate Reduction Formulae.	K3,K5
	CO4: Translate Change of order of integration	K2,K5
	CO5: Apply method of variation of parameters.	K3,K5

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													CO/PSO Mapping	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3											2	
CO2	3	3											2	
CO3	3	3											2	
CO4	3	3											2	
CO5	3	3											2	

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2. Assignment. 3. End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus				
Unit – I	**DIFFERENTIAL CALCULUS**		Periods	**12**
Limit, continuity, differentiability , rules of differentiation, differentiation of various functions, Rolle's theorem(excluding proof), Mean value theorem(excluding proof), Taylor's theorem(excluding proof), Maxima and Minima. Physical Applications (Newton's law of cooling – Heat flow problems, Rate of decay of radioactive materials – Chemical reactions and solutions, Ohm's law, Kirchoff's law- Simple electric circuit problems)				
Unit – II	**FUNCTIONS OF SEVERAL VARIABLES**		Periods	**12**
Partial differentiation – Homogeneous functions and Euler's theorem(excluding proof) – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables(excluding proof) – Maxima and minima of functions of two variables				
Unit – III	**MUTIPLE INTEGRALS**		Periods	**12**
Riemann integral- Fundamental theorem of calculus(excluding proof) - methods of integration (Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions) -Reduction formula on $\int_0^{\frac{\pi}{2}} \cos^n x\,dx$, $\int_0^{\frac{\pi}{2}} \sin^n x\,dx$.				
Unit – IV	**ORDINARY DIFFERENTIAL EQUATIONS**		Periods	**12**
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.				
Unit – V	**ORDINARY DIFFERENTIAL EQUATIONS**		Periods	**12**
Second order Linear ordinary differential equations with constant coefficients, Cauchy's - Euler equations(excluding proof)- Legendre's Linear differential equations(excluding proof) - Method of variation of parameters.				
		Total Periods		**60**
Text Books				
1.	Stewart, J. Calculus: Early Transcendentals (8th Edition), Cengage Learning, 2015.			
2.	Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.			
References				
1.	Kreyszig E, Advanced Engineering Mathematics (10th Edition), John Wiley (2015).			
2.	Boyce W E and DiPrima R, Elementary Differential Equations (9th Edition), John Wiley (2005).			
3.	Nishant Shukla, Elementary Integral Calculus			
4.	Anton H, Calculus: Early Transcendentals, 10th Edition, Wiley (2012).			
5.	B V Ramana, Higher Engineering Mathematics, Tata McGraw Hill Education Pvt Ltd., New Delhi (2012)			
E-Resources				
1.	https://freevideolectures.com › All Courses › Calculus › UCLA			
2.	www.learnerstv.com/Free-engineering-Video-lectures			
3.	www.nptel.ac.in			

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205				

Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**I**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19EN101	English For Communication- I	3	0	0	3	50	50	100

Course Objective	The main objective of this course is to: • To make learners listen to audio files and replicate it in speaking contexts. • To make learners read widely in order to practice writing • To make learners develop vocabulary and strengthen grammatical understanding • Assist students in the development of intellectual flexibility, creativity, and cultural literacy so that they may engage in life-long learning. • Identify and begin to apply the language features of academic and professional writing and speaking.

Course Outcome	The students who complete this course successfully are expected to:	Knowledge Level
	CO1: Speak adequately from the inputs they gained through listening.	K2
	CO2: Write appropriately based on the knowledge gained through reading of a variety of materials	K3
	CO3: Use language through their grammatical acquisition and their knowledge about using right word at the right context.	K3
	CO4: Listen the accents and tones of the language properly.	K2
	CO5: Comprehend and retain the contextual and syntax understanding from reading.	K4

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						2			3	3		3		2
CO2						2			3	3		3		2
CO3						2			3	3		3		2
CO4						2			3	3		3		2
CO5						2			3	3		3		2

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Course Assessment Methods Direct	
Direct	
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations	
Indirect	
1.Course - end survey	

Content of the syllabus

Unit – I		Periods	**9**

Listening-Introduction to Different Types of Listening, Listening to Casual Conversations, **Speaking-** Introduction to develop the Art of Speaking, Giving Self Introduction, **Reading**–Understanding the Basics of Reading Skills, Reading Instructions and Technical Manuals, **Writing**- Introduction to writing strategies, Writing Definitions, **Focus on Language** - -Technical terms (Jargon), Word Formation with Prefixes and Suffixes, Using Active Voice and Passive Voice, Basic sentence patterns, Tenses (past, present, perfect and continuous tenses).

Unit – II		Periods	**9**

Listening- Listening to lectures, listening to description of equipment, **Speaking-** Strategies for Developing Conversational Skills, Short Conversations through Role Play Activities, **Reading**– Reading Comprehension, Reading e-mails, Reading Headlines, Predicting the Content, **Writing**- Note making, Writing Descriptions, **Focus on Language**–Collocations, Functional Use of Tenses, Subject - verb agreement.

Unit – III		Periods	**9**

Listening- Listening to different kinds of interviews (Face - to - face, radio, TV and telephone interviews), **Speaking-**Describing an Object, Asking Questions, Participating in Discussions **Reading**– Intensive reading, Reading passages for gist. **Writing**- Informal writing -short e-mails with emphasis on Brevity, Clarity, Coherence and Cohesion), **Focus on Language**–Sequential Connectives, Impersonal Passive

Unit – IV		Periods	**9**

Listening-Note Taking, **Speaking-** Improving Fluency through Narration. **Reading**–Reading passages for specific information- Phone messages, Reading and Transferring Information. **Writing**- Effective writing strategies, Informal writing, Writing a Memo, **Focus on Language**– Pronunciation Practice (Phonetic sounds - Vowels, Consonants and Diphthongs), Cause and Effect, Conditional Statements (if - clauses and types), Usage of Modal Verbs.

Unit – V		Periods	**9**

Listening- Listening to understand Modulation, Listening to Welcome Speeches, **Speaking-** Delivering Welcome Addr**ess,** Understanding Segmental and Suprasegmental Features-Practicing Stress, Pause and Intonation, **Reading**– Reading for a purpose, Reading Business Documents, Interpreting Charts and Graphs,. **Writing**- Writing Business e-mails, Describing a Process. **Focus on Language** -Synonyms and Antonyms, Common Errors in English.

	Total Periods	

Text Books	
1.	Sumant. s, Pereira Joyce, Shameem.M, Selvarajan.R-English Communication Skills,Vijay Nicole imprints Pvt.Ltd, 2015.

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2.	Sokkaalingam, S.RM., The Art Of Speaking EnglishVersatile Publishing House,2018.	
	References	
1.	Dr. Padma Ravindran, Poorvadevi, M. Y. AbdurRazack- English for life, English for work, students Book, Ebek language laboratory pvt ltd, 2011.	
2.	DuttRajeevan, Prakash. A Course in Communication Skill (Anna University, Coimbatore edition): Cambridge University Press India Pvt.Ltd, 2007.	
3.	S.P. Dhanavel, English and Communication Skills for Students of Science and Engineering, Orient BlackswanPvt, Ltd, 2009.	
4.	Technical English – I & II, Sonaversity, Sona College of Technology, Salem, First Edition, 2012.	
5.	Meenakshmi Raman and Sangeeta Sharma- 'Technical communication English Skills for Engineers; oxford University Press, 2008.	

E-Resources
1.	http://www.sparknotes.com/lit/the-alchemist/summary.html
2.	https://www.stephencovey.com/7habits/7habits.php
3.	http://en.wikipedia.org/wiki/The_Seven_Habits_of_Highly_Effective_People

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205					
Programme	**B.E.**	Programme Code			**107**	Regulation	**2019**
Department	**Computer Science & Technology**					Semester	**I**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19PH105	**Engineering Physics**	3	0	0	3	50	50	100

Course Objective	The student should be made to, • understand the basic concepts of properties of matter • gain knowledge about the conduction properties of metals • identify the different types of crystal structures and crystal growth techniques. Study the production and applications of ultrasonics. • correlate better understanding the carrier concentration and its variations with temperature in a semiconductor. Study the properties of modern engineering materials and its uses • categorize the types of laser and fiber optics

Course Outcome	At the end of the course, the student will be able to	Knowledge Level
	CO1: Understand the elastic properties of the materials	K2
	CO2: gain knowledge about the conduction properties of metals	K3
	CO3: determine packing factor for various unit cells and understand different types of crystal imperfections and learn the engineering, medical applications.	K1
	CO4: discuss the basic idea of semiconducting materials and realize the function of modern engineering materials	K1
	CO5: learn the optical properties of materials and its uses	K3
Pre-requisites	-	

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COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
CO1	3	2	3	1	2									2
CO2	3	2	3	3	1									
CO3	3	3		3	1									2
CO4	3		2	1	1								3	2
CO5	3			1	2	2								2

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III
2. Assignment.
3. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	PROPERTIES OF MATTER	Periods	9

Elasticity: Types of moduli of elasticity - Stress - Strain Diagram – uses. Young's modulus: Experimental determination by non-uniform bending - Twisting couple on a wire – Application: Torsional pendulum.
Viscosity: Co-efficient of viscosity - Poiseuilles' formula - Experimental determination – uses.

Unit – II	ELECTRONS IN SOLID	Periods	9

Classical theory: Classical free electron theory of metals- Expressions for electrical conductivity and Thermal Conductivity of metals – Wiedemann-Franz law (Qualitative) - Success and failures.
Quantum theory: de Broglie's hypothesis - Schrodinger's time independent and time dependent wave equations (Qualitative) - Particle in a one-dimensional box - Fermi – Dirac Statistics - Density of energy states (Qualitative).

Unit – III	CRYSTAL PHYSICS AND ULTRASONICS	Periods	9

Crystallography - Unit cell - Crystal systems - Bravais lattices- Lattice planes - Miller indices - Inter-planar spacing in cubic lattice- Calculation of number of atoms per unit cell- Atomic radius – Coordination number- Packing Factor for HCP structures.
Ultrasonics: Introduction – Magnetostriction and Piezoelectric Oscillator methods – Applications: Sound Navigation and Ranging (SONAR), Non – Destructive Testing (NDT) and Sonogram.

Unit – IV	SEMICONDUCTING & MODERN ENGINEERING MATERIALS	Periods	9

Intrinsic semiconductor: (Qualitative only) – Carrier concentration – Fermi level – Electrical conductivity - Band gap determination. Extrinsic semiconductors: Carrier concentration in n – type and p – type semiconductor (Qualitative) – Variation of Fermi level with temperature.
Metallic glasses: preparation, properties and applications - Shape memory alloys (SMA): Characteristics and applications of NiTi alloy

Unit – V	LASER AND FIBER OPTICS	Periods	9

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Laser: Characteristics of laser – Derivation of Einstein's A and B coefficients. Types: Nd-YAG laser - Semiconductor laser: Homo junction - Applications.

Optical fiber: Principle of propagation of light through optical fiber - Numerical aperture and acceptance angle (Qualitative) -Types of optical fibers -Fiber optical communication system (block diagram) -Application: Medical endoscope

	Total Periods	

Text Books		
1.	R.K. Gaur and Gupta. S.L, Engineering Physics, Dhanpat Rai Publishers, 2017.
2.	Pillai., Solid state physics, New Age International Private Limited.
3.	Dr.P.Mani, "Engineering Physics", Shri Dhanam publisher, Chennai – 600 042

References	
1.	B.K. Pandey, S. Chaturvedi. "Engineering Physics", 1st Edition, Cengage Learning India Pvt Ltd, (2012).
2.	Fundamentals Of Physics Extended 8/Ed 8th Edition, David Halliday, Robert ResnickJearl Walker, Wiley India Pvt Ltd, 2008.
3.	Lawrence H.Vanvlack, "Elements of materials Science Engineering, 6th Edition, Pearson Publication.
4.	S.O.Pillai, "Solid State Physics", New Age International Publishers
5.	Dr.V.Rajendran, "Engineering Physics", Tata McGraw Hill Education Private Limited, New Delhi

E-Resources	
1.	www.e-booksdirectory.com
2.	Home.iitk.ac.in
3.	physics.cu.ac.bd/

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN						
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	Elayampalayam, Tiruchengode – 637 205						

Programme	**B.E.**	Programme Code			**107**	Regulation	**2019**
Department	**Computer Science & Technology**					Semester	**I**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS101	**Programming for Problem Solving**	3	0	0	3	50	50	100

Course Objective	The main objective of this course is to: • Learn the fundamentals of computers and acquire problem solving skills • Understand C programming concepts • Write the programs using arrays and strings • Write the programs using functions • Write the programs using structures

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Write the algorithms and to draw flowcharts for solving problems.	K3
	CO2: Analyze the basics of C programming language	K4
	CO3: Implement the C programs using arrays and strings	K4
	CO4: Develop C programs using the functions and pointers.	K3
	CO5: Solve the real time problems using Structures and union	K3

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	-	2	-	-	3	3	3	3	2	3	-
CO2	3	3	3	-	2	-	-	3	3	3	3	2	3	-
CO3	3	3	3	-	2	-	-	3	3	3	3	2	3	-
CO4	3	3	3	2	2	-	-	3	3	3	3	2	3	-
CO5	3	3	3	2	2	-	-	3	3	3	3	2	3	3

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III   2. Assignment   3. End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit – I	**INTRODUCTION TO PROBLEM SOLVING**	Periods	**9**
Basic Organization of Computer - Programming Languages- Flowchart – Pseudocode - Compilers- Interpreter-Algorithm - Building Blocks of Algorithm - Algorithmic Problem Solving-Simple Strategies for Developing Algorithms - Illustrative Problems: Find Minimum value from list of elements, Guess an Integer Number in a Range, Factorial of a given number			
Unit – II	**C PROGRAMMING**	Periods	**9**
Introduction to C – Features - Data Types – Constants – Variables - I/O Statement - Operators –Expressions - Decision Making and Branching – Looping Statements - Break, Goto, Continue.			
Unit – III	**ARRAYS AND POINTERS**	Periods	**9**
Arrays: Concepts – Need – one dimensional array – array declaration – features – array initialization - Two-Dimensional Arrays- Multidimensional Arrays. **Pointers:** Introduction, pointer declaration-accessing variable through pointer-pointers and Arrays, Pointers and strings – Pointers structures-pointer Arithmetic - Array of Pointers – dynamic memory allocation.			
Unit – IV	**FUNCTIONS AND STRINGS**	Periods	**9**
Function: Introduction, function declaration, defining and accessing functions, User-defined Functions-storage classes-function prototypes-parameter passing methods-recursion. **Strings:** Concepts – Strings manipulation - String Input / Output Functions- Strings standard functions -Arrays of Strings.			
Unit – V	**STRUCTURES AND UNIONS**	Periods	**9**
Structures-Introduction- nested structures- Arrays of Structures - Structures and Functions - Pointers to Structures – Unions- Type Definition – Bitfields- Enumerated Types.			
		Total Periods	**45**

Text Books

1.	Kernighan BW and Ritchie DM, "The C Programming Language", 2nd Edition, Prentice Hall ofIndia, 2015.
2.	E. Balagurusamy, Computer Programming, First Edition, Mc Graw Hill, 2016.

References

1.	Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
2.	Dr.V.Rameshbabu, Dr.R.Samyutha, M.Muni Rathnan, "Computer Programming", VRB Publishers Pvt.Ltd,
3.	E. Balagurusamy, Programming in ANSI C, Seventh Edition, Mc Graw Hill, 2017.

E-Resources

1.	https://www.geeksforgeeks.org/c-language-set-1-introduction/
2.	https://www.programiz.com/c-programming
3.	https://www.cprogramming.com/

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**B.E.**	Programme Code			**107**	Regulation	**2019**	
Department	**Computer Science & Technology**					Semester	**-**	

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19GE101	**Engineering Graphics**	2	0	3	3	50	50	100

Course Objective	**The main objective of this course is to:** • Develop skills to enhance their ability to know the concept of engineering graphics and to draw the points kept in various positions, lines and planes. •Project the drawing of various solids. • Sketch sectioned views of solids. • Draw the development of surfaces. • Draw the isometric and orthographic projections for any given object to the required standard

Course Outcome	At the end of the course, the student should be able to	Knowledge level
	CO1: Construct plane curves and develop projection of points , lines and plane surfaces	K2
	CO2: Construct projection of solids with various conditions.	K4
	CO3: Design the section of solids and analyze the true shape of the section	K3
	CO4: Design and develop the different solid surfaces.	K2
	CO5: Construct isometric and orthographic projection of different solids.	K1

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	-	-	-	-	-	-	-	3	2
CO2	3	3	2	2	2	-	-	-	-	-	-	-	2	-
CO3	3	2	2	2	3	-	-	-	-	-	-	-	2	2
CO4	3	2	3	3	2	-	-	-	-	-	-	-	3	3
CO5	3	3	2	3	3	-	-	-	-	-	-	-	2	2

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Concepts & Conventions(Not for Examination)	Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.	**Periods**	**1**
Unit – I	**PROJECTION OF POINTS, LINES AND PLANE SURFACES**	Periods	**3+8**
Introduction to Plane curves, Orthographic projection – principles – projection of points, straight lines (only first angle projections) and plane surfaces (polygonal and circular).			
Unit – II	**PROJECTION OF SOLIDS**	Periods	**3+8**
Projections of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane.			
Unit – III	**SECTION OF SOLIDS**	Periods	**3+8**
Sectioning of solids - prisms, pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other - Obtaining true shape of section.			
Unit – IV	**DEVELOPMENT OF SURFACES**	Periods	**3+8**
Development of lateral surfaces of simple solids like prisms, pyramids, cylinders and cones – development of simple truncated solids involving prisms, pyramids, cylinders and cones.			
Unit – V	**ISOMETRIC PROJECTIONS, ORTHOGRAPHIC VIEWS FROM PICTORIAL VIEWS**	Periods	**5+10**
Isometric Projection and Introduction to AutoCAD / Solid Edge: Principles of isometric projection - Isometric scale -Isometric projections of simple solids like prisms, pyramids, cylinders and cones & orthographic views from pictorial views.			
Demonstration only: **Computer Aided Drafting (Auto CAD / Solid Edge):** Introduction to drafting packages and demonstration of their use.			
		Total Periods	**60**

Text Books

1. Basant Agrawal and C.M Agrawal ,"Engineering Drawing ",Tata McGraw Hill ,Third Edition,2019.
2. Jain and Gautam ,"Engineering Graphics & Design ",Khanna Publishing House, 2018

References

1. Dr.P.Kannan and Dr.J.Bensam Raj, "Engineering Graphics", JBR Tri Sea Publishers Pvt. Ltd,2018.
2. K.V Natarajan, "Engineering Drawing and Graphics", M/s. N.Dhanalakshmi, Chennai,2014.
3. K.Venugopal and V. Prabhu Raja, "Engineering Graphics"New Age International Publishers,2011.
4. N.S Parthasarathy and Velamurali, " Engineering Graphics", Oxford University, New Delhi,2015
5. Bhatt N.D and Panchal V.M, "Engineering Drawing", Charotar Publishing House,50th Edition,2010

E-Resources

1. http://nptel.ac.in/courses/105104148, "Engineering Graphics" - Dr. Nihar Ranjan Patra , IIT Kanpur
2. http://cfd.annauniv.edu/webcontent.htm, "Engineering Graphics" - Dr.Velamurali
3. http://link.springer.com/ "Engineering Graphics"-Springer Nature.

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205	

Programme	**B.E.**	Programme Code				**107**	Regulation		**2019**
Department	**Computer Science & Technology**						Semester		**I**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19PH106	**PHYSICS LABORATORY**	0	0	4	2	60	40	100

Course Objective	**The main objective of this course is to:** • Understand elastic behavior of Materials • Predict viscous force in liquids. • Gain knowledge in measuring the lowest thickness materials • To Identify wavelengths of prominent lines using polychromatic lamp • Observe heat conduction in bad conductor • Understand the principle of interferometer • To learn about the characteristics of Lasers

Course Outcome	At the end of the course, the student will be able to	Knowledge level
	CO1: Measure the young"s modulus of the materials, Rigidity modulus – Torsion pendulum	K3
	CO2: Calculate Coefficient of viscosity of liquid and thickness of thin wire using Air wedge	K3
	CO3: Observe and measure the different wavelengths of mercury Spectrum and dispersive power of a prism	K3
	CO4: Illustrate the conductivity of bad conductors. To know how to determine the velocity of ultrasonic waves in liquid	K3
	CO5: To understand the importance of laser beam compared to ordinary light	K2

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak														**CO/PSO Mapping**	
Programme Outcomes (POs)														PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		PSO 1	PSO 2
CO1	3	1												2	
CO2	3	3	1	2	2									2	
CO3	3	2			2									3	
CO4	3	3		1										1	
CO5	3	1	1		1									2	

Course Assessment Methods Direct

Direct
1. Prelab and post lab test   **2.** End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus		
PHYSICS		
1.	Determination of Young's modulus of the material - Uniform bending method	**CO1**
2.	Determination of Young's modulus of the material - Non uniform bending method	**CO1**
3.	Determination of Rigidity modulus – Torsion pendulum	**CO1**
4.	Determination of Coefficient of viscosity of a liquid – Poiseuille's method	**CO2**
5.	Determination of thickness of a thin material – Air wedge method	**CO2**
6.	Determination of wavelength of mercury spectrum – spectrometer grating	**CO3**
7.	Determination of Dispersive power of a prism – Spectrometer	**CO3**
8.	Determination of thermal conductivity of metallic glass using Lee's Disc Method	**CO4**
9.	Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer	**CO4**
10.	Determination of Wavelength and particle size using Laser	**CO5**
	Total Periods	**45**

Text Books

1.	R. Jayaraman, Engineering Physics Laboratory Manual, Pearson Pub, Edition-2021.
2.	A.K. Katiyar &C.K. Pandey Engineering Physics: Theory and Practical, Wiley Pub,2 nd Edition.

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Programme	**B.E. / B.Tech.,**		Programme Code		Regulation		**2019**
Department	**CSE, EEE, ECE, IT, Bio-Tech, CST & BME**				Semester		**I**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS102	**Computer Practices Laboratory**	0	0	4	2	50	50	100

Course Objective	The Main Objective of the course is to • Make the students to learn the programming language • Understand the basic programming constructs and articulate how they are used • Develop a program with a desired runtime execution flow • Articulate where computer programs fit in the provision of computer based solutions to real world problems • Develop modular, efficient and readable C programs by hands-on experience.

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Prepare document using word processor and spread sheet	K3
	CO2: Sketch flow of execution of C programs using algorithm and flowcharts	K3
	CO3: Write the simple C Programs using decision and looping statements	K3
	CO4: Demonstrate code reusability with the help of user defined functions and pointers.	K4
	CO5: Write programs that perform operations using derived data types.	K3

Pre-requisites	**NIL**	

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Cos	Programme Outcomes (POs)												PSOs	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO 1	3	3	3		3			1	1	2		3	3	2
CO 2	3	3	3		3			2	1	3		2	3	2
CO 3	3	3	3	2	3			2	2	3		2	3	2
CO 4	3	3	3	2	3			2	2	3		2	3	2
CO 5	3	3	3	3	3			2	2	3		2	3	1

Course Assessment Methods

Direct
1.   Prelab and post lab test 2.   Conduct of experiments & Viva 3.   End-Semester examinations
Indirect
1.   Course - end survey

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	Course Outcome
LIST OF EXPERIMENTS:	
1. Design an algorithm and flowchart using word processor that reads the customer number and power consumed and prints the amount to be paid by the customer. An electric power distribution company charges its domestic consumers as follows Consumption Units Rate of Charge --- 0-200 Rs.0.50 per unit 201-400 Rs.100 plus Rs.0.65 per unit excess 200 401-600 Rs.230 plus Rs.0.80 per unit excess of 400.	**CO1**
2. Design an algorithm and flowchart for a simple calculator program using word processor for performing various arithmetic operations such as "+" - Addition "-" - Subtraction "*" - Multiplication "/" - Division "%" - Modulus	**CO2**
3. Design and develop a C program to accept a number from the user and check whether it is a palindrome or not. Palindrome number : (a number is a Palindrome which when read in reverse order is same as read in the right order) Example: Palindrome :11, 101, 151 Not a Palindrome:123 , 100	**CO3**
4. Develop a C program to find the sum of the digits of an integer and the number of digits in the integer that is given as input by the user. Test Case: Sample Input: 15390 Sample Output: Sum of the digits=18 No. of digits = 5 For an incorrect choice, an appropriate error message should be displayed.	**CO3**
5. Develop a program to perform the following operations using two dimensional or multi-dimensional matrices: a. Addition of two matrices (3x3) b. Subtraction of two matrices (2x2) c. Multiplication of two matrices using dynamic memory allocation.	**CO3**
6. Write a program to find the maximum and minimum element in a set of inputs using one dimensional array.	**CO3**

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7. Write a program to count the total number of vowels and consonants in a string. For example Input string: I am proud to be an Indian Output: Total vowels – 10 and Total consonants – 10	**CO4**

8. Develop a program to perform the following string manipulations without using string functions:
    a. String copy
    b. String Concatenate
    c. String length
    d. String Compare
	CO4

9. The Fibonacci numbers are defined recursively as follows:
    F1=1
    F2=1
    Fn= Fn-1 + Fn-2, n>2
    Write a function that will generate and print the first n Fibonacci numbers.
    Test the function for n=5,10,15
	CO4

10. Write a function using pointers to exchange the values stored in two locations in the memory.
  Test Case :
  Input : A=10 , B=-5
  Output : A= -5 , B=10
	CO4

11. Develop a program to build a database of students with the following attribute: Roll no, Name, Course, Stream, Percentage, and Division. Take input for each student in all fields except division. Calculate division of each student such that those students having percentage >=60% are belongs to first division. Similarly, for second and third division students having conditions 50 %< =percentage<60% and 35 %< =percentage<50% respectively. If any student has percentage less than 35% then write "fail" in division field. After building the database display the database of the students. Hint: create database using structure.	**CO5**
Total Periods	**45**

E-Resources	
1.	https://www.programiz.com/c-programming
2.	https://www.cprogramming.com/
3.	https://beginnersbook.com/2015/02/simple-c-programs/

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Programme	**B.E.**	Programme Code				**107**	Regulation		**2019**
Department	**Computer Science & Technology**						Semester		**I**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MCFY1	**Environmental Science and Engineering**	3	0	0	0	100	0	100

Course Objective	The main objective of this course is to: • Familiarize basics of ecosystem and creating environmental awareness. • Congregate quality and standards requirement of water. • Contrast water management procedures. • Acquire knowledge on air pollution and its control. • Summarize Solid waste and its prevention methods.

Course Outcome	The students who complete this course successfully are expected to:	Knowledge level
	CO1: Distinguish the types of Ecosystem and implicit the knowledge.	K1
	CO2: Recognize quality, standard and control strategies of polluted water.	K3
	CO3: Infer and express air pollution and its control.	K3
	CO4: Acquire Knowledge about Radioactive pollution and disposal method	K3
	CO5: Aweraness about population growth, human rights and Environment	K2

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	1	1			2	3				1	2		
CO 2	1	2	2			2	3					3		1
CO 3	2	2	1			3	3				1	2		1
CO 4	1	1	1			2	3				1	2		
CO 5	1	2	1			2	2				1	3	2	

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit – I	**Introduction to Environmental Science and Engineering**	Periods	**9**

Nature and scope of environmental education- Natural Resources – (Forest, Water, Food, Energy &Land Resources) problems and remedial measures, Ecosystem and Biodiversity- Ecosystem-Structure, Characteristics and functions of ecosystem (in general)- Biodiversity – Definition – Conservation of Biodiversity (in-situ and Ex-situ)- Environmental awareness and sustainable development

Unit – II	**Water pollution and Waste water treatment process.**	Periods	**9**

Water pollution-causes, effects and control measures of water pollution- case study- Waste water treatment process- Primary, Secondary , Tertiary and desalination -Water quality parameters- Hardness, Alkalinity, DO, COD, BOD-Water quality standard- WHO and BIS.

Unit – III	**Air Pollution and its Control**	Periods	**9**

Air Pollution – Types of Air pollutants-CO_2,SO_2, NO_2, PAN etc Sources- causes, effects (Acid rain, Green house effect, Ozone layer depletion and global warming)- control measures (Electro static precipitator, Gravitational settling chamber, Baghouse filter, Wet Scrubber and cyclone separator).

Unit – IV	**Radioactive Pollution and Solid waste management**	Periods	**9**

Radio active pollutants-sources, effects , Nuclear Energy – Nuclear Fusion –Nuclear Fission-Nuclear power plant- Light water nuclear power plant- Diagram- illustration- working – pollution- impacts-and control measures- case study- solid waste-definition-Types of solid waste- Disposal method and its problem in solid waste management-Significance for prevention of hazardous waste management.

Unit – V	**Human population and the environment**	Periods	**9**

Population growth, Human rights, Value education, environment and Human health, Family welfare Program, Women and Child welfare, Role of information technology in environment – Satellite, Data base, Geographical Information System (GIA), Environmental impact Analysis (EIA) and Human health.

		Total Periods	**45**

Text Books	
1.	Dr.S. Vairam, "Environment Science and Engineering" Gems publication. Edition 2018
2.	Gilbert.M.Masters-"Environmental Science"-Pearson education. Edition-2-2013

References	
1.	Linda Williams- "Environmental Science"-Tata McGRAW – Hill Edition. Edition-I-2008
2.	T.G.Miller Jr-"Environmental Science"-Wadsworth publishing Co. Edition -10-2004
3.	William P. Cunningham, Barbara Woodworth Saigo- Tata McGraw Hill.Edition-4-2011
4.	NPTEL Course Notes
5.	Cunnighum and cooper-"Environmental Science"-Jaico Publ, House Edition-4-2007

E-Resources	
1.	https://libraries.ou.edu/
2.	https://libguides.reading.ac.uk/
3.	https://libguides.reading.ac.uk/

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<table>
<tr><td colspan="2" rowspan="3" style="text-align:center">(logo)</td><td colspan="7" style="text-align:center">VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN</td><td colspan="2" rowspan="3" style="text-align:center">(seal)</td></tr>
<tr><td colspan="7" style="text-align:center">(Autonomous Institution, Affiliated to Anna University ,Chennai)</td></tr>
<tr><td colspan="7" style="text-align:center">Elayampalayam, Tiruchengode – 637 205</td></tr>
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Programme	**B.E.**		Programme Code	**107**	Regulation		**2019**
Department	**Computer Science & Technology**				Semester		**II**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MA202	**Linear Algebra and Ordinary Differential Equations**	3	1	0	4	50	50	100

Course Objective	The Main Objective of the course is to • Understand Eigen values and Eigen vectors and its role in the system of. equations • Proficiently understand the vector differential calculus. • Demonstrate vector integral calculus. • To know about Cartesian and Polar co-ordinates and also transformations. • Identify the Laplace transform of derivatives and integrals.

Course Outcome	At the end of the course, the student should be able to,	owledge level
	CO1: Analyze the Reduction of a quadratic form.	K3, K4
	CO2: Identify vector differential calculus.	K2, K3
	CO3: Apply Green's , Stoke's and Gauss Divergence theorems	K1, K5
	CO4: Identifying the analytic functions	K2, K5
	CO5: Recognize the Laplace transform of unit step and unit impulse functions.	K5, K3

e-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
COs	Programme Outcomes (POs)												PSOs	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
CO 1	3	3											2	
CO 2	3	3											2	
CO 3	3	3											2	
CO 4	3	3											2	
CO 5	3	3											2	

Course Assessment Methods

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1. Course - end survey

Content of the syllabus

Unit – I	**MATRICES**	Periods	**12**

Characteristic equation – Eigen values and Eigenvectors of a real matrix– Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem(excluding proof) – Diagonalization of matrices – Reduction of a

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quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms. Simple application in encoding message using 2×2 matrix.			
Unit - II	**VECTOR DIFFERENTIAL CALCULUS**	Periods	**12**
Vector Differentiation: Vector and Scalar Functions- Derivatives- Curves, Gradient of a Scalar Field- Directional Derivative -Divergence of a Vector Field - Curl of a Vector Field – Tangents and Normals.			
Unit – III	**VECTOR INTEGRAL CALCULUS**	Periods	**12**
Line, Surface and Volume integrals, Green's theorem in a plane(excluding proof), Gauss Divergence theorem(excluding proof), Stokes theorem (Excluding proof) - simple applications involving rectangular parallelepipeds and spheres.			
Unit - IV	**ANALYTIC FUNCTIONS**	Periods	**12**
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions c+z, cz,1/z and Bilinear transformation.			
Unit – V	**LAPLACE TRANSFORMS**	Periods	**12**
Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems(excluding proof) -Transforms of derivatives and integrals – Initial and final value theorems(excluding proof) – Inverse transforms – Convolution theorem(excluding proof) – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.			
		Total Periods	**60**

Text Books	
1.	T.Veerarajan, Engineering Mathematics, Tata McGraw Hill Education Pvt. Ltd-2012
2.	Ravish R Sing , Mukul Bhatt, "Engineering Mathematics", Mc Graw Hill Education Pvt. Ltd-2018
ferences	
1.	Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics" , Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.
2.	Kreyszig, E., Advanced Engineering Mathematics (10th Edition), John Wiley (2015).
3.	Alan Jefferis , Advanced Engineering Mathematics,Academic Press- New Delhi-2003
4.	Yunus A.Cengel, William J.Palm III," Differential equations for Engineers & Scientists", Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.
5.	John Bird, Higher Engineering Mathematics, Anuradha Agencies(2004)
Resources	
1.	https://en.wikipedia.org › wiki › Ordinary_differential_equation
2.	www.learnerstv.com/Free-engineering-Video-lectures
3.	www.nptel.ac.in

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205	

Programme	B.E.	Programme Code		107	Regulation		2019	
Department	**Computer Science & Technology**				Semester		**II**	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19EN202	**English for Communication – II**	3	0	0	3	50	50	100

Course Objective	The main objective of this course is to: • To provide suitable listening tasks to develop communicative ability for academic and professional progress • To inculcate channelized reading to make learners proficient in the chosen professional writing contexts. • To improve learners' vocabulary and grammar to supplement their language use at professional contexts • Assist students in the development of intellectual flexibility, creativity, and cultural literacy so that they may engage in life-long learning. • Identify and begin to apply the language features of academic and professional writing and speaking

		Knowledge level
Course Outcome	The students who complete this course successfully are expected to:	
	CO1: Acquire sufficient command over language to speak at an academic or professional context through continuous exposure to similar listening tasks.	K2
	CO2: Write technically well at a professional contexts through exposing them to similar readings.	K3
	CO3: Use language at length at technical and professional situations through the enrichment of vocabulary and strengthening of grammatical knowledge.	K3
	CO4: Students should be able to ethically gather, understand, evaluate and synthesize information from a variety of written and electronic sources.	K2
	CO5: Students should be proficient in oral communication and writing.	K4

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													CO/PSO Mapping	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1						2			3	3		3		2
CO 2						2			3	3		3		2
CO 3						2			3	3		3		2
CO 4						2			3	3		3		2
CO 5						2			3	3		3		2

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Course Assessment Methods Direct	
Direct	
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations	
Indirect	
1.Course - end survey	

Content of the syllabus

Unit – I		Periods	**9**

Listening- Listening for Cultural Awareness, Listening to Professional Conversations, Talks, Interviews and Lectures **Speaking-** Developing Confidence to get rid of Fear on the Dias, Discussion at a Corporate Context. **Reading**– Inferential Reading, Reading Short Messages and Technical Articles, **Writing**- Introduction to Letter Writing, Writing Formal and Informal Letters, Thanking Letters, Letters Calling for Quotations, Letters Placing an Order, Seeking clarification, Letters of Complaint. **Focus on Language**–Adjectives and Degrees of Comparisons

Unit – II		Periods	**9**

Listening- Listening to specific information relating to technical content, Listening for statistical information **Speaking-** Expressing opinions, Formal Discussions, Describing Role Play at Business Context and Consolidating Ideas. **Reading**–Reading Technical Articles in Journals and Comparing Articles. **Writing**- Letter seeking permission to undergo practical training and to undertake project work. **Focus on Language**– Simple, compound and complex sentences and Transformation of Sentences.

Unit – III		Periods	**9**

Listening- Listening to understand the overall meaning, Listening to Interviews and Presentations. **Speaking-** Giving Instructions and Showing Directions and Rephrasing Instructions. **Reading**– Skimming and Scanning, Reading Job Advertisements. **Writing**- Applying for a Job, Writing a CV. **Focus on Language**– Pronouns, Phrasal verbs, Restrictive and Non - restrictive clauses.

Unit – IV		Periods	**9**

Listening- Listening and retrieving Information. **Speaking-** Developing fluency and Coherence, Accent Neutralization, Voice Modulation, and Intonation, Improving Voice Quality. **Reading**–Reading and understanding Advertisements. **Writing**- Letters to the Editor, Letter of Complaint, Various kinds of Reports, Permission to go for Industrial visits. **Focus on Language**– Countable, Uncountable nouns, Recommendations, Discourse Markers and Comparative and Contrastive Connectives, Imperatives.

Unit – V		Periods	**9**

Listening- Listening to Fragmented Texts and Filling in the Blanks. **Speaking-**Mind Mapping, Developing Coherence and Self-Expression, Making presentations, Paralinguistic and Extra linguistic Features (body language), **Reading**– Predicting content, Interpreting Reports. **Writing**- Writing Proposals, Agenda, Minutes of the Meeting. **Focus on Language**– British and American Vocabulary, Editing, Error Detection, and Punctuation.

	Total Periods	**45**

Text Books	
1.	Sumant.S,Pereira Joyce, English for Communication, Vijay Nicole Imprints Pvt.Ltd., 2014.

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2.	Sokkaalingam, S.RM., The Art Of Speaking EnglishVersatile Publishing House,2018.

References	
1.	Norman Whitby - Business Benchmark Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2008. , 1997.
2.	Dutt, Rajeevan, Prakash .A Course in Communication Skills (Anna University, Coimbatore edition) :. Cambridge University Press India Pvt.Ltd, 2007.
3.	Meenakshi Raman and Sangeeta Sharma-'Technical Communication English Skills for Engineers'; Oxford University Press, 2008.
4.	S.P. Dhanavel, English and Communication Skills for Students of Science and Engineering, Orient BlackswanPvt, Ltd, 2009.
5.	Technical English – I & II, Sonaversity, Sona College of Technology, Salem, First Edition, 2012.

E-Resources	
1.	http://www.kalevleetaru.com/Publish/Book_Review_Who_Moved_My_Cheese.pdf
2.	http://www.bookbrowse.com/reviews/index.cfm/book_number/304/who-moved-my-cheese
3.	http://www.imdb.com/title/tt0482629/plotsummary

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Programme	B.E.	Programme Code			107	Regulation		2019	
Department	**Computer Science & Technology**					Semester		**II**	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CH207	**Engineering Chemistry**	3	0	0	3	50	50	100

Course Objective	The main objective of this course is to: • To recognize the basic technology requirements in water treatment • To gain knowledge in Polymeric materials towards engineering applications. • To enrich the Knowledge of the students with the basics of Nano materials, their properties and applications. • Familiarize about the renewable energy and different types of batteries in the engineering application. • Gain knowledge in destruction of metals and protection for engineering applications

Course Outcome	The students who complete this course successfully are expected to:	Knowledge Level
	CO1: Implement innovative solutions in **wastewater** treatment process.	K3
	CO2: Identify the applications of a specific polymer in the field of engineering.	K2
	CO3: Forecast the information of Nanoparticles and their industrial applications	K2
	CO4: Recognize the renewable energy devices **for** sustainable energy.	K3
	CO5: Identify the rate of corrosion of a metal in a given environment and **find out** appropriate control techniques to avoid corrosion.	K3

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	2	2		2	2				1	2	2	1
CO 2	3	2	2	1		2	2				1	1	2	1
CO 3	3	2	3	2	1	2	1				1	1	1	1
CO 4	3	3	2	2	2	3	3				1	2	3	2
CO 5	3	3	2	2	1	3	2				2	2	1	1

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	WATER TECHNOLOGY	Periods	9

Introduction-Sources and impurities in Water, Soft and Hard water, Water quality parameters, Types of Hardness – Determination of Hardness by EDTA method, Domestic Water Treatment. Boiler Feed Water –Requisites, Problems due to hard water in boilers - Scale and Sludge formation in boilers-Caustic Embrittlement-Boiler corrosion, Treatment of boiler feed Water – Internal conditioning (Carbonate, Phosphate, and Calgon conditioning) External conditioning – Ion exchange process, Zeolite process, Brackish water –Water purification by Reverse osmosis.

Unit – II	POLYMER CHEMISTRY	Periods	9

Introduction - Occurrence, definitions – Functionality - Degree of Polymerization, Classification of polymers – structure (Linear, Branched & network polymer structure) block, random & graft copolymers, properties of polymers, Tacticity, Tg, molecular weight - number and weight average method. Types of polymerizations: Addition, condensation and copolymerization. Mechanism of polymerization: Addition - Free radical, cationic and anionic polymerization). Preparation, properties and applications of PE, PMMA, PC, nylon6, nylon 66, PET, and Bakelite.

Unit – III	NANO CHEMISTRY	Periods	9

Basics- distinction between molecules, nanoparticles and bulk materials; size dependent properties. Nanoparticles: nanocluster, nanorod, nanotube (CNT) and nanowires. Synthesis: Sol-gel, Precipitation, Thermolysis - hydrothermal, solvothermal, Electro deposition, Spray Pyrolysis, Chemical Vapour deposition, Laser ablation; Properties and applications of nano materials in medical and electronic devices.

Unit – IV	RENEWABLE ENERGY AND STORAGE DEVICES	Periods	9

Renewable energy and its sources - Solar Energy - Photo voltaic cells, Importance of Solar cells - p-n junctions in Solar cells - Working of Photovoltaic cell, Recent advances in solar cell materials, Wind energy - Types of Wind Power Plants (WPPs), Components and working of WPPs, Tidal energy - Types of Tidal power plants (TPPs), Barrage and Non-Barrage Tidal power systems. Batteries and fuel cells: Types of batteries - Dry cells-Alkaline battery, lead storage battery, Ni-Cd battery, lithium battery, Fuel cell - H_2-O_2 fuel cell-applications.

Unit – V	CORROSION AND ITS CONTROL	Periods	9

Introduction, Types of corrosion - chemical and electrochemical corrosion, mechanism, Pilling -Bedworth rule, Types of electrochemical corrosion – Galvanic corrosion, Pitting corrosion, Crevice corrosion, Corrosion on wire fence and Pipeline corrosion, Factors influencing rate of corrosion, corrosion control methods – Sacrificial anode and impressed cathodic current. Protective coatings – Paints: constituents and functions, Metallic coatings - steps involved in cleaning the surface for Electroplating, Electroplating (Au), Electro less plating (Ni).

		Total Periods	45

Text Books

1.	O.G.Palanna, "Engineering Chemistry "Tata Mc GrawHill PVT,Ltd. Second Edition -2017
2.	Dr.S.Vairam ,Dr.S.Mageswari,Dr.K.Balachandran, Engineering Chemistry : First Edition, Wiley publication,Reprint-2016

References

1.	Engineering Chemistry: Jain & Jain, Dhanpat Rai Publishing Company Edition- 16- 2015.
2.	Arun Bahl, B.S. Bahl, G.D. Tuli, Essentials of Physical Chemistry, Published by S. Chand & Company Ltd, 2014
3.	Puri, Sharma and Pathnia, Physical Chemistry-II, Vishal Publishers,.Edition- 2019.
4.	Engineering Chemistry: Sashi Chawla, Dhanpat Rai & Co (pvt.)ltd. Edition- 5- 2013.

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5.	Dr.S.Vairam ,Dr.Suba Ramesh, Engineering Chemistry: First Edition, Wiley publication,Reprint-2016

E-Resources	
1.	https://www.who.int/water_sanitation_health/dwq/arsenicun6.pdf
2.	https://www.schandpublishing.com/books/tech-professional/applied-science/a-textbook-polymer-chemistry/9788121941129/#.XdZ214MzY2w
3.	https://www.elsevier.com/books/nanochemistry/klabunde/978-0-444-59397-9

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Programme	B.E.	Programme Code			107	Regulation		2019
Department	Computer Science & Technology					Semester		II

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19EE201	Basic Electrical and Electronics Engineering	3	0	0	3	50	50	100

Course Objective	The students should made to • Learn the basic concepts of electrical parameters and electrical machines • Learn the electrical wiring methods • Learn the basics about semiconductor families and digital logics

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Understand the basics of electric circuits and type of the connection	K2
	CO2: Understand the basics of electromagnetic laws and basic working principle of DC and AC machines.	K2
	CO3: Understand the concepts of tariff, energy saving, illumination, electriclamps and safety measures.	K2
	CO4: Understand the basic operating characteristics of semiconductor devices.	K2
	CO5: Understand the fundamentals of digital logics and integrated circuits.	K2

Pre-requisites	Basic concepts and understanding of magnetic fields

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													CO/PSO Mapping	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2										3	3	2
CO2	3	2										3	3	2
CO3	3											3	3	3
CO4	3	2										3	3	2
CO5	3	2										3	3	2

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2. Assignment. 3. End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit – I	**INTRODUCTION OF ELECTRICAL CIRCUITS**	Perio ds	**9**

Definition of Voltage, Current, Power, Energy, Power factor, Circuit parameters, Ohm‟s law, Kirchoff‟s law. Concepts of AC Circuits- RMS value, Average value, Form and Peak factors, Concept of real and reactivepower. Introduction to three phase systems - types of connections, relationship between line and phase values. Concept of DC circuits.

Unit – II	**INTRODUCTION OF ELECTRICAL MACHINES AND MEASUREMENTS**	Periods	**9**

Faraday‟s laws of electromagnetic induction - Lens law - Fleming's left hand rule and Right hand rule. Working principle and construction of AC and DC machines -Working principle and construction of Transformer- Introduction to electrical measuring instruments – Analog and Digital Instruments **(Qualitative)**

Unit – III	**WIRING AND ILLUMINATION**	Periods	**9**

Types of wiring-staircase and corridor wiring - wiring accessories. Different types of safety measures -Earthing. Electrical tariff - Energy conservation. Simple layout of power system-various energy resources,.
 The Laws of Illumination - Different types of electrical lamps.

Unit – IV	**SEMICONDUCTOR DEVICES**	Periods	**9**

PN junction diodes - Zener diodes - characteristics. Transistors: PNP and NPN transistors - Theory of operation - Transistor configurations -characteristics - comparison. Special semiconductor devices: FET - SCR - LED – V-I characteristics –UPS – SMPS.

Unit – V	**DIGITAL FUNDAMENTALS**	Periods	**9**

Number systems - Boolean Theorems – De Morgan's Theorem - Logic gates -Implementation of Boolean Expression using Gates - Introduction to Operational Amplifier.

		Total Periods	**45**

Text Books	
1.	D.P. Kotharti and I.J Nagarath, Basic Electrical and Electronics Engineering, McGraw Hill, ThirdEdition, 2016.
2.	M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronics Engineering, Oxford, 2016.
References	
1.	S.B. LalSeksena and KaustuvDasgupta, Fundaments of Electrical Engineering, Cambridge, 2016
2.	Mittle,Mittal, Basic Electrical Engineering‖, 2nd Edition, Tata McGraw-Hill Edition, 2016.
3.	S.K.Sahdev, Basic of Electrical Engineering, Pearson, 2015.
4.	John Bird, ―Electrical and Electronic Principles and Technology, Fourth Edition, Elsevier, 2010.
5.	K Murugesh Kumar, Elements of Electrical Engineering, Vikas Publishing House Pvt. Ltd.2011.
E-Resources	
1.	https://nptel.ac.in/courses
2.	https://www.electrical4u.com/electrical-engineering-articles/illumination-engineering/
3.	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/lecture-notes

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<table>
<tr><td colspan="2" rowspan="3"><img/></td><td colspan="6">VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous Institution, Affiliated to Anna University ,Chennai)
Elayampalayam, Tiruchengode – 637 205</td></tr></table>

Programme	**B.E.**	Programme Code			**107**	Regulation		**2019**

Department	**Computer Science & Technology**		Semester	**II**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19GE202	**Basic Civil and Mechanical Engineering**	3	0	0	3	50	50	100

Course Objective	**The main objective of this course is to:** • Familiarize the materials and measurements used in Civil Engineering. • Provide the exposure on the fundamental elements of civil engineering components and structures. • Impart basic knowledge of power plants, pumps & boilers. • Study the various types of IC engines and understand the features of IC engine. • Enable the students to distinguish the components and working principle of refrigeration and air conditioning system.

Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO 1: Explain the usage of civil engineering materials and measure the location of points in surveying	K2
	CO 2: Identify the nature of building components, structures and material qualities.	K1
	CO 3: Classify the various types of power plant, pump, turbine & boiler	K2
	CO 4: Compare spark ignition and compression ignition of two stroke and four stroke engine.	K2
	CO 5: Elaborate the working principle of refrigeration and air conditioning system.	K3

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak														**CO/PSO Mapping**	
Programme Outcomes (POs)														PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**		**PSO 1**	**PSO 2**
CO 1	3	3	3	2	3	-	-	-	-	-	-	-		3	2
CO 2	3	3	3	2	3	-	-	-	-	-	-	-		2	-
CO 3	3	2	2	-	2	-	-	-	-	-	-	-		2	3
CO 4	3	3	2	-	2	-	-	-	-	-	-	-		2	-
CO 5	3	2	2	-	2	-	-	-	-	-	-	-		3	2

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	CIVIL ENGINEERING MATERIALS AND SURVEYING	Periods	9

Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel sections.

Surveying: Introduction to Surveying & Leveling.

Unit – II	BUILDING COMPONENTS AND STRUCTURES	Periods	9

Foundations: Site selection, Foundation – Types – Requirement of good foundations.
Superstructure: Brick masonry – Stone masonry – Beams – Columns – Lintels – Roofing – Flooring - Plastering

Unit – III	POWER PLANT ENGINEERING	Periods	9

Introduction, Classification of Power Plants – Boiler - Working principle of steam , Gas , Diesel , Hydro-electric, Solar, Wind and Nuclear Power plants – Merits and Demerits – Pumps and turbines – Working principle of reciprocating pumps (single acting and double acting) – Centrifugal Pump.

Unit – IV	IC ENGINES AND AUTOMOTIVE VEHICLES	Periods	9

Internal combustion engines as automotive power plant – Four stroke and two stroke cycles – Working of SI and CI engines - Comparison of four stroke and two stroke engines - Introduction to Electric vehicles.

Unit – V	REFRIGERATION AND AIR CONDITIONING SYSTEM	Periods	9

Terminology of refrigeration and air conditioning. Principle of vapour compression and vapour absorption refrigeration system – Layout of typical domestic refrigerator – Window and split type room air conditioner

		Total Periods	**45**

Text Books

1.	Dr.P.Kannan, "Basic Mechanical Engineering", JBR Tri Sea Publishers Pvt. Ltd., 2019.
2.	Pravin Kumar, "Basic Mechanical Engineering", Pearson Publishers, New Delhi, 2013.

References

1.	Dr.S.Ramachandaran, " Basic Civil and Mechanical Engineering " Air Walk Publication,2016
2.	R.Gupta, "Basic Civil Engineering", RPH Publication, 2016.
3.	Mrs.V.Valarmathi, Mr.K.Rajasekar & Mr.T.Satheeskumar,"Basic Civil Engineering", JBR Tri Sea Publishers Pvt. Ltd., 2017.
4.	G.Shanmugam and M.S Palanichamy, "Basic Civil and Mechanical Engineering ",Tata McGraw Hill Publishing Company Limited, New Delhi,2014
5.	S.Seetharaman, " Basic Civil Engineering ",Anuradha Agencies,2005

E-Resources

1.	https://nptel.ac.in/downloads/105105104/
2.	https://nptel.ac.in/courses/112107216/
3.	http://link.springer.com/ "Basic Civil and Mechanical Engineering"-Springer Nature.

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**II**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS203	**Python Programming**	2	0	2	3	50	50	100

Course Objective	The student should be made to, • Understand the fundamentals of Python programming • Handle list, tuples, sets and Dictionaries data types • Learn function prototypes and string functions. • Use files and modules for data processing • Understand packages in Python and data visualization.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Develop basic Python programs using conditional and control statements.	K3
	CO2: Perform operations on list, tuples, sets and Dictionaries.	K3,K4
	CO3: Implement function prototypes and string functions.	K3,K4
	CO4: Apply files and modules and perform operations on CSV files.	K3,K4
	CO5: Perform data visualization and apply Python packages	K3,K4

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	1	-	-	1	-	-	-	-	1	1	3	2
CO2	3	2	1	-	2	1	-	-	-	-	1	1	3	2
CO3	3	2	1	-	2	1	-	-	-	-	1	1	3	2
CO4	3	2	1	1	2	1	-	-	-	-	1	1	3	2
CO5	3	2	1	-	2	1	-	-	-	-	1	1	3	2

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2. Assignment. 3. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**INTRODUCTION TO PYTHON**	Periods	**12**

Introduction to Python, features, installing Python, writing and executing Python program — native data types, comments, constants, variables, operators, expression, conditional statements, control statements,

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continue, pass, break.

Illustrative programs: finding factorial of n, generating Fibonacci series, exchange the values of two variables, calculating student grade, sum and average of n elements, linear search, printing a pattern.

Unit – II	LISTS, TUPLES, SETS AND DICTIONARIES	Periods	12

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Sets: methods and operators, Dictionaries: operations and methods.

Illustrative programs: find minimum in a list, list operations, create and insert elements in a Dictionary, operations on sets and tuples.

Unit – III	FUNCTIONS AND STRINGS	Periods	12

Functions definition, declaration, arguments, parameters – formal and local, parameter passing methods - function prototypes, recursion; Strings: string slices, immutability, string functions and methods, string module, regular expressions.

Illustrative programs: String manipulations, function that takes a list of words and returns the length of the longest one, counting the vowels and consonants in a given string , exchanging of two values using recursion.

Unit – IV	FILES AND MODULES	Periods	12

Files and exception: Text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, accessing CSV file.

Illustrative programs: Word count, file copy, file operations: accessing a CSV file and generate reports.

Unit – V	PACKAGES AND DATA VISUALIZATION	Periods	12

Text processing, Numerical processing: numpy package – mean, medium and mode, pandas package – vector, data frame, data visualization: matplotlib, Time operations.

Illustrative programs: Bar chart, Pie Chart, Create and display a data frame from a dictionary inputusing Pandas, Create a 3x3 matrix with values from 2 to 10 using numpy.

	Total Periods	60

Text Books		
1.	AnuragGupta,G.P BISWAS ,” Python Programming – Problem solving, packages and Libraries, Edition 1, Tata McGraw Hill, 2018
2	E Balagurusamy, “Problem Solving and Python Programming”, Edition1 , TataMcGraw Hill, 2018
3.	ReemaThareja, “Python Programming using Problem Solving Approach”, OXFORD University Press, 2017.
References	
1.	Allen B. Downey, “Think Python: How to Think Like a Computer Scientist,,,, 2nd edition, Updated forPython 3, Shroff/O,,Reilly Publishers, 2016.
2.	John V Guttag, ―Introduction to Computation and Programming Using Python,,,, Revised andexpanded Edition, MIT Press , 2013
3.	John V. Guttag,, Introduction to Computation and Programming using Python‖, Prentice Hall of India,2014.
E-Resources	
1.	http://greenteapress.com/wp/think- python/)
2.	https://www.python.org/about/gettingstarted/
3.	https://beginnersbook.com/2018/03/python-tutorial-learn-programming/
4.	https://www.tutorialspoint.com/python/index.html
5.	https://www.google.com/www.udemy.com/PythonVideos/Online-Course

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Programme	**B.E.**	Programme Code		**107**	Regulation		**2019**
Department	**Computer Science & Technology**				Semester		**II**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CH208	**CHEMISTRY LABORATORY**	0	0	4	2	60	40	100

Course Objective	The main objective of this course is to: • Gather basic simple acid-base reactions and study the mechanism of acid mixture with base. • Learn pH and potential of hydrogen in a sample solution. • Study the redox reaction through potential difference. • Quote iron forms complex with thiocyanate. • Gather knowledge on hardness producing salts and removal of hardness through estimation. • Collect data required for dissolved oxygen present in water sample. • Understand alkalinity and available chlorine present in water sample.

Course Outcome	The students who complete this course successfully are expected to:	Knowledge Level
	CO1: Infer knowledge on neutralization reaction between acid, acid mixture with base and identify the concentrations.	K3
	CO2: Spot the concentration of sample solution through potential of hydrogen and redox reaction.	K3
	CO3: Estimate Iron by complexation reaction spectrometrically.	K5
	CO4: Determine hardness and dissolved oxygen present in domestic water supply.	K5
	CO5: Identify alkalinity and available chlorine present in the given sample.	K5

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3		2	2	1	1					2	1	2
CO2	3	3		2	1							1		2
CO3	3	3		2	1								1	2
CO4	3	3	1	2	2	2	2					2	1	2
CO5	2	3	1	2	2	2	2					2	1	2

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Course Assessment Methods Direct		
Direct		
1.Prelab and post lab test 2.End-Semester examinations		
Indirect		
1.Course - end survey		

Content of the syllabus		
CHEMISTRY		
1.	Estimation of HCL using NaOH by Conductometric titration .	
2.	Estimation of Mixture of acid using NaOH by Conductometric titration.	
3.	Estimation of Barium chloride using sodium sulphate by Conductometric precipitation titration.	
4.	Estimation of ferrous iron by Potentiometric titration.	
5.	Determination of HCL using NaOH by pH metry.	
6.	Estimation of Ferric ion by Spectrophotometry.	
7.	Determination of Total, temporary and permanent hardness of water by EDTA method.	
8.	Estimation of Dissolved Oxygen content in water by Winkler's method.	
9.	Estimation of alkalinity in water sample.	
10.	Estimation of available chlorine in bleaching powder.	
	Total Periods	**45**

Text Books	
1.	Chemistry laboratory I & II by Dr.A.Ravikrishnan,Sri Krishna Pub,Revised Edition-2017
2.	Chemistry laboratory Manual by Dr.Veeraiyan, Revised Edition-2017

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Programme	**B.E.**	Programme Code			**107**	Regulation	**2019**

Department	**Computer Science & Technology**					Semester	**II**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19GE203	**Engineering Practices Laboratory**	0	0	4	2	50	50	100

Course Objective	**The main objective of this course is to:** - Know the plumbing line assemblies. - Weld lap joint, butt joint and T-joint. - Learn the assembling and dismantling methodology of home appliances. - Learn the resistor value identification through colors coated on resistor. - Learn the basics of signal generation in CRO. - Learn the soldering techniques in PCB board for designing the projects.

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Perform basic machining operations and finish the job to the requirements and quantify the accuracy.	K2
	CO2: Make various joints such as cross lap joint and Tee lap joint in the carpentry.	K2
	CO3: Understand the basics of house wiring techniques and the measurements of basic electrical quantities.	K2
	CO4: Understand the resistor value identification through colors coated on resistor.	K2
	CO5: Understand the soldering techniques in PCB board for designing the projects.	K2

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	CO 1	3	2	3	2	2	-	-	-	2	-	-	-	2
CO2	CO 2	3	2	3	2	2	-	-	-	2	-	-	-	2
CO3	CO 3	3	2	2	3	2	2	-	-	2	-	-	-	3
CO4	CO 4	3	2	2	3	2	2	-	-	2	-	-	-	2
CO5	CO 5	3	2	3	3	2	2	-	-	2	-	-	-	3

Course Assessment Methods Direct

Direct
1.Prelab and post lab test 2.End-Semester examinations
Indirect
1.Course - end survey

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S.No	LIST OF EXPERIMENTS	Course Outcome
	GROUP A **(CIVIL & MECHANICAL ENGINEERING)**	
	(CIVIL ENGINEERING PRACTICE)	
	Plumbing : 1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers and elbows in household fittings.	CO2
	2. Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components	CO2
	Carpentry: 3. Study of the joints in roofs, doors, windows and furniture.	CO2
	4. Hands-on-exercise: Wood work, joints by sawing, planning and cutting.	CO2
	MECHANICAL ENGINEERING PRACTICE	
	Welding: 5. Preparation of arc welding of butt joints, lap joints and tee joints.	CO1
	6. Gas welding practice	CO1
	Basic Machining: **7.** Turning and Facing.	CO1
	8. Drilling Practice	CO1
	Sheet Metal Work: 9. Forming & Bending	CO1
	10. Model making – Tray and Basket.	CO1
	4.Demonstration on: (a) Foundry operations like mould preparation for gear and step cone pulley. (b) Fitting – Exercises – Preparation of square fitting and vee – fitting models. **5. Study of Air Conditioner & Centrifugal Pump.**	
	GROUP B **(ELECTRICAL & ELECTRONICS ENGINEERING)**	
1. Residential house wiring and stair case wiring using switches, fuse, indicator & lamp.		CO3
2. Fluorescent lamp wiring.		CO3
3. Measurement of voltage, current, power & power factor using R-Load.		CO3
4. Measurement of energy using single phase meter.		CO3
5. Measurement of resistance to earth of electrical equipment.		CO3
6. Measurement of illumination to earth of electrical equipment.		CO3
7. Study of batteries.		CO3
IV. ELECTRONICS ENGINEERING PRACTICE		
1. Study of Electronic components and equipments – Resistor, colour coding.		CO4
2. Study of logic gates AND, OR, NOR, NAND and NOT.		CO4
3. Generation of Clock Signal.		CO4
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.		CO5
Total Periods		**45**

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	Reference Book :
1.	Dr.P.Kannan, Mr.T.Satheeskumar & Mr.K.Rajasekar, "Engineering Practices Laboratory" Manual. First Edition, 2017.
2.	Mr.T.Jeyapoovan, Mr.M.Saravana Pandian, "Engineering Practices Lab" Manual, Vikas Publishing House Pvt Ltd, 2017.

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Programme	**B.E.**	Programme Code		**107**	Regulation		**2019**	
Department	**Computer Science & Technology**				Semester		**II**	

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MCFY2	**Indian Constitution and Universal Human Values**	3	0	0	0	100	0	100

Course Objective	The main objective of this course is to: i) To know about Indian constitution. ii) To know about central and state government functionalities in India iii) To know about Indian society

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	● Understand the functions of the Indian government	K1
	● Understand and abide the rules of the Indian constitution	K1
	● Understand and appreciate different culture among the people	K1
	● Understanding human being as a co-existence of the sentient „I‟ and the material	K1,K2
	● Body‟ and the needs of Self („I‟) and „Body‟ and Ability to utilize the professional competence for augmenting universal human order and Ability to identify the scope and characteristics of people-friendly and ecofriendly Production systems.	K2

Pre-requisites	-

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1						3		3	2					
CO 2						3		3	3					
CO 3						3		3	2					
CO 4						3		3	3					
CO 5						3		3	3					

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	INTRODUCTION	Periods	9

Historical Background – Constituent Assembly of India – Fundamental Rights – Citizenship – Constitutional Remedies for citizens.

Unit – II	STRUCTURE AND FUNCTION OF CENTRAL	Periods	9

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – StateLegislature – Judicial System in States – High Courts and other Subordinate Courts.

Unit – III	STRUCTURE AND FUCTION OF STATE	Periods	9

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – StateLegislature – Judicial System in States – High Courts and other Subordinate Courts.

Unit – IV	Universal Human Values	Periods	9

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education.

Unit – V	OPTOEL Universal Human Values - Professional Ethics ECTRONICS	Periods	9

Understanding Harmony in the Human Being - Harmony in Myself and society.

		Total Periods	45

Text Books

1.	Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, NewDelhi
2.	Tanushukla, Human Values and professional Ethics, Cengage publications.

References

1.	R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi
2.	Indian polity, M.Laksmikanth,Tatamchrawhill publications
3.	R R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values andprofessional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2
4.	R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi
5.	Indian polity, M.Laksmikanth,Tatamchrawhill publications

E-Resources

1.	https://mhrd.gov.in/
2.	https://niti.gov.in/content/niti-aayog-library
3.	www.drishtiias.com/

Signature of BoS Chairman

<table>
<tr>
<td rowspan="3" colspan="2"></td>
<td colspan="6">VIVEKANANDHACOLLEGEOFENGINEERINGFORWOMEN
(AutonomousInstitution,AffiliatedtoAnnaUniversity,Chennai)Elay ampalayam,Tiruchengode–637205</td>
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</table>

Programme	**B.E.** Programme Code			**107**	Regulation	**2019**
Department	**Computer Science& Technology**				Semester	**III**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MA304	**DISCRETE MATHEMATICS**	3	0	0	4	50	50	100

Course Objective	The Main Objective of the course is to • Introduce basic tools and techniques in Discrete Mathematical Structure • Provide information about the concepts needed to test the logic of a program and Theory of inference • Recognize the connection between set, operations and logic • Identify the domain and range of a relation • Recognize the concepts of groups

Course Outcome	**CO1:** Demonstrate the mathematical reasoning and logics	Knowledge level
	CO2: Reformulate statements from common language to formal language	K1,K2
	CO3: Relate logic with sets	K2,K5
	CO4: Analyze the connection between functions and relations.	K2,K3
	CO5: Demonstrate Algebraic facility with Groups ,Subgroups and Normal subgroups	K3,K5
	CO1: Demonstrate the mathematical reasoning and logics	K1,K3

Pre-requisites	-

CO /PO Mapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3											2	
CO2	3	3											2	
CO3	3	3											2	
CO4	3	3											2	
CO5	3	3											2	

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2. Assignment. 3. End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	PROPOSITIONAL CALCULUS	Periods	12

Propositions – Logical connectives – Compound propositions – Conditional and biconditional propositions – Truth tables – Tautologies and contradictions – Contrapositive – Logical equivalences and implications – DeMorgan's Laws – Normal forms – Principal conjunctive normal form and Principal disjunctive normal form – Rules of inference – Arguments – Validity of arguments.

Unit - II	PREDICATE CALCULUS	Periods	12

Predicates – Statement function – Variables – Free and bound variables – Quantifiers – Universe of discourse – Logical equivalences and implications for quantified statements – Theory of inference – Rules of universal specification and generalization – Validity of arguments.

Unit – III	SET THEORY	Periods	12

Set Theory: Cartesian product of sets – Relations on sets – Types of relations and their properties – Matrix representation of a relation - Graph of a relation – Equivalence relations – Partial ordering – Poset – Hasse diagram – Lattices – Properties of lattices

Unit - IV	FUNCTIONS	Periods	12

Definition – Classification of functions – Composition of functions – Inverse functions – Characteristic function of a set – Recurrence relations – Solution of recurrence relations – Generating Functions – Solving recurrence relation by generating functions.

Unit – V	GROUP THEORY	Periods	12

Algebraic systems – Definitions – Examples – Properties – Semi groups – Monoids – Sub semi groups and Sub monoids - Groups and Subgroups – Homomorphism – Cosets – Lagrange's theorem – Normal subgroups – Normal algebraic system with two binary operations.

		Total Periods	45

Text Books

1.	Tremblay J P and Manohar R., Discrete Mathematical Structures with Applications to Computer Science, TMH, New Delhi – 2004.
2.	Rosen K H, "Discrete Mathematics and its Applications", Sixth Edition, Tata McGraw-Hill Pub.co. Ltd., Delhi, 2006.

References

1.	Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Publishing Company, 2012
2.	Singh S.B., Jai Kishore and Ekata, "Discrete Structures", 3rd Edition, Khanna Book Publishing, Delhi, 2017
3.	Seymour Lipschutz, Marclars Lipson, "Discrete Mathematics", Tata McGraw Hill.,New Delhi.
4.	Bernard Kolman, Robert Busby, Sharon C.Ross," Discrete Mathematical Structures", Pearson Education, Delhi, 6th Edition, 2015.
5.	D.S.Malik, "Discrete Mathematical Structures Theory and Applications", Thomson Publishers, 2004.

E-Resources

1.	https://en.wikipedia.org › wiki › Discrete_mathematics
2.	www.learnerstv.com/Free-engineering-Video-lectures
3.	www.nptel.ac.in

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Programme	**B.E.**	Programme Code				**107**	Regulation	**2019**
Department	**Computer Science & Technology**						Semester	**III**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT301	**Data Structures &Algorithms**	3	0	0	3	50	50	100

Course Objective	The main objective of this course is to: • Understand the significance of Data structures and List ADTs. • Learn the concepts and applications of Stack, Queue and De queue. • Understand the Tree ADT and types of balancing the tree • Learn the fundamentals of Graph ADT, various Traversal algorithms, Types and finding the Minimum spanning Tree • Learn the different types of Sorting and Searching Techniques and Hashing

Course Outcome	At the end of the course ,the student should be able to,	Knowledge level
	CO1: Able to handle operations like searching, insertion, deletion, and traversing mechanism etc. on various data structures.	K3
	CO2: Explore to use and implement linear and non-linear data structures like stacks, queues, linked list	K4
	CO3: Implement Tree ADT ,Binary search tree, AVL and Splay tree in C	K3
	CO4: Apply and implement the concept to Topological ordering and Minimum Spanning Tree of a Graph ADT	K3
	CO5: Analyze and implement various sorting and searching algorithms in C	K3

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak														CO/PSO Mapping	
	Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	2	1				1	2	3	3
CO2	3	3	3	3	3	2	1				1	2	3	3
CO3	3	3	3	3	3	2	1				1	2	3	3
CO4	3	3	3	3	3	2	1				1	2	3	3
CO5	3	3	3	3	3	2	1				1	2	3	3

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit– I	**INTRODUCTION**	Periods	**9**
Fundamental ADTs—Singly Linked List–Simple Array based Implementation-Circular Linked List–Doubly Linked List–Circular Doubly Link List -Applications of Linked Lists-Cursor Implementation of Link List.			
Unit–II	**STACK,QUEUEANDHEAP**	Periods	**9**
StackADT–ArraybasedImplementation-ListbasedImplementation–QueueADT–Arraybased Implementation-ListbasedImplementation-ParsingArithmeticExpressions-DequeueADT–Implementation,.PriorityQueue Model, Implementation ,Binary Heap.			
Unit – III	**TREES**	Periods	**9**
Tree ADT–Binary Tree–Terminologies-ArraybasedImplementation-ListbasedImplementation–Traversal Algorithms-SearchTrees–BinarySearchTree–BalancingTrees–AVLTree–SplayTree–B-Tree.			
Unit– IV	**GRAPHS**	Periods	**9**
GraphADT–DataStructuresforGraphs–TypesofGraphs–GraphTraversals–Topological Ordering Dijkstra's Algorithm – Minimum Spanning Tree-Network Flow problem– Application of DFS			
Unit– V	**SORTING,SEARCHINGANDHASHING**	Periods	**9**
Types of Sorting-Bubble Sort –Selection Sort –Insertion Sort –Shell Sort –Quick Sort –Radix Sort–Merge Sort. Linear Search– Binary Search. Hashing– Open Addressing– Separate Chaining–Hash Functions– Rehashing-Extendible Hashing.			
		Total Periods	
Text Books			
1.	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson India.		
References			
1.	MichaelT.Goodrich,RobertoTamassiaandMichaelH.Goldwasser,"DataStructuresandAlgorithmsinJava"6[th]Edition,WileyIndia.ISBN: 9788126551903		
2.	RobertLafore,"DataStructures andAlgorithmsinJava"2[nd]Edition,PearsonIndia.ISBN:9788131718124		
3.	Kruse andLeung,"DataStructuresandProgramDesigninC",1/e, Pearson India.		
4.	Robert SedgewickandKevinWayne,"Algorithms",4[th]Edition,Addison-Wesley.		
5.	PeterBrass,"AdvancedDataStructures",1Edition,Cambridge.		
E-Resources			
1.	https://www.javatpoint.com/data-structure-tutorial		
2.	https://www.udemy.com/course/data-structures-and-algorithms-deep-dive-using-java		

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**III**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT302	**Database Management Systems**	3	0	0	3	50	50	100

Course Objective	The main Objective of the course is • Toinformtheessentialsofdatamodelstointellectualizeandillustratea database system using ER diagram. • To conceptualize the relational algebra, calculus concepts and relational databaseimplementationusingSQLwitheffectiverelationaldatabasedesign concepts and to demonstrate Query evaluation and optimization techniques. • To understand the Normalization process • To elaborate the fundamental concepts of transaction processing-concurrency control techniques and recovery procedure. • To Understand the Storage strategies and database securities

Course Outcome	At the end of the course ,the student should be able to,	Knowledge level
	CO1: Distinguish data base systems from file systems and described at a models and DBMS architecture and analyze , derive an information model expressed in the form of an entity relation diagram and transform in to a relational data base schema.	K2
	CO2: Construct queries using relational algebra, relational calculus and SQL and know the basic query evaluation and query optimization techniques	K2
	CO3: Demonstrate with understanding of SQL Programming language and normalization theory.	K2
	CO4: Identify the basic issues of transaction processing and concurrency control and familiar with basic databases storage structures and access techniques.	K3
	CO5: Know the basic database storage structures and access techniques along with data base security issues	K3

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	1	2	1							1	2	3
CO2	3	3	3	3	3				2			1	3	3
CO3	3	3	3	3	3				2			1	3	3
CO4	3	3	3	2	3				1			1	3	3
CO5	3	3	3	2	3				1			1	2	2

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Course Assessment Methods Direct			
Direct			
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations			
Indirect			
1.Course - end survey			
Content of the syllabus			
Unit– I	**Introduction**	Periods	**10**
Introduction: Introduction to Database Hierarchical, Network and Relational Models .Three-Schema Architecture and Data Independence– The Database System Environment– **Data models**: Entity-relationship model, network model, relational and object oriented data models, Embedded SQL.			
Unit–II	**Relational query languages and Query processing**	Periods	**9**
Relational algebra ,Relational Calculus, DDL and DML constructs ,Query processing and optimization			
Unit – III	**Relational Data base and Design**	Periods	**8**
SQL-Set operations, Aggregate Functions, Nested Sub Query Views, Modification of DataBase, Joined Relation-Normalization-1 NF,BCNF, 3NF			
Unit– IV	**Transaction Processing and Database Recovery**	Periods	**8**
Concurrency control ,ACID property ,Serializability of scheduling ,Locking and time stamp based schedulers ,Multi-version and optimistic Concurrency Control schemes ,Database recovery			
Unit– V	**Database Storage strategies &Security**	Periods	**10**
RAID–File Organization –OrganizationofRecordsinFiles–IndexingandHashing–B+treeIndexFiles–Static Hashing– Dynamic Hashing **Data base Security**: Authentication, Authorization and access control.			
		Total Periods	**45**
Text Books			
1.	Abraham Silberschatz, HenryF. Korth, S. Sudharshan,"Data base System Concepts", 7th Edition ,TataMc GrawHill, March 2019.		
2.	R.ElmasriandS.Navathe,"Fundamentals of Database Systems", Pearson7thEdition, 2016.		
3.	Peterrob,CarlosCoronel,"DatabaseSystemsDesign,ImplementationandManagement",9thEdition, ThomsonLearning,2009.		
References			
1.	J.D.Ullman,"PrinciplesofDatabaseandKnowledge–BaseSystems",Vol1,Computer Science Press, Inc.NewYork,1998.		
2.	GuptaGK,"DatabaseManagementSystems",TataMcGrawHillEducationPrivateLimited,NewDelhi,2011		
3.	SergeAbiteboul,RichardHull,VictorVianu,"FoundationsofDatabases",Addison-Wesley Publishing Company, 1995.		

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E-Resources	
1.	www.tutorialspoint.com/dbms/
2.	https://alison.com/courses/IT-Management-Software-and-Databases
3.	https://mva.microsoft.com/en-us/training-courses/database-fundamentals-8243?l=TEBiexJy_5904984
4.	http://www.sqlcourse.com/
5.	https://university.mongodb.com/
6.	http://www.edureka.co/mongodb
7.	https://www.lynda.com/NoSQL-training-tutorials/1473-0.html

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Programme	B.E.	Programme Code				107	Regulation		2019	
Department	Computer Science& Technology						Semester		III	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19IT304	**Computer Organization & Architecture**	3	0	0	3	50	50	100

Course Objective	The main objective of this course is to: • Understanding of the basic structure and operation of a digital computer. • Recognize in the operation of the hardwire control and microprogrammed control. • Illustrate in detail the different types of control and the concept of pipelining. • Classify the hierarchical memory system including cache memories and virtual memory. • Clarify the different ways of communicating with I/O devices and standard I/O interfaces.

Course Outcome	At the end of the course ,the student should be able to,	Knowledge level
	CO1: Design the concepts in modern computer architecture.	K3
	CO2: Interpret the operations and instruction sequences in a basic computer.	K3
	CO3: Examine the hierarchical memory system including cache memory and virtual memory.	K3
	CO4: Inspect the different ways of communicating with I/O devices and standard I/O.	K3
	CO5: Demonstrate the memory functioning and DMA Controller.	K3

Pre-requisites	-

CO /PO Mapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	2										2	2
CO2	2	2	3										2	2
CO3	1	3	3										2	2
CO4	1	2	2										2	2
CO5	1	3	2	1									2	2

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2. Assignment. 3. End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit– I	**BASICSTRUCTUREOFCOMPUTERS**	Periods	**9**
Functional units–Basic operational concepts –Bus structures –Software Performance and metrics– MultiprocessorsandMulticomputer–MemoryLocationsandAddresses Instructions and instruction sequencing– Addressing modes–Fixed point and Floating point representations.			
Unit–II	**BASICPROCESSINGUNIT**	Periods	**9**
Fundamental concepts–Execution of a complete instruction–Multiple bus organization–Hardwired Control– Micro programmed control: Micro Instructions-Micro Instructions with next address field.			
Unit – III	**PIPELINING**	Periods	**9**
Basic concepts–Data hazards–Instruction hazards–Influence on instruction sets Datapath and control considerations–Superscalar operation–Performance considerations.			
Unit– IV	**MEMORYSYSTEM**	Periods	**9**
Basic concepts–Semiconductor RAM–ROM–Speed Size and cost– Cache memories–performance consideration–Virtual memory–Memory management requirements –Associative memories –Secondary storage devices.			
Unit– V	**I/OORGANIZATION**	Periods	**9**
I/Odevices-AccessingI/Odevices–ProgrammedInput/output–Interrupts–DirectMemoryAccess–Buses– Interfacecircuits–StandardI/OInterfaces (PCI, SCSI, and USB)–processor Families.			
		Total Periods	**45**
CaseStudies:Casestudy-InstructionsetsofsomecommonCPUs,ARecentIntelProcessor,A casestudyonALU-ArithmeticandLogicUnitofthecomputerandIBM5SYSTEM/360-370Architecture.			
Text Books			
1.	Carl Hamacher, Zvonko VranesicandSafwatZaky,5thEdition"Computer Organization" ,McGraw-Hill, November4, 2011.		
2.	William Stallings ,"Computer Organization and Architecture–Designing for Performance",9th Edition, Pearson Education, March 2012.		
References			
1.	M.MorrisMano, "ComputerSystemArchitecture", ThirdEdition, PrenticeHallofIndia, 2000.		
2.	DavidA.PattersonandJohnL.Hennessy,"ComputerOrganizationandDesign :TheHardware/Softwareinterface", Third Edition, Elsevier,2005.		
3.	JohnP.Hayes,"ComputerArchitectureandOrganization",3rdEdition,McGraw-Hill,1998		
E-Resources			
1.	https://www.javatpoint.com/computer-organization-and-architecture-tutorial		
2.	https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/		
3.	https://tutorialspoint.dev/computer-science/computer-organization-and-architecture		

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Programme	**B.E.** Programme Code				**107**	Regulation	**2019**
Department	**Computer Science& Technology**					Semester	**III**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS307	**Object Oriented Programming**	2	0	2	3	50	50	100

Course Objective	The student should be made to, • Understand Object Oriented Programming concepts and basic characteristics of Java • Know the principles of packages ,inheritance and interfaces • Define exceptions and use I/O streams • Develop a java application with threads • Design and build simple Graphical User Interfaces

Course Outcome	At the end of the course ,the student should be able to,	Knowledge level
	CO1: WriteJavaprograms using OOP principles	K2
	CO2: DevelopJavaprogramswiththeconceptsinheritance,packagesand interfaces	K3
	CO3: BuildJavaapplicationsusingexceptionsandI/O streams	K3
	CO4: DevelopJavaapplicationswiththreads	K3,K4
	CO5: ImplementinteractiveJavaprogramsusingswings	K3,K4

Pre-requisites	-

CO /PO Mapping
(3/2/1indicatesstrengthofcorrelation)3-Strong,2 – Medium,1-Weak

	Programme Outcomes(POs)												PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	3	3	3	2	2	1	2	2	2	2	1	
CO2	3	2	1	2	2	2	2	1	2	1	3	2	2	
CO3	2	3	2	3	3	3	3	2	2	1	2	2	1	
CO4	3	2	1	3	3	1	1	1	2	2	3	2	1	
CO5	3	2	1	2	3	2	2	1	2	2	3	2	1	

(Header: CO/PSO Mapping)

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2. Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus				
Unit– I	**INTRODUCTION TO OOP AND JAVA FUNDAMENTALS**		Periods	**9**
Object Oriented Programming –objects and classes-Abstraction -Encapsulation-Inheritance-Polymorphism-OOP in Java–Characteristics of Java–The Java Environment- Java Source File- Structure–Compilation.FundamentalProgrammingStructuresinJava–DefiningclassesinJava–constructors,methods-access specifiers-static members-Data Types ,Control Flow, Arrays-Strings.				
Unit–II	**INHERITANCE AND PACKAGES**		Periods	**9**
Inheritance Basics–Multilevel Hierarchy–Constructors–Method Overriding-Using super–Dynamic Method Dispatch–Using final–Abstract Classes–Packages–Access Protection–Importing Packages–Interfaces.				
Unit – III	**EXCEPTIONHANDLINGANDI/O**		Periods	**9**
Exceptions-exception hierarchy-throwing and catching exceptions–built-in exceptions. Input/ Output Basics–Streams–Byte streams and Character streams–Reading and Writing Console–Reading and Writing Files				
Unit– IV	**MULTI THREADING PROGRAMMING**		Periods	**9**
Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads ,thread groups				
Unit– V	**EVENT DRIVEN PROGRAMMING**		Periods	**9**
Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - Introduction to Swing – layout management-Swing Components–Text Fields ,Text Areas– Buttons-Check Boxes– Radio Buttons–Lists-choices-Scrollbars–Windows–Menus– Dialog Boxes				
			Total Periods	**45**

Text Books

1.	HerbertSchildt,"JavaThecompletereference",8thEdition,McGrawHillEducation,2011.
	References
1.	CayS.Horstmann,Garycornell,"CoreJavaVolume–IFundamentals",9thEdition,PrenticeHall,2013.
2.	PaulDeitel,HarveyDeitel,"JavaSE8for programmers",3rdEdition,Pearson,2015
3.	StevenHolzner,"Java2Blackbook",Dream techpress,2011.
4.	TimothyBudd,"UnderstandingObject-orientedprogrammingwithJava",UpdatedEdition,PearsonEducation,2000.

E-Resources

1.	https://www.geeksforgeeks.org/java-programming-basics/
2.	https://chortle.ccsu.edu/Java5/Notes/chap55/ch55_8.html
3.	https://www.javatpoint.com/java-oops-concepts

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Programme	B.E.	Programme Code			107	Regulation	2019

VIVEKANANDHACOLLEGEOFENGINEERINGFORWOMEN
(AutonomousInstitution,AffiliatedtoAnnaUniversity,Chennai)Elaya
mpalayam,Tiruchengode–637205

Programme	B.E.	Programme Code				107	Regulation	2019
Department	Computer Science& Technology						Semester	III

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT303	DATA STRUCTURES LABORATORY	0	0	4	2	50	50	100

Course Objective	The Main Objective of the course is to
	• Familiarize the operations on Linear Data Structures and Nonlinear Data Structures
	• Understand the basic operations on Search Trees and graphs
	• Know to the basics of various graph Traversal methods
	• Understand the concepts of various Searching, Sorting and Hashing Techniques

	At the end of the course ,the student should be able to,	Knowledge level
Course Outcome	**CO1:**Implement List based and Array based Linear and Nonlinear Data Structures	K3
	CO2: Suggest appropriate Search Tree for solving a given problem	K3
	CO3: Appropriately use the various graph Traversal for a given problem	K3
	CO4: Adopt an appropriate Searching and Sorting method to solve a problem	K3
	CO5: Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval	K3
Pre-requisites	-

CO /PO Mapping														CO/PSO Mapping	
(3/2/1indicatesstrengthofcorrelation)3-Strong,2 – Medium,1-Weak															
Programme Outcomes(POs)														PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		PSO 1	PSO 2
CO1	3	3	3	3	3					2		2		3	3
CO2	3	3	3	3	2					1		2		3	3
CO3	3	3	3	3	3					2		2		3	3
CO4	3	3	3	3	2					1		3		3	3
CO5	3	3	3	3	2					2		3		3	3

Course Assessment Methods Direct

Direct
1.Pre lab and post lab test
2.Record mark
3.End-Semester examinations
Indirect
1.Course - end survey

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S.No	LIST OF EXPERIMENTS	Course Outcome
1.	Array implementation of Stack and Queue ADTs	CO1
2.	Array implementation of List ADT	CO1
3.	Linked list implementation of List, Stack and Queue ADTs	CO1
4.	Applications of List, Stack and Queue ADTs	CO1
5.	Implementation of Binary Trees and operations of Binary Trees	CO2
6.	Implementation of Binary Search Trees	CO2
7.	Implementation of AVL Trees	CO2
8.	Graph representation and Traversal algorithms	CO3
9.	Applications of Graphs	CO3
10.	Implementation of searching and sorting algorithms	CO4
11.	Hashing– any two collision techniques	CO5
	Total Periods	**45**

E-Resources

1.	https://www.programiz.com/c-programming
2.	https://www.cprogramming.com/
3.	www.tutorialspoint.com/ds/

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	VIVEKANANDHACOLLEGEOFENGINEERINGFORWOMEN			
	(AutonomousInstitution,AffiliatedtoAnnaUniversity,Chennai)Elaya mpalayam,Tiruchengode–637205			
Programme	**B.E.** Programme Code		**107** Regulation	**2019**
Department	**Computer Science& Technology**		Semester	**III**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT304	**DBMS Laboratory**	0	0	4	2	50	50	100

Course Objective	The Main Objective of the course is to • Learn to create and use a database • Understand data definitions and data manipulation commands • Learn the use of nested and join queries and familiarize advanced SQL queries. • Familiar with the use of a front end tool and Understand design and implementation of typical database applications • Be Exposed to different real time applications

Course Outcome	At the end of the course ,the student should be able to,	Knowledge level
	CO1: Use data definitions and manipulation commands for designing relational database	K3
	CO2: Apply the Nested and Join Queries for retrieving the data from Database and familiarize with advance SQL concepts	K3
	CO3: Analyze the stored programming concepts using triggers and procedures	K3
	CO4: Implement the PL/SQL blocks	K4
	CO5: Develop simple application using Front end	K4
Pre-requisites	-	

CO /PO Mapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	3	3	3				2			2	3	3
CO2	3	3	3	3	3				2			2	3	3
CO3	3	3	3	3	3				2			2	3	3
CO4	3	3	3	3	3				2			2	3	3
CO5	3	3	3	3	3				2			2	3	3

Course Assessment Methods Direct

Direct
1. Pre lab Post Lab
2. End-Semester examinations
Indirect
1.Course - end survey

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S.No	LIST OF EXPERIMENTS	Course Outcome
1.	Creation of database and writing SQL queries to retrieve information from the database	CO1
2.	Performing Insertion ,Deletion, Modifying, Altering, Updating and Viewing records based on conditions	CO2
3.	Mini project (Application Development using Oracle/ My sql) a) Inventory Control System. b) Material Requirement Processing. c) Hospital Management System. d) Railway Reservation System. e) Personal Information System. f) Web Based User Identification System. g) Timetable Management System. h) Hotel Management System	CO5
4.	Creation of Views, Synonyms, Sequence, Indexes, Save point.	CO2
5.	Creating an Employee database to set various constraints	CO2
6.	Creating relationship between the databases.	CO2
7.	Study of PL/SQL block	CO4
8.	Write a PL/SQL block to satisfy some conditions by accepting input from the user	CO4
9.	Write a PL/SQL block that handles all types of exceptions	CO4
10.	Creation of Procedures	CO2
11.	Creation of database triggers and functions	CO2
	Total Periods	**45**

E-Resources

1.	https://www.programiz.com/c-programming
2.	https://www.cprogramming.com/
3.	https://beginnersbook.com/2015/02/simple-c-programs/

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<table>
<tr><td rowspan="3"></td><td colspan="6">VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous Institution, Affiliated to Anna University ,Chennai)
Elayampalayam, Tiruchengode – 637 205</td><td></td></tr>
</table>

Programme	**B.E/B.Tech.**		Programme Code	**107**		Regulation	**2019**
Department	**CSE, EEE, ECE, IT ,CST & BT**					Semester	**III**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MCSY3	**NUMERICAL ABILITY**	3	0	0	0	100	-	100

Content of the syllabus

Unit – I	**NUMBER SYSTEMS**	Periods	**6**

Number Properties – HCF – LCM - Square root – Cube root – Simplification – Averages.

Unit - II	**DIRECT PROPORTIONAL PROBLEMS**	Periods	**8**

Percentage - Profit & Loss –. Ratio & Proportions – Mixture & Allegations - Problem on Ages

Unit – III	**INDIRECT PROPORTIONAL PROBLEMS**	Periods	**8**

Time & Work – Pipes & Cisterns - Time, Speed & Distance – Boats & Streams – Races & Games ofSkills .

Unit - IV	**BANKER'S PROBLEMS**	Periods	**4**

Simple Interest – Compound Interest – Logarithms – Partnership - Discounts.

Unit – V	**MISCELLANEOUS PROBLEMS**	Periods	**4**

Mensuration: Area & perimeter – Volume & Surface Area – Geometry-Trigonometry.

		Total Periods	**30**

Text Books

1.	Dinesh Khattar- The Pearson guide to Quantitative Aptitude for Competitive Examinations 3rd edition.

References

1.	R.S. Aggarwal - Quantitative Aptitude for Competitive Examinations

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Programme	B.E.	Programme Code			107	Regulation		2019
Department	Computer Science& Technology					Semester		IV

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MA405	STATISTICS AND NUMERICAL METHODS	3	1	0	4	50	50	100

Course Objective	The main objective of the course is to • This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring inengineering and technology. • To acquaint the knowledge of testing of hypothesis for small and large samples which plays animportant role in real life problems. • To introduce the basic concepts of solving algebraic and transcendental equations. • To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering andtechnology disciplines. • To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering andtechnology disciplines

Course Outcome	The end of the course, the student should be able to	Knowledge level
	CO1: Apply the concept of testing of hypothesis for small and large samples in reallife problems.	K1,K3
	CO2: Apply the basic concepts of classifications of design of experiments in thefield of agriculture.	K2,K3
	CO3: Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineeringproblems.	K3,K5
	CO4: Understand the knowledge of various techniques and methods for solving firstand second order ordinary differential equations	K2,K5
	CO5: Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications	K3,K4

Pre-requisites	-

CO /PO Mapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3											2	
CO2	3	3											2	
CO3	3	3											2	
CO4	3	3											2	
CO5	3	3											2	

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Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III   2. Assignment.   3. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**TESTING OF HYPOTHESIS**	Periods	**12**
mpling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean,   variance and proportion - Contingency table (test for independent) - Goodness of fit.

Unit - II	**DESIGN OF EXPERIMENTS**	Periods	**12**
One way and two way classifications - Completely randomized design – Randomized block design – Latin square   design - 2^2 factorial design.

Unit – III	**SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS**	Periods	**12**
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solutionof linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric   matrices.

Unit - IV	**INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION**	Periods	**12**
Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation   – Approximation of derivate using interpolation polynomials – Numerical single and double integrations usingTrapezoidal and Simpson's 1/3 rules.

Unit – V	**NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	Periods	**12**
Single step methods : Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge- Kutta method for solving first order equations - Multi step methods : Milne's and Adams - Bash forth predictor correctormethods for solving first order equations.

		Total Periods	**60**

Text Books	
1.	Grewal. B.S. and Grewal. J.S., "Numerical Methods in Engineering and Science ", 10th Edition, Khanna Publishers, New Delhi, 2015
2.	Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers",Pearson Education, Asia, 8th Edition, 2015.

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References	
1.	Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8thEdition, 2014.
3.	Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi,2006.
4.	C.Gupta & V.K.Kapoor," Fundamentals of Mathematical Statistics", Sultan chand & sons Education Publishers,Newdelhi, 10th Edition.
5.	William Navidi,"Statistics for Engineers and Scientists", TMH Publishers, New Delhi, 3rd Edition, 2013.
E-Resources	
1.	https://www.maths.unsw.edu.au › courses › math2089-numerical-methods.
2.	www.learnerstv.com/Free-engineering-Video-lectures

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Programme	B.E.	Programme Code				107	Regulation		2019		
Department	Computer Science& Technology						Semester		IV		

Course Code	Course Name	Periods Per Week			Credit		Maximum Marks		
		L	T	P	C	CA	ESE	Total	
U19CS411	Design and Analysis of Algorithms	3	0	0	3	50	50	100	

Course Objective	The student should be made to, - Analyze the asymptotic performance of algorithms. - Apply the concept of Divide and conquer and greedy algorithms - Demonstrate a familiarity of Dynamic Programming. - Apply the important concept of Backtracking. - Synthesize efficient algorithms for NP Problems	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Analysis algorithm techniques and analyze the asymptotic runtime complexity of algorithms.	K2
	CO2: Apply the algorithms and design techniques to solve the problems using divide and conquer and Greedy algorithm.	K3
	CO3: Understand and design the algorithms using dynamic programming	K3
	CO4: Apply the concepts of Back tracking	K4
	CO5: Synthesize efficient algorithms for NP problems	K3,K4
Pre-requisites	-	

CO /PO Mapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3	3	2	1	1			1	2		2	1	2
CO2	2	2	2	3	1	2			1	2		2	2	2
CO3	2	2	3	2	1	2			1	2		1	3	2
CO4	2	3	2	3	1	2			1	2		2	2	3
CO5	2	3	2	3	1	2			1	2		2	3	3

Course Assessment Methods Direct

Direct

1.Continuous Assessment Test I, II & III
   2.Assignment.
   3.End-Semester examinations

Indirect
1.Course - end survey

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Content of the syllabus			
Unit – I	**ALGORITHM ANALYSIS AND RECURRENCE EQUATION**	Periods	**9**
Models of computation- algorithm analysis- time and space complexity- average and worst case analysis- lower bounds- Recurrence Equations-Solving recurrence equations – Analysis of linear search.			
Unit – II	**DIVIDE AND CONQUER & GREEDY ALGORITHMS**	Periods	**9**
Divide And Conquer: General Method – Binary Search – Finding Maximum and Minimum – Merge Sort.-Quick sort. Greedy Algorithms: General Method – Container Loading – Knapsack Problem – Huffman trees..			
Unit – III	**DYNAMIC PROGRAMMING**	Periods	**9**
General Method – Multistage Graphs – All-Pair shortest paths – Optimal binary search trees – 0/1 Knapsack – Traveling salesperson problem.			
Unit – IV	**BACKTRACKING & BRANCH AND BOUND**	Periods	**9**
General Method – 8 Queens's problem – sum of subsets – graph coloring– Hamiltonian problem – knapsack problem. **Branch and Bound**: LIFO and FIFO search – assignment problem,			
Unit – V	**PROBLEM CLASSES**	Periods	**9**
NP-Completeness: Polynomial Time, Polynomial-time verification, NP Completeness and reducibility, NP - Completeness Proofs, NP Complete Problems.			
		Total Periods	**45**
Text Books			
1.	T.H.Cormen, C.E.Leiserson, R.L.Rivest, C.Stein, "Introduction to Algorithms", 3rd Edition, Prentice-Hall India, 2009.		
References			
1.	Ellis Horowitz, Sartaj Sahni , Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms" 2nd Edition, 2008.		
2.	J. Kleinberg and E. Tardos, "Algorithm Design", Pearson International Edition, 2005.		
E-Resources			
1.	https://edutechlearners.com/download/Introduction_to_algorithms-3rd%20Edition.pdf		
2.	http://www.cs.sjtu.edu.cn/~jiangli/teaching/CS222/files/materials/Algorithm%20Design.pdf		
3.	www.nptel.ac.in		

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	VIVEKANANDHACOLLEGEOFENGINEERINGFORWOMEN (AutonomousInstitution,AffiliatedtoAnnaUniversity,Chennai)Elay ampalayam,Tiruchengode–637205						

Programme	**B.E.** Programme Code				**107**	Regulation	**2019**
Department	**Computer Science& Technology**					Semester	**IV**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT405	**Computer Networks**	3	0	0	3	50	50	100

Course Objective	The student should be made to, • Understand the importance of data communications and the division of network functionalities in supporting business communications and daily activities. • Be familiar with the components required to build the different types of networks. • Recognize the different internetworking devices and their functions. • Know flow control and congestion control algorithms. • Understand the role of application protocols in networking.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Understand the Network and its components along with the functionality of OSI and TCP/IP reference models	K4
	CO2: Able to understand the concepts of IP address and network devices	K3
	CO3: Enables the students to compare and select appropriate routing algorithms for a network	K3
	CO4: Examine the important aspects and functions of flow control mechanism andError detection ,Error correction techniques	K4
	CO5: Able to analyze the concepts of digital ,analog conversions and multiplexingtechniques	K3
Pre-requisites	-	

CO /PO Mapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
	Programme Outcomes(POs)												PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	2	1	3	2		2	3		3	3	2
CO2	2	2	2	3	3	3	2		2	3		3	2	2
CO3	1	2	3	2	3	3	2		2	3		3	3	2
CO4	2	3	3	2	3	3	2		2	3		3	2	2
CO5	2	1	2	2	3	3	2		2	3		3	2	2

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Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III
2.Assignment.
3.End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**Introduction to Networks and OSI Layers**	Periods	**9**

Evolution :ARPANET, NSF net, Internet -Computer Communication - Components- Data representation-Types of Connection. Categories: LAN, MAN, WAN Data Transmission modes .Network Topology- Types and Comparison. Switched Networks- Circuit and Packet switching. Types of Packet Switched networks-Datagram networks and virtual- Circuit networks Structure of Circuit and Packet Switches. Comparisons Protocols and Standard Organizations,Forums and Regulatory agencies Internet Standards –RFC OSI Model - Layered architecture- Functions of Each Layer in the OSI TCP/IP Protocol suite .Comparison between OSI and TCP.

Unit – II	**IP addressing**	Periods	**9**

IPv4 addresses, Address space, Notations -Classful addressing- problem solving Two level hierarchy - Three level hierarchy- subnet mask - Address aggregation- problem solving. Special addresses. Classless addressing - Variable length blocks- Two level addressing- Block allocation - Sub netting- problem solving Private address, Network addresstranslation -Super netting. Introduction to IPv6 address. Intermediate devices - Hub, Repeaters, Switch, Bridge- Gateways -Structure of a Router

Unit – III	**Routing Protocols & Configurations**	Periods	**9**

Static Routing, Introduction to dynamic Routing Protocols, RIP v1 and RIP v2 ,OSPF, EIGRP, BGP configurations.

Unit – IV	**TCP/IP, Flow Control Mechanism and Error Detection**	Periods	**9**

Framing Flow control mechanism- Stop and Wait protocol- Stop and Wait Automatic Repeat Request -Go-Back-N - Selective Repeat -Types of errors -Error Detection and Correction -Hamming Distance -Cyclic Redundancy Check -Checksum – CSMA- CSMA/CD- HDLC PPP-TCP/IP Protocols.

Unit – V	**Physical Layer Characteristics**	Periods	**9**

Physical Layer overview, Latency, Bandwidth, Delay, Wireless: 802.11, Transmission Media : Twisted pair, Coaxial, Fiber, 802.15, 802.15.4, 802.16

		Total Periods	**45**

Text Books

1.	Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, TMH, 2011.
2.	Todd Lammle, "CCNA Study Guide", Edition7, Publication Date: April 5, 2011| ISB: 10:0470901071 ISBN:13: 9780470901076

References

1.	Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011.
2.	James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
3.	Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.
4.	Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", Mc Graw Hill Publisher, 2011.

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Programme	B.E. Programme Code				107	Regulation		2019
Department	**Computer Science& Technology**					Semester		**IV**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19IT408	**Operating Systems**	3	0	0	3	50	50	100

Course Objective	The student should be made , • To understand the basic concepts and functions of operating systems. • To understand Processes and Threads • To analyze Scheduling algorithms. • To understand the concept of Deadlocks. • To analyze various memory management schemes. • To understand I/O management and File systems.

		Knowledge Level
	At the end of the course, the student should be able to,	
Course Outcome	**CO1:**Illustrate the operating system concepts and its functionalities	K2
	CO2: Compare various CPU scheduling algorithms	K3
	CO3: Explain the need for process synchronization	K3
	CO4: Identify the issues in memory management	K3
	CO5: Compare file and disk management strategies	K2

Pre-requisites	-

CO /PO Mapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	2	3	2	1	1	1	3		3	2	2
CO2	2	2	3	2	2	2	1	1	1	3		3	2	1
CO3	2	2	3	2	2	2	1	1	1	3		3	2	1
CO4	2	2	3	2	2	2	1	1	1	3		3	2	1
CO5	2	2	3	2	2	2	1	1	1	3		3	2	2

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	INTRODUCTION	Periods	9

Introduction-History of Operating Systems-Operating System Structure – Operating System Operations – Process Management – Memory Management – Storage Management – Protection and Security – Distributed

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Systems – Computing Environments – System Structures: Operating System Services – User Operating System Interface – System Calls – Types of System Calls – System Programs.

Unit – II	PROCESS MANAGEMENT ANDCOORDINATION	Periods	9

Process Concept: Process Scheduling – Operations on Processes – Inter-process Communication. **Multithreaded Programming:** Overview – Multithreading Models – Threading Issues – **CPU Scheduling**: Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Synchronization – The Critical-Section Problem – Peterson„s Solution – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Monitors.

Unit – III	DEADLOCKS AND MEMORY MANAGEMENT	Periods	9

Deadlocks: System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock **Memory Management Strategies**: Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table – Segmentation

Unit – IV	VIRTUAL MEMORY MANAGEMENT	Periods	9

Virtual Memory Management: Demand Paging – Copy on Write – Page Replacement – Allocation ofFrames – Thrashing. **File System:** File Concept – Access Methods – Directory Structure – File Sharing –

Protection

Unit – V	STORAGE MANAGEMENT	Periods	9

Implementing File Systems: File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management **Secondary Storage Structure:** Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management. Devices – Device controllers- Device drivers.

Case Study: (Only for Assignment Studies not for End-Semester-Examinations)
1. Kernel data structures for various open source operating systems
2. Linux Scheduling
3. Linux File system , Windows 7
4. RTOS , Mobile OS

		Total Periods	45

Text Books

1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Principles",John Wiley & Sons (Asia) Pvt. Ltd, Ninth Edition, 2018

References

1.	Andrew S. Tanenbaum, ―Modern Operating Systems, 4th edition Prentice Hall of India Pvt.Ltd, 2016.
2.	Gary Nutt, "Operating Systems- A Modern Perspective‖", Pearson Education Pvt. Ltd,5thEdition, 2012
3.	William Stallings, "Operating System", Pearson Education, Sixth edition, 2012.

E-Resources

1.	www.webopedia.com/TERM/O/operating_system.html
2.	https://www.tutorialspoint.com/operatingsystem/os_overview.htm
3.	www.dictionary.com/browse/operating--system

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Programme	B.E. Programme Code				107	Regulation	2019

Department	Computer Science& Technology					Semester	IV

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS406	Foundations of Artificial Intelligence	3	0	0	3	100	0	100

Course Objective	The main objective of this course is to: • Analyze the various characteristics of Intelligent agents • Organizing different search strategies in AI • Incorporating Knowledge in solving AI problems • Planning various applications of AI. • Constructing in different ways of designing software agents

Course Outcome	The students who complete this course successfully are expected to:	Knowledge Level
	CO1: To learn the difference between optimal reasoning vs human like reasoning.	K1
	CO2: To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities	K2
	CO3: To understand the logic systems in AI..	K2
	CO4: To learn different knowledge representation techniques	K3
	CO5: To understand the basics of Experts systems and its applications	K3

Pre-requisites	-

CO /PO Mapping (3/2/1indicatesstrengthofcorrelation)3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
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CO2	3	3	3	3	3	2				2	2	2	2	2
CO3	3	3	3	3	3	2				2	2	2	3	3
CO4	3	3	3	3	3	2				2	2	2	2	2
CO5	3	3	3	3	3	2				2	2	2	3	3

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	Introduction to Artificial Intelligence	Periods	9

Introduction, History, Intelligent Systems, Foundations of AI, Sub areas of AI, Applications.
Problem Solving - State-Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem,

Unit – II	Searching Techniques	Periods	9

Exhaustive Searches, DFS, Heuristic Search Techniques, Iterative-Deepening A*, Constraint Satisfaction.
Game Playing, Bounded Look-ahead, Strategy and use of Evaluation Functions, Alpha- Beta Pruning

Unit - III	Logic Programming	Periods	9

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic,Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic,
Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Unit – IV	Knowledge Representation	Periods	9

Introduction, Approaches to Knowledge Representation, Knowledge Representation using SemanticNetwork, Extended Semantic Networks for KR, Knowledge Representation using Frames.

Unit – V	Expert System and Applications	Periods	9

Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and Tools. Uncertainty Measure - Probability Theory: Introduction, Probability Theory, Bayesian Belief
Networks, Certainty Factor Theory.

		Total Periods	45

Text Books

1.	Saroj Kaushik. Artificial Intelligence. Cengage Learning. 2011
2.	S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2015

References

1.	Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition 2009.
2.	Introduction to Artificial Intelligence by Eugene Charniak, Pearson
3.	Introduction to Artificial Intelligence and expert systems Dan W.Patterson. PHI.
4.	Artificial Intelligence by George Fluger rearson fifth edition
5.	NPTEL Course Notes

E-Resources

1.	https://www.youtube.com/watch?v=9IgscYw7BnY
2.	https://towardsdatascience.com/foundations-of-ai-b11d6ad7ce6f
3.	https://artint.info/2e/html/ArtInt2e.html

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Programme	B.E./ B.Tech.	Programme Code		107	Regulation		2019
Department	**CSE,IT, EEE, ECE, CST& BT**				Semester		**IV**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MCSY4	**VERBAL ABILITY**	3	0	0	-	100	-	100

Content of the syllabus

Unit – I		**TENSES**	Periods	**6**

Purpose and rules of tenses and its keywords (focus should be given to present continuous, future continuous, present perfect, future perfect, present perfect continuous, past perfect continuous, future perfect continuous with more examples) - Direct and Indirect Speech – Voices.

Unit – II		**ARTICLES**	Periods	**6**

Purpose of Articles: Indefinite Article: If you want to say about ANY item, you should use the articles A / An.**A :** A European, A One Eyed beggar, A University, A Useful Website. Name of professions, Expression of quantity, To make a Proper noun a Common noun, With certain numbers, used before the word 'Half' when it follows a whole number. **Exceptions: Choosing A or An** There are a few exceptions to the general rule of usinga before words that start with consonants and an before words that begin with vowels. The first letter of the wordhonor, for example, is a consonant, but it"s unpronounced. In spite of its spelling, the word honor begins with a vowel sound. Therefore, we use an. **Example.**

The Definite Article:

Where to use the Definite Article -A specific item, a particular person or thing, Before superlative forms, Before double comparatives, Before musical instruments, Before rank or title, Before name of the political parties, armed forces, physical positions, Before a Proper noun when used as a Common noun, Before some adjectives to make them nouns, Before Ordinal numbers, Before the names of Oceans, Seas, Rivers, Canals, Deserts, Groups of Mountains and Groups of Islands, Before the names of the Things, which are unique in nature, Beforethe names of Planets and Satellites, Before Holy Books, Before the names of News Papers, Before the names of some countries, measuring expressions beginning with by. **Omission of articles**:

Before Plural countable noun, Before proper noun, Before languages, a single item of uncountable noun, Before name of the meals except adjective usage, Double expressions – with wife and fork, with hat and folk, from top to bottom, With the names of meals such as Breakfast, Before predicative nouns denoting a unique position, After type of / kind of / sort of / post of / title of / rank of / articles are not used. Ex. He is not that sortof man, Articles are not used with material nouns, After di-transitive verb articles should not be used except when it is used as mono transitive verb, Before the names of meals no article should be used in a general way except in particular causes.

Repetition of the articles

1. When two or more adjectives qualify the same noun, the article is used before the first adjective only;but when they qualify different nouns, expressed or understood, the article is used before each adjective.

PREPOSITIONS

a. Prepositions Of Time-On, In, At, Since, For, Ago, During, Before, After, Until, Till, To/Past, From/To, By
b. Prepositions Of Place- In, At, On, Off, By, Beside, Under, Over, Below, Above, Up And Down, Ago
c. Prepositions Of Directions/ Movements Across, Through, To, Into, Out Of, Onto, Towards, From
d. Other Prepositions- Of, By , About, For, With
Prepositions Usage with Its Context

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Unit - III	SENTENCE CORRECTION	Periods	6

SENTENCE CORRECTION

a) In each of the following sentences, four options are given. You are required to identify the best way of writing the sentence in the context of the correct usage of standard written English. While doing so, you have to ensure the message being conveyed remains the same in all the cases.

b) For each of the following questions, a part or the whole of the original sentence has been underlined. You have to find the best way of writing the underlined part of the sentence.

c) In the following questions, you have to identify the correct sentence/s. For each of the following questions, find the sentence/s that are correct.

d) In each of the following questions, one or more of the sentences is/are incorrect. You have to identify the incorrect sentence/s.

SENTENCE IMPROVEMENT

    a. Subject-Verb Agreement

    b. Parallelism

    c. Redundancy: The error of repeating the same thing.

    d. Modifier

    e. Comparisons

    RULE: (a) When comparative degree is used with than, make sure that we exclude the thing comparedfrom the rest of class of things by using the

    f. Confusing words

        i) Few and Less

        ii) Few and A few

        iii) Little and A Little

    A little tact would have saved the situation(some tact).Lay and Lie Lay, laid

Unit – IV	SENTENCE COMPLETION	Periods	6

SENTENCE COMPLETION: Purpose and usage of proper words. **SPOTTING ERRORS:**

    a. Errors on conjunctions

    b. Errors on „if" clauses

    c. Errors on adverbs

    d. Errors on adjectives

    e. Errors on prepositions

    f. Errors on determiners

    g. Errors on verbs

    h. Errors on nouns

    i. Errors on modifiers

    j. Errors on degrees of comparison

    k. Errors on subject-verb agreement

    l. Errors on infinitives

    m. Errors on pronouns

    n. Errors on tenses

    o. Redundancy errors

    p. Errors on articles

    q. Error on complex sentences

Unit – V	VOCABULARY	Periods	6

Synonyms: Root Based Word, Suffix Based Word. Antonyms - Contextual Vocabulary - Verbal Analogy			
		Total Periods	**30**

Text Books

1.	Objective General English by SP Bakshi – Arihant Publication

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References

	1.	A modern Approach to verbal and non-verbal reasoning by R.S. Agarwal
	2.	Word power made easy by Norman Lewis

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN					
	(Autonomous Institution, Affiliated to Anna University ,Chennai)					
	Elayampalayam, Tiruchengode – 637 205					

Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**IV**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT407	**Computer Networks Laboratory**	0	0	4	2	50	50	100

Course Objective	The student should be made to, • Relate the theoretical and practical base in computer networks issues. • Have hands on experience on various networking protocols like FTP, DNS, SNMP. • Understand the basic concepts of application layer protocol design; includingclient/server models, peer to peer models, and network naming. • Compare the performance of various routing protocols

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Design computer networks using subnetting and routing concepts	K4
	CO2: Understand Router Configuration	K3
	CO3: Design a Network with Static Routing	K6
	CO4:Design a Network with Dynamic Routing	K6
	CO5: Understand the bandwidth calculations and configurations	K6

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	2	2	2			2	2	1	3	2	2
CO2	3	2	2	2	3	3			2	2	1	3	3	2
CO3	2	2	2	2	1	3			2	2	1	3	2	1
CO4	2	2	3	2	2	3			2	2	1	3	2	1
CO5	3	2	3	2	3	3			2	2	1	3	2	2

Course Assessment Methods Direct

Direct
1.Prelab and post lab test   2.End-Semester examinations
Indirect
1.Course - end survey

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LIST OF EXPERIMENTS		
COMPUTER NETWORKS		
1.	Introduction to packet tracer	**CO1**
2.	Types of Network topology	CO1
3.	IP addressing and Sub netting (VLSM)	CO2
4.	Router Configuration (Creating Passwords, Configuring Interfaces)	CO2
5.	Static and Default Routing	CO3
6.	RIP ver1	CO4
7.	RIP ver2	CO4
8.	Single Area OSPF link costs and Interfaces	CO4
9.	Multi Area OSPF with Stub Areas and Authentication	CO5
10.	EIGRP Configuration, Bandwidth and Adjacencies	CO5
11.	EIGRP authentication and Timers.	CO5
	Total Periods	**45**

E-Resources	
1.	https://www.cisco.com
2.	https://www.netcad.com
3.	https://study-ccna.com

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<table>
<tr><td colspan="6" align="center">VIVEKANANDHACOLLEGEOFENGINEERINGFORWOMEN
(AutonomousInstitution,AffiliatedtoAnnaUniversity,Chennai)Elay
ampalayam,Tiruchengode–637205</td><td></td></tr>
</table>

Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Scienece and Technology**				Semester	**V**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MA509	**Probability, Queueing Theory & Game theory**	3	1	0	4	50	50	100

Course Objective	The main objective of the course is to • Able to understand laws of Probability and the use of Baye's theorem • Acquire and knowledge of standard distributions • Understand the basic characteristics queueing models and analyzing queuing models. • Able to apply scheduling technique (CPM/PERT) to find critical path. • Able to Analyze strategic in decision making

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1:apply the concept of probability to find the outcome of random events	K1,K3
	CO2: Apply the standard distributions that can describe the real life phenomena	K2,K3
	CO3: Apply and analyzing queuing models to improve Queueing process	K3,K5
	CO4: Able to optimize project scheduling by finding critical path.	K2,K5
	CO5: to evaluate determining different strategies to get optimum solution.	K3,K4

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation)3-Strong,2 – Medium,1-Weak														**CO/PSO Mapping**	
Programme Outcomes(POs)														PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3											2	
CO2	3	3											2	
CO3	3	3											2	
CO4	3	3											2	
CO5	3	3											2	

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit – I	**INTRODUCTION TO PROBABILITY**	Periods	**12**
Introduction to Probability, Axioms of Probability: Sample spaces and events, axioms of Probability, sample spaces having equally likely outcomes – Conditional Probability and independence (Conditional Probabilities; Baye's formula, independent events)			
Unit - II	**STANDARD PROBABILITY DISTRIBUTIONS**	Periods	**12**
Discrete Distributions : Binomial distribution - Poisson distribution – Geometric distribution – Continuous Distributions : Uniform distribution, , Exponential distribution – Normal distribution.			
Unit – III	**QUEUEING THEORY**	Periods	**12**
Introduction – Queueing system- Characteristics of Queueing System – Symbols and Notations – Poisson process and Exponential Distribution – Classification of Queues – Model I (M/M/I): (∞/FIFO)- Model II (M/M/I): (∞/SIRO) - Model III (M/M/I): (N/FIFO) - Model IV (M/M/∞): (∞/FIFO) - Model V (M/M/C): (∞/FIFO)			
Unit - IV	**NETWORK SCHEDULING BY PERT/CPM**	Periods	**12**
Introduction – Network and Basic components – Rules of Network Construction – Time calculations in Networks – Critical Path Method (CPM) – PERT – PERT Calculations – Advantages of Network (PERT/CPM)			
Unit – V	**GAME THEORY**	Periods	**12**
Game Theory-Two person Zero sum games-Saddle point, Dominance Rule, Convex Linear Combination (Averages), methods of matrices, graphical and LP solutions.			
		Total Periods	**60**

Text Books	
1.	Montgomery, D.C. and Runger, C.G., Applied Statistics and Probability for Engineers, 6th Edition, Wiley Students Edition, Wiley, 2016.
2.	Kanti Swarup, P.K. Gupta and Man Mohan, Operations Research, 8th Edition, Sultan Chand & Sons, 2000.

References	
1.	Richard Bronson and Govindasami Naadimuthu , Operations Research, 2nd Edition, Tata McGraw – Hill Publishing Company Ltd., 2005.
2.	Hamdy A.Taha, Operations Research an Introduction, 10th Edition, Pearson Publications, 2019
3.	Devore, J.L., Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage Learning, 2011.
4.	Gupta S.C. and Kapoor V.K, Fundamentals of Mathematical Statistics, 1st Edition, Sultan an Sons, 2001
5.	Johnson, R.A., Miller, I. and Freund, J., Miller & Freund's Probability and Statistics for Engineers 8th Edition, Pearson Education, 2010.

E-Resources	
1.	https://www.maths.unsw.edu.au › courses › math2089-numerical-methods.
2.	www.learnerstv.com/Free-engineering-Video-lectures
3.	www.nptel.ac.in

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Scienece and Technology**				Semester	**V**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19EC528	**Embedded Systems Design**	3	0	0	3	50	50	100

Course Objective	The main objective of the course is to • Study foundational concepts of microcontroller architecture and programming. • Study ARM Processor hardware features and its operations. • Introduce peripheral modules Communication in processors, Input/output interfacing. • design simple embedded microcontroller based applications • Introduce Basics of Real time operating system and example tutorials to discuss real-time operating system tool.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1:get foundational knowledge in activating and using a generic microcontroller. Preliminary design considerations for systemlevel implementation.	K2
	CO2:gain the knowledge of LPC2148 Microcontroller Operation	K3
	CO3:understand the Advanced Peripherals for LPC2148	K3
	CO4:design simple embedded microcontroller based applications	K4
	CO5:gain knowledge about real time operating systems for embedded systems.	K3

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation)3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2									2	2	
CO2	2	3	2	2									2	2
CO3	2		3	3									3	3
CO4	2							2					2	2
CO5	3	2	2									2	2	

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	REVIEW OF EMBEDDED SYSTEMS	Periods	9

Introduction to embedded system, embedded system architecture, classifications of embedded systems, challengesand design issues in embedded systems, fundamentals of embedded microcontrollers, CISC vs. RISC, fundamentals of Von neuman/ Harvard microcontrollers.

Unit - II	INTRODUCTION TO LPC2148 MICROCONTROLLER	Periods	9

Background of ARM Architecture – LPC2148 microcontroller introduction – Peripheral features - Bus Structure –Memory Map – PLL and VLSI Bus Divider – Software development using Embedded „C" – Development Tools.

Unit – III	LPC2148Microcontroller Operation and Peripherals	Periods	9

General Purpose IO – Timer Operation – Prescalar – Timer Capture and Compare modes – PWM Modulator –Real Time Clock – Watch Dog Timer – Interrupt. UART operation - Analog to Digital Converter – Digital to Analog Converter.

Unit - IV	DESIGN OF SIMPLE EMBEDDED SYSTEMS:	Periods	

Design of Simple I/O systems using Switches, LEDs, Buzzers - Interfacing LCD Displays – DC Motor Speed Control System - Stepper Motor Interfacing – Relays – Keypads –PC interface.

Unit – V	REAL TIME OPERATING SYSTEMS	Periods	9

Task and Task States, tasks and data, semaphores and shared Data Operating system Services-Message queues-Timer Function-Events-Memory Management, Interrupt Routines in an RTOS environment, basic design Using RTOS.

			45

Text Books

1.	Trevor Martin,"The Insider's Guide to the Philips ARM7-Based Microcontrollers", Hitex Pubications(UK), 2005
2.	Raj kamal, ―Embedded Systems – Architecture, Programming and Design‖, Third Edition,McGraw Hill Education, 2017
3.	Jonathan Valvano, ―Embedded Microcomputer Systems Real Time Interfacing, Third Edition Cengage Learning, 2012.
4.	David E Simon, "An Embedded Software Primer", Pearson Education Asia, New Delhi, 2009.

References

1.	Jonathan W Valvano, "Introduction to Arm Cortex -M Microcontrollers", 2012.
2.	Tammy Noergaard, ―Embedded Systems Architecture, Second Edition, Newness Publications, 2010
3.	Elecia White, ―Making Embedded Systems, Third Edition, O"REILLY, 2011.
4.	K.V.Shibu, ―Introduction to Embedded systems, Second Edition, Mc Graw Hill Publications, 2017

E-Resources

1.	https://learnengineering.in/introduction-to-arm-cortex-m-microcontrollers-by-jonathan-w-valvano/
2.	https://www.edx.org/course/embedded-systems-shape-the-world-microcontroller-i
3.	https://www.codrey.com/embedded-systems/embedded-systems-introduction/

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Programme	B.E.	Programme Code				**107**	Regulation	**2019**	
Department	**Computer Scienece and Technology**						Semester	**V**	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT508	**Artificial Intelligenceand its Applications**	3	0	0	3	50	50	100

Course Objective	The student should be made to, - To know the basic concept of intelligent agents and objects - To know the underlying structure and logical implications behind intelligence mathematically - To know the automated learning techniques and to explore the techniques in ReinforcementLearning - To explore the basics of Machine learning and Neural networks - To know about the Natural Language processing and explore AI techniques for robotics

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Understand the concepts of Agents and objects	K2
	CO2: Understand the probabilistic reasoning using Bayesian Models	K3
	CO3: Apply probabilistic models for various use cases and reinforcement learning	K3
	CO4: Apply the concepts of Machine learning and ANN techniques in AI	K4
	CO5: Apply NLP and AI techniques for robotics	K3,K4

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation)3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	2	3	1					3	3	3
CO2	3	3	3	3	3	3	1					3	2	3
CO3	3	3	3	3	3	3	1					3	3	3
CO4	3	3	3	3	3	3	1					3	3	3
CO5	3	3	3	3	3	3	1					3	3	3

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Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**Introduction to objects and agents**	Periods	**9**

Ontological engineering – categories and objects – events – mental objects and modal logic – reasoning systems for categories – reasoning with default information- Software Agents-Architecture for Intelligent Agents-Agent communication-Negotiation and Bargaining-Argumentation among Agents-Trust and Reputation in Multi-agent systems

Unit–II	**Probabilistic reasoning**	Periods	**9**

Acting under uncertainty- Bayesian inference – naïve bayes models Probabilistic reasoning – Bayesian networks- Probabilistic reasoning over time – time and uncertainty – inference in temporal models – Hidden Markov Models –Kalman filters

Unit – III	**Probabilistic Models and Reinforcement Learning**	Periods	**9**

PROBABLISTIC MODELS Statistical learning theory – maximum-likelihood parameter learning – naïve bayes models – generative and descriptive models – continuous models- – Gaussian mixture models – **REINFORCEMENT LEARNING:** Learning from rewards – passive reinforcement learning – active reinforcementlearning – generalization in reinforcement learning

Unit–IV	**Introduction to Machine Learning and Artificial NeuralNetworks**	Periods	**9**

MACHINE LEARNING: Introduction, Machine Learning Process, Feature Engineering-Feature Extraction, FeatureSelection, Feature Engineering Methods Data Visualization Line Chart, Bar Chart, Pie Chart, Histograms, Scatter Plot, Seaborn- Distplot, joint plot.-Definitions of Supervised and unsupervised learning,

Unit –V	**Introduction To NLP and ROBOTS**	Periods	**9**

Introduction to Natural Language processing-Components in NLP-Terminologies- examples-Case Studies: Alexa , SIRI.

	Total Periods	**45**

Text Books

1.	Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, PearsonEducation, 2020..
2.	Dr.Nilakshi Jain, Artificial Intelligence, As per AICTE: Making a System Intelligent, Wiley Publications, 1stEdition,2019
3.	Ameet V Joshi, Machine Learning and Artificial Intelligence, Springer Publications, 2020
4.	Dr.S.Lovelyn Rose, Dr. L.Ashok Kumar, Dr.D.Karthika Renuka, Deep Learning using Python, Wiley IndiaPvt. Ltd 2019.

References

1.	Saroj Kaushik, Artificial Intelligence, Cengage Learning India, 2011.
2.	Machine Learning Dummies, John Paul Muller, Luca Massaron, Wiley Publications, 2021.
3.	Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
4.	Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013

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E-Resources	
1.	https://www.simplilearn.com/learn-ai-basics-skillup
2.	https://developers.google.com/machine-learning/crash-course
3.	https://www.opentrends.net/en/article/basic-concepts-artificial-intelligence

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Programme	**B.E.**	Programme Code			**107**	Regulation		**2019**		
Department	**Computer Scienece and Technology**					Semester		**V**		

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT509	**Internet Programming**	3	0	0	3	50	50	100

Course Objective	The student should be made, • To describe basic Internet Protocols. • Explain tools for Internet programming. • Describe scripting languages – Java Script. • Explain dynamic HTML programming. • Explain Server Side Programming tools	
Course Outcome	At the end of the course, the student should be able to,	Knowledgee Level
	CO1: Construct a basic website using HTML	K2
	CO2: Develop attractive web page using Cascading Style Sheets.	K3
	CO3: Build dynamic web page with validation using Java Script objectsand by applying different event handling mechanisms	K3
	CO4: Construct simple web pages in PHP and to represent data in XMLformat	K3
	CO5: Use AJAX and web services to develop interactive web applications	K2
Pre-requisites	-	

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	3	3	2				1	3		3	3	3
CO2	2	2	3	3	2				1	3		3	3	3
CO3	2	2	3	3	3				1	3		3	3	3
CO4	2	2	3	3	3				1	3		3	3	3
CO5	2	2	3	3	3				1	3		3	3	3

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit–I	**Introduction**	Periods	**9**
Introduction to Internet, World Wide Web, History of the Internet & World, History of the Internet and World, Categories of Web Applications, Hypertext Mark Up Language (HTML), Basic HTML page, Text Formatting, Table, Headers, Linking, Images, List, Meta Elements.			
Unit–II	**Cascade Style Sheet**	Periods	**9**
CSS Syntax and structure, CSS rules for Backgrounds, Colors and properties, Manipulating texts, Fonts, borders and boxes, Margins, Padding Lists, CSS Positioning , Animations, Tool-Tips, Style images, Variables, Media Queries, Wildcard Selectors, Working with Gradients, Pseudo Class , Pseudo elements, basic of frameworks like Bootstrap, Need for Scripting languages, Types of scripting languages, Client side scripting, Server side scripting, Simple Applications Demo			
Unit– III	**Client Side Programming**	Periods	**9**
Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects, Regular Expressions-Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript-JSON introduction – Syntax – Function Files – Http Request – SQL, nodejs.			
Unit–IV	**PHP and XML**	Periods	**9**
An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation- Regular Expressions - File handling – Cookies - Connecting to Database. **XML:** Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).			
Unit–V	**Introduction To AJAX and Web Services**	Periods	**9**
AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application – SOAP, Basics ofREST API.			
		Total Periods	**45**

Text Books	
1.	Paul Deitel, Harvey Deitel and Abbey Deitel - Internet And World Wide Web: How To Program, Pearson Education; Fifth edition, ISBN-10 : 9789352868599, 2018
2.	Deitel and Deitel and Nieto, ―Internet and World Wide Web - How to Program‖, PrenticeHall, 5th Edition, 2011.

References	
1.	Jeffrey C and Jackson, ―Web Technologies A Computer Science Perspective‖, PearsonEducation, 2011..
2.	Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, WileyPublications, 2009.

E-Resources	
1.	https://www.w3schools.com/php/
2.	https://www.tutorialspoint.com/html/index.htm
3.	https://www.youtube.com/watch?v=G0BzzuXS8gI

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Programme	B. E		Programme Code		**107**		Regulation		**2019**
Department	**CST**						Semester		**V**

Course Code	Course Name	Periods Per Week				Credit	Maximum Marks		
		L	T	P		C	CA	ESE	Total
U19MCTY5	**Logical Reasoning**	2	0	0		-	100	-	100

Content of the syllabus

Unit – I	VERBAL REASONING	Periods	6

Coding – Decoding(Letter Coding, Direct Letter Coding, Number/Symbol Coding, Deciphering Message – Word coding and Numeral coding, Substitution Coding, Crypt coding – crypt addition, subtraction, Information Arrangement Coding) , **Analogy** (Direct and Simple Analogy, Completing the Analogues pair, Choosing the Analogues pair,Choosing the similar word, Number Analogy, Alphabet Analogy), **Classification**(Choosing the odd words, Choosing theodd pair of words, Choosing the odd letter group, Choosing the odd number and odd pair of numbers), **Alphabet** Test(Arrangement according to dictionary, Alpha-Numeric sequence, Letter word problems, Rule detection), Word Formation (Using letters from a given word, By unscrambling words)

Unit - II	SITTING ARRANGEMENT & SENSE TEST	Periods	6

Sitting Arrangement (Arrangement in a line, Arrangement around of a circle, square and rectangle, Arrangement around pentagonal and hexagonal, **Direction Sense Test**[(Main, Cardinal and Shortest Direction)Final Detection, Displacement, Direction and Displacement], **Number, Ranking, Time sequence Test** (Number Test, Ranking Test, Time Sequence Test), Puzzles (Based on classification, Based on placing and comparison, Family Based problems)

Unit – III	NUMBER AND LETTER SERIES	Periods	6

Number and Letter Series[(**Number Series**: To find a missing term, Find the number that does not follow the pattern, Miscellaneous pattern of the series (Based on addition / subtraction of consecutive odd / even no"s, Based on addition / subtraction of prime numbers, Multiplication and Division, Based on addition / subtraction of squares of natural numbers, Based on addition / subtraction of cubes of natural numbers) , **Letter Series** (Alphabet Series, Continuous pattern of series)], **Inserting the missing character**, **Age, Blood** (Jumbled up descriptions, Relation puzzles, Coded Relations), **Clock and calendar** (Mathematical operations and Notations- Problem of solving by substitution, Interchanging signs and numbers, Deriving the appropriate conclusions), **Logical order of words, Clerical aptitude** (Question based on address, Question based on issues)

Unit – IV	LOGICAL AND ANALYTICAL REASONING	Periods	6

Logical venn diagrams (Universal positive, Universal Negative, Universal Affirmative or Negative, Miscellaneous, Geometrical Figures on Venn Diagrams), **Eligibility test, Syllogisms, Statement and Assumptions, Statement and Conclusions, Statement and Arguments, Statement and Course of Action, Verification of Truth of the Statement, Data Sufficiency.**

Unit – V	DATA INTERPRETATION & FLOW CHART	Periods	6

Input – Output (Shifting, Arranging),**Data Interpretation** (Table chart, Bar chart, Pie chart, Miscellaneous chart, Mixed chart), **Cube**(no of sided painted, Full cube, cutting cube), **Flow chart** (Description flow chart, Value updating flow chart), **Quantitative reasoning, Logical deduction, Deductive reasoning, Binary logic**

		Total Periods	30

Text Books		
1.	How to crack Test of Reasoning - Jai kishan and Prem kishan -arihant publication	

References		
1.	How to prepare logical reasoning for CAT – Arun Sharma – Mc Graw Hill Publication	

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<table>
<tr><td rowspan="3" colspan="2" style="text-align:center">(logo)</td><td colspan="6" style="text-align:center">VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous Institution, Affiliated to Anna University ,Chennai)
Elayampalayam, Tiruchengode – 637 205</td><td style="text-align:center">(cert logo)</td></tr>
</table>

Programme	**B.E.**	Programme Code			**107**	Regulation	**2019**
Department	**Computer Science & Technology**					Semester	**V**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19EC526	**Embedded Systems Design Laboratory**	0	0	4	2	50	50	100

Course Objective	The student should be made to, • To Design microcontroller based embedded systems. • To introduce the embedded systems design tools and hardware programming • To equip the students skills in both simulation and practical implementation of the basic building blocks of a microcontroller including timers, counters, I/O techniquesand requirements, A/D conversion, serial communications • To develop firmware for the systems and to validate the same through functional simulation and hardware verification.

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: The students get exposure to the system design aspects of Microcontrollers	K4
	CO2: Will be able Design applications for customized requirements	K3
	CO3: Will learn firmware development for microcontrollers	K6
	CO4: Nalayse and design using ARM LPC2148 Microcontrollers	K6
	CO5: Understand the interfacing the display with the Microcontrollers	K6

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2		3		2								1	2
CO2	3		2		3								3	3
CO3	2		2		1								1	2
CO4	2		3		2								2	2
CO5	2		3		2								1	2

Course Assessment Methods Direct

Direct
1.Prelab and post lab test 2.End-Semester examinations
Indirect
1.Course - end survey

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LIST OF EXPERIMENTS		
Embedded Systems Design Laboratory		
1.	Study of ARM Controller and LPC2148	**CO1**
2.	Implementation of GPIO of ARM LPC2148	**CO2**
3.	Interfacing Timer using ARM LPC2148.	**CO2**
4.	Implementation of UART features of ARM LPC2148.	**CO3**
5.	Implementation of ADC of ARM LPC2148.	**CO3**
6.	Implementation of DAC of ARM LPC2148.	**CO4**
7.	Seven segment display interface using LPC2148	**CO4**
8.	Interfacing 4x4 matrix key with LPC2148	**CO4**
9.	Interfacing buzzer with LPC2148	**CO5**
10.	Real time clock implementation using LCD and ARM LPC2148	**CO5**
11.	Interfacing Graphical LCD using LPC2148.	**CO5**
	Total Periods	**45**

E-Resources	
1.	https://www.electronicwings.com/arm7/lpc2148-timercounter#:~:text=LPC2148%20has%20two%2032%2Dbit,signal%20at%20specified%20time%20value.
2.	https://www.engineersgarage.com/how-to-interface-4x4-matrix-keypad-with-lpc2148-part-6-9/
3.	https://www.youtube.com/watch?v=JLsPS58bmO0

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN						
	(Autonomous Institution, Affiliated to Anna University ,Chennai)						
	Elayampalayam, Tiruchengode – 637 205						

Programme	**B.E.**	Programme Code			**107**	Regulation	**2019**
Department	**Computer Science & Technology**					Semester	**V**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT510	**Internet Programming Laboratory**	0	0	4	2	50	50	100

Course Objective	The student should be made to, • Design a web page using HTML/XML and style sheets. • Create dynamic web pages using server side scripting. • Develop the Client Server applications. • be familiar with the PHP programming with xml. • Develop web services using AJAX

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Construct a basic website using HTML	K2
	CO2: Develop attractive web page using Cascading Style Sheets.	K3
	CO3: Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms	K3
	CO4: Construct simple web pages in PHP and to represent data in XMLformat	K4
	CO5: Use AJAX and web services to develop interactive web applications	K3

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	1	2							2	2	2
CO2	3	2	2	1	3							2	2	2
CO3	2	2	2	2	1							2	2	2
CO4	2	2	3	2	2							2	2	2
CO5	3	2	3	2	3							2	2	2

Course Assessment Methods Direct

Direct
1.Prelab and post lab test   2.End-Semester examinations
Indirect
1.Course - end survey

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LIST OF EXPERIMENTS		
Internet ProgrammingLaboratory		
1.	Design the following static web pages required for an online book store web site. HOME PAGE: Uniform Resource Locator, Tools and Web Programming Languages. Web Standards	CO1
2.	Design the following static web pages required for an online book store web site. LOGIN PAGE, CATOLOGUEPAGE	CO1
3.	Design the following static web pages required for an online book store web site. CART PAGE:	CO2
4.	Design the following static web pages required for an online book store web site. REGISTRATION PAGE	CO2
5.	Design the following static web pages required for an online book store web site. using bootstrap	CO2
6.	Design the following static web pages required for an online book store web site. VALIDATION using Scripting Language	CO3
7.	Write an XML file which will display the Book information	CO4
8.	Design dynamic web page with login credentials using PHP and MSQL	CO4
9.	Create a web page using web services	CO5
	Total Periods	
E-Resources		
1.	https://www.youtube.com/watch?v=1X37MpeVcmU	
2.	https://www.youtube.com/watch?v=5GcQtLDGXy8	
3.	https://www.geeksforgeeks.org/rest-api-introduction/	

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Programme	B.E.	Programme Code		107	Regulation	2019
Department	Computer Science and Technology				Semester	V

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE01	Cryptography and Network Security	3	0	0	3	50	0	100

Course Objective	The main objective of this course is to: - Understand OSI security architecture and classical encryption techniques. - Understand various block cipher and stream cipher models - Describe the principles of public key cryptosystems, hash functions and digital signature. - Gain a first-hand experience on encryption algorithms, encryptionmodes. - Understand the basics of Cyber security	
Course Outcome	The students who complete this course successfully are expected to:	Knowledge Level
	CO1: Implement the Classical Encryption Techniques.	K1
	CO2: Categorize block cipher modes of operation and comprehend digital signature functions	K2
	CO3: Implement Public Key Cryptography and hash functions.	K2
	CO4: Understand the concepts of Message Authentication	K3
	CO5: Comprehend the basics about the Cyber Security	K3
Pre-requisites	-	

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
	Programme Outcomes(POs)												PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	2	1	1			2	2	3	3
CO2	3	3	3	3	3	2	1	1			2	2	2	2
CO3	3	3	3	3	3	2	1	1			2	2	3	3
CO4	3	3	3	3	3	2	1	1			2	2	2	2
CO5	3	3	3	3	3	2	1	1			2	2	3	3

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	Introduction to Network Security	Periods	9

Introduction to Cryptography and Network Security:OSI Security Architecture, Introduction to Security attacks, Security mechanisms, Symmetric cipher model, Substitution techniques: Caesar cipher, Play fair Cipher, Mono alphabetic cipher, Poly alphabetic ciphers , Onetime pad, Hill Cipher – Encryption, Decryption, Transposition techniques, Steganography

Unit – II	Cipher techniques	Periods	9

Block cipher principles-Introduction, Data Encryption Standard, DES Example, Strength of DES, Block cipher Modes of operation – Multiple Encryption, Block cipher Modes of operation –Triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode and Counter Mode, Advanced Encryption Standard – Structure and Transformation Functions, AES Key Expansion and AES Example, Blowfish, RC5 algorithm.

Unit - III	Public Key Crypto Systems	Periods	9

Principles of Public-key Cryptosystems - Structure and key management, Principles of Public-key Cryptosystems – Applications for Public-key Cryptosystems, Requirements for Public-key Cryptosystems and Public – Key Cryptanalysis, RSA algorithm - Key management, RSA algorithm - Encryption and Decryption, Diffie Hellman key exchange – Algorithm, Key Exchange Protocols, Man-in-the- Middle Attack, Elliptic Curve Cryptography

Unit – IV	Message Authentication Code	Periods	9

Message Authentication Codes, Requirements for Message Authentication Codes, Applications of Cryptographic Functions - Message Authentication, Two Simple Hash Function, Security Requirements for Cryptographic hash Functions, Hash Algorithms - MD5, Hash Algorithms – SHA, Digital Signature Standard, Applications pertaining to Encryption using different ciphers and modes, One-way hash algorithm, KERBROS, x.509 Authentication Service, Firewall Concepts and its types, Viruses and its threats.

Unit – V	Basics of Cyber Security	Periods	9

Introduction to Cyber Security and attacks, Email Security, Physical Security & Its Importance,Mobile Security & Common Vulnerabilities,, Critical Security Components, Basics of Malwares, Importance of Cyber Law

		Total Periods	45

Text Books

1.	WilliamStallings,"CryptographyandNetworkSecurity",6th Edition, 2014,Pearson Education, ISBN:9789332518773.
2.	AtulKahate,"CryptographyandNetworkSecurity",2nd Edition, 2009, McGraw Hill Education India PvtLtd,ISBN:100070151458

References

1.	Ankit Fadia , Network Security: A Hacker's Perspective, Course Technology Inc; 2nd edition ISBN-10 : 1598631632,2006.
2.	Mike Speciner Radia Perlman, Charlie Kaufman, Network Security : PRIVATE Communication in a PUBLIC World, Pearson, Second Edition, ASIN : B074PMVRJT
3.	NPTEL Course Notes

E-Resources

1.	https://www.geeksforgeeks.org/network-security/
2.	https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science and Technology**				Semester	**V**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE01	**Cryptography and Network Security**	3	0	0	3	50	50	100

Course Objective	The main objective of this course is to: - Understand OSI security architecture and classical encryption techniques. - Understand various block cipher and stream cipher models - Describe the principles of public key cryptosystems, hash functions and digital signature. - Gain a first-hand experience on encryption algorithms, encryptionmodes. - Understand the basics of Cyber security

Course Outcome	The students who complete this course successfully are expected to:	Knowledge Level
	CO1: Implement the Classical Encryption Techniques.	K1
	CO2: Categorize block cipher modes of operation and comprehend digital signature functions	K2
	CO3: Implement Public Key Cryptography and hash functions.	K2
	CO4: Understand the concepts of Message Authentication	K3
	CO5: Comprehend the basics about the Cyber Security	K3

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	2	1	1			2	2	3	3
CO2	3	3	3	3	3	2	1	1			2	2	2	2
CO3	3	3	3	3	3	2	1	1			2	2	3	3
CO4	3	3	3	3	3	2	1	1			2	2	2	2
CO5	3	3	3	3	3	2	1	1			2	2	3	3

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

Signature of BoS Chairman

Content of the syllabus

Unit – I	Introduction to Network Security	Periods	9

Introduction to Cryptography and Network Security:OSI Security Architecture, Introduction to Security attacks, Security mechanisms, Symmetric cipher model, Substitution techniques: Caesar cipher, Play fair Cipher, Mono alphabetic cipher, Poly alphabetic ciphers , Onetime pad, Hill Cipher – Encryption, Decryption, Transposition techniques, Steganography

Unit – II	Cipher techniques	Periods	9

Block cipher principles-Introduction, Data Encryption Standard, DES Example, Strength of DES, Block cipher Modes of operation – Multiple Encryption, Block cipher Modes of operation –Triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode and Counter Mode, Advanced Encryption Standard – Structure and Transformation Functions, AES Key Expansion and AES Example, Blowfish, RC5 algorithm.

Unit - III	Public Key Crypto Systems	Periods	9

Principles of Public-key Cryptosystems - Structure and key management, Principles of Public-key Cryptosystems – Applications for Public-key Cryptosystems, Requirements for Public-key Cryptosystems and Public – Key Cryptanalysis, RSA algorithm - Key management, RSA algorithm - Encryption and Decryption, Diffie Hellman key exchange – Algorithm, Key Exchange Protocols, Man-in-the- Middle Attack, Elliptic Curve Cryptography

Unit – IV	Message Authentication Code	Periods	9

Message Authentication Codes, Requirements for Message Authentication Codes, Applications of Cryptographic Functions - Message Authentication, Two Simple Hash Function, Security Requirements for Cryptographic hash Functions, Hash Algorithms - MD5, Hash Algorithms – SHA, Digital Signature Standard, Applications pertaining to Encryption using different ciphers and modes, One-way hash algorithm, KERBROS, x.509 Authentication Service, Firewall Concepts and its types, Viruses and its threats.

Unit – V	Basics of Cyber Security	Periods	9

Introduction to Cyber Security and attacks, Email Security, Physical Security & Its Importance,Mobile Security & Common Vulnerabilities,, Critical Security Components, Basics of Malwares, Importance of Cyber Law

		Total Periods	45

Text Books

1.	WilliamStallings,"CryptographyandNetworkSecurity",6th Edition, 2014,Pearson Education, ISBN:9789332518773.
2.	AtulKahate,"CryptographyandNetworkSecurity",2nd Edition, 2009, McGraw Hill Education India Pvt Ltd,ISBN:100070151458

References

1.	Ankit Fadia , Network Security: A Hacker's Perspective, Course Technology Inc; 2nd edition ISBN-10 : 1598631632,2006.
2.	Mike Speciner Radia Perlman, Charlie Kaufman, Network Security : PRIVATE Communication in a PUBLIC World, Pearson, Second Edition, ASIN : B074PMVRJT
3.	NPTEL Course Notes

E-Resources

1.	https://www.geeksforgeeks.org/network-security/
2.	https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm

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Programme	**B.E.**	Programme Code			**107**	Regulation		**2019**
Department	**Computer Science and Technology**					Semester		**V**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE02	**Pattern Recognition Techniques**	3	0	0	0	50	50	100

Course Objective	The main objective of this course is to: • Understand the fundamentals of Pattern Recognition techniques • Learn Statistical models of Pattern Recognition • Understand the principles of Clustering approaches to Pattern Recognition • Understand the Syntactic Pattern Recognition techniques • Understand the Neural Network approach to Pattern Recognition

Course Outcome	The students who complete this course successfully are expected to:	Knowledge Level
	CO1:Summarize the various theorems involved in pattern recognition	K1
	CO2: Discuss the theories in Pattern recognition	K2
	CO3: Categorize the various pattern recognition techniques into supervised and unsupervised	K3
	CO4: Illustrate the techniques in pattern recognition	K3
	CO5: Discuss the applications of pattern recognition in various applications	K3

Pre-requisites	-

CO /PO Mapping
(3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak

CO/PSO Mapping

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

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

Signature of BoS Chairman

Content of the syllabus

Unit – I	Introduction	Periods	9

Basics of Probability, Random Processes and Linear Algebra: Probability: independence of events, conditional and joint probability, Bayes" theorem; Random Processes: Stationary and non stationary processes, Expectation, Autocorrelation, Cross-Correlation, spectra; Linear Algebra: Inner product, outer product, inverses, Eigen values, Eigen vectors; Bayes Decision Theory

Unit – II	Theories	Periods	9

Bayes Decision Theory: Minimum-error-rate classification, Classifiers, Discriminate functions,Decision surfaces, Normal density and discriminate functions, discrete features, Parameter Estimation Methods: Maximum-Likelihood estimation: Gaussian case; Maximum a Posteriori estimation;Bayesian estimation: Gaussian case.

Unit - III	Learning Methods	Periods	9

Unsupervised learning and clustering: Criterion functions for clustering; Algorithms for clustering: K-Means, Hierarchical and other methods; Cluster validation; Gaussian mixture models; Expectation- Maximization method for parameter estimation; Maximum entropy estimation, Sequential PatternRecognition: Hidden Markov Models (HMMs); Discrete HMMs; Continuous HMMs

Unit – IV	Techniques	Periods	9

Nonparametric techniques for density estimation: Parzen-window method; K-Nearest Neighbour method, Dimensionality reduction: Fisher discriminant analysis; Principal component analysis; Factor Analysis

Unit – V	Functions and Applications	Periods	9

Linear discriminant functions: Gradient descent procedures; Perceptron; Support vector machines,Non-metric methods for pattern classification: Non-numeric data or nominal data; Decision trees: CART , Applications: Image processing, segmentation, and analysis, Speech recognition, Fingerprintidentification

		Total Periods	45

Text Books

1.	Beyerer Jürgen / Richter Matthias / Nagel Matthias, De Gruyter, Pattern Recognition: Introduction Features Classifiers And Principles, De Gruyter Publishing, ISBN9783110537932, 2017.
2.	C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

References

1.	P.A. Devijer & J. Kittler, Pattern Recognition - A Statistical Approach, Prentice-Hall.Christopher. M. Bishop, 'Pattern recognition and machine learning, Springer, 2006.
2.	GIBSON, Pattern Recognition, Publisher Prhusa / Pen. Rand. USA, ISBN: 9780425192931,2016
3.	NPTEL Course Notes

E-Resources

1.	https://www.mathworks.com/discovery/pattern-recognition.html
2.	https://www.youtube.com/watch?v=cbZUnuyxcVs
3.	https://www.youtube.com/watch?v=zb4J8_weas0

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science and Technology**				Semester	**V**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE03	**Fundamentals of Visualization**	3	0	0	3	50	50	100

Course Objective	The main objective of this course is to: - Understand about Computing Virtualization tools, applications and techniques - Understand CPU virtualization, memory virtualization - How to configure VM CPU and memory options - Understand storage and network virtualization - Acquire knowledge about virtualization security - Learn about many case studies	
Course Outcome	The students who complete this course successfully are expected to:	Knowledge Level
	CO1:Able to define, distinguish Computing Virtualization tools, applications and techniques	K1
	CO2: Able to configure virtual machine CPU and memory options	K2
	CO3: Able to configure VM storage	K3
	CO4: Able to understand network options in Virtualization	K3
	CO5: Identify threats and able to secure virtualized environment	K3
Pre-requisites	-	

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	2	1				2	2	3	3
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CO3	3	3	3	3	3	2	1				2	2	3	3
CO4	3	3	3	3	3	2	1				2	2	2	2
CO5	3	3	3	3	3	2	1				2	2	3	3

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

Signature of BoS Chairman

Content of the syllabus

Unit – I	Introduction	Periods	9

Overview Of Virtualization -Basics of Virtualization - Virtualization Types – Desktop Virtualization,Storage Virtualization – System-level Operating Virtualization – Application Virtualization- Virtualization Advantages, Understanding Hypervisors, Understanding Virtual Machines, Assignment- Installing, windows, Linux on a virtual machine.

Unit – II	Concepts in Creating Virtual Machines	Periods	9

Creating a Virtual machine- Performing P2V Conversions, Loading your Environment, Building a new Virtual machine, Managing CPUs for a virtual machine-Understanding CPU Virtualization, Configuring VM CPU options, Tuning practices for VM CPUs, Managing Memory for a virtual
Machine-Understanding memory virtualization, Configuring VM memory options, Tuning practicesfor VM memory

Unit - III	Storage Management in Virtual Machine	Periods	9

Managing Storage for a virtual machine-Understanding storage virtualization, Configuring VMStorage , options, Tuning practices for VM storage, SCSI- Speaking SCSI- Using SCSI buses – FiberChannel – Fiber Channel Cables – Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI, Server virtualization concepts, Introduction to server virtualization, Types of servervirtualization technologies, Limitations of server virtualization, Managing Networking for a virtual machine-understanding network virtualization, Configuring VM network options, Tuning practices for Virtual networks.

Unit – IV	Network Device Virtualization s	Periods	9

Theory Network Device Virtualization - VLANs , VRF Instances- VFIs -Virtual Firewall Contexts Network Device Virtualization, Fundamentals of Virtualization security-Virtualization architecture, Threats to a virtualized environment.

Unit – V	Security Virtualization	Periods	9

How security must adapt to virtualization, Securing hypervisors-Hypervisor configuration and security, Designing virtual networks for security-comparing virtual and physical networks, Virtual networksecurity considerations, Configuring virtual switches for security

		Total Periods	45

Text Books

1.	Virtualization Security: Protecting Virtualized Environments, Dave shackleford, sybex publications,2013
2.	Matthew Portnoy, Virtualization Essentials, WILEY INDIA, 2nd Edition, 2016

References

1.	William von Hagen, Professional Xen Virtualization, Wrox Publications, January, 2008
2.	David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach Publications, 2006
3.	NPTEL Course Notes

E-Resources

1.	https://www.youtube.com/watch?v=ZogZwbyPO_4
2.	https://www.oreilly.com/library/view/vmware-vsphere virtualization/9780133442090/Lesson_5_2.html
3.	https://www.redhat.com/en/topics/virtualization

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Programme	**B.E.**	Programme Code			**107**	Regulation		**2019**	
Department	**Computer Science and Technology**					Semester		**V**	

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE04	**Mobile Computing**	3	0	0	3	50	50	100

Course Objective	The student should be made to, - Provide the basic concepts of wireless and communication networks - Explore the overview of mobile communications and its characteristics - Develop skills of finding solutions and building software for mobile computing applications - Enable students to know different multiple division techniques and existing wireless networks - Build knowledge on various Mobile Computing Algorithms

Course Outcome	At the end of the course, the student should be able to,	KnowledgeLevel
	CO1: Define the fundamentals of cellular architecture and its distribution	K4
	CO2: Analyze the various mobility models in location management and types of handoff	K3
	CO3: Acquire the knowledge of Frequency, Time, Code, Space Multiple Access control	K3
	CO4: Incorporate theoretical knowledge about Wireless Sensor Networks	K4
	CO5: Analyze the characteristics and application of Wireless sensor network and 5Gnetworks	K4

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak														**CO/PSO Mapping**	
Programme Outcomes(POs)														PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		PSO 1	PSO 2
CO1	2		3	2											2
CO2	2		2	3										2	1
CO3		2	3											1	
CO4	2	3		2										1	
CO5	2	1	2											1	

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Course Assessment Methods Direct

Direct

1.Continuous Assessment Test I, II & III
   2.Assignment.
   3.End-Semester examinations

Indirect
1.Course - end survey

Content of the syllabus			
Unit – I	**Introduction to Mobile Computing**	Periods	**9**
Overview of wireless and mobile infrastructure, Preliminary concepts on cellular architecture, Design objectives and performance issues, Radio resource management and interface, Propagation and path loss models, Channel interference and frequency reuse, Cell splitting, Channel assignment strategies, Overview of generations:- 1G to 5G, Location and handoff management - Introduction to location management (HLR and VLR), Mobility models characterizing individual node movement (Random walk), Mobility models characterizing individual node movement(Fluid flow.			
Unit – II	**Mobility Models and its Characteristics**	Periods	**9**
Mobility models characterizing individual node movement(Markovian), Mobility models characterizing individual node movement(Activity based), Mobility models characterizing the movement of groups of nodes(Reference point based group mobility model), Mobility models characterizing the movement of groups of nodes(Community based group mobility model), Static (Always vs. Never update, Reporting Cells, Location Areas), Dynamic location management schemes (Time, Movement, Distance, Profile Based), Terminal Paging (Simultaneous paging, Sequential paging), Location management and Mobile IP Overview of handoff process, Factors affecting handoffs and performance evaluation metrics, Handoffstrategies, Different types of handoffs (soft, hard, horizontal, vertical)			
Unit - III	**Wireless transmission fundamentals**	Periods	**9**
Introduction to narrow and wideband systems, Spread spectrum - Frequency hopping, Introduction to MIMO, MIMO Channel Capacity and diversity gain, Introduction to OFDM, MIMO-OFDM system,Multiple access control (FDMA, TDMA,CDMA, SDMA), Wireless local area network, Wireless personal area network (Bluetooth and zigbee), Characteristics and applications, Coverage and connectivity problems.			
Unit – IV	**Wireless Sensor Networks**	Periods	**9**
Concepts of WSN, Basic architecture, Design objectives of WSN, Applications of WSN, Sensing and communication range Coverage and connectivity, Sensor placement, Data relaying and aggregation, Energy consumption, Clustering of sensors, Energy efficient Routing (LEACH).			
Unit – V	**Cognitive Radio Networks**	Periods	**9**
Cognitive radio networks - Fixed spectrum access, Dynamic spectrum access, Direct spectrum sensing,Indirect spectrum sensing, Spectrum sharing, Interoperability and co-existence issues, Applications of cognitive radio networks, D2D communications in 5G cellular networks - Introduction to D2D communications, High level requirements for 5G architecture, Introduction to the radio resource management, Power control and mode selection problems, Millimeter wave communication in 5G			
		Total Periods	**45**
Text Books			
1.	Lingyang Song,"Wireless Device-to-Device Communications and Networks ",1st Edition, 2015,Cambridge University Press, ASIN : B00SYVZ82M.		
2.	Jochen Schiller,Mobile Communications., Pearson Education, 2004		

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References	
1.	Theodore Rappaport ,Wireless Communications: Principles and Practice, Pearson Education, 2002
2.	Ezio Biglieri, MIMO Wireless Communications O Wireless Communications, Cambridge UniversityPress, ISBN:9780511618420, 2009
3.	Andrea J. Goldsmith, Larry J. Greenstein, Narayan Mandayam and H. Vincent Poor, Principles of CognitiveRadio.EzioBiglieri, , Cambridge University Press, 2012
E-Resources	
1.	https://www.javatpoint.com/mobile-computing
2.	https://www.youtube.com/watch?v=5kBknJWi71Q
3.	https://www.educba.com/mobile-computing-types/

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Programme	B.E.	Programme Code		107	Regulation	2019

Department	Computer Science and Technology			Semester	V

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE05	Network Programming	3	0	0	0	100	0	100

Course Objective	The main objective of this course is to: • To learn different socket function and implement client serverapplications using sockets • To conduct experiments to know how different internet protocols like TCP/IP works • To analyze various application program like TELNET, DNS, DHCP • Build different application like Routing, Load balancing & Security • To apply protocols get adapted to emerging technologies

Course Outcome	The students who complete this course successfully are expected to:	Knowledge Level
	CO1: Become familiar with elementary socket functions.	K1
	CO2: Design and implement client –server applications using Sockets	K2
	CO3: Learn about functions that convert between names and numeric values and protocols	K2
	CO4: Analyze network protocol functions	K3
	CO5: Learn about the advanced socket functions	K3

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
	Programme Outcomes(POs)												PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	2	1				2	2	3	3
CO2	3	3	3	3	3	2	1				2	2	2	2
CO3	3	3	3	3	3	2	1				2	2	3	3
CO4	3	3	3	3	3	2	1				2	2	2	2
CO5	3	3	3	3	3	2	1				2	2	3	3

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit – I	**Introduction to Network Security**	Periods	**9**
Introduction, simple daytime client, protocol independence, Error handling, simple daytime server, Roadmap to client/server, Overview of TCP/IP protocol- TCP connection establishment and termination, TCP state transition diagram – Time-wait state, SCTP association establishment and termination, TCP port numbers and concurrent servers, Buffer size and limitations, standard internet services, protocol usage by common, Internet applications.			
Unit – II	**Socket Functions**	Periods	**9**
Socket function, connect function, bind function, listen function, accept function, Fork function, exec function, concurrent servers, close function-get sock name and get peer name, TCP Echo server, TCP Echo client, normal startup and termination, POSIX signal handling, Wait and Waitpid functions, Termination of server process, Crashing and rebooting of server host.			
Unit - III	**Protocol Functions**	Periods	**9**
Get sock opt function, set sock opt function, IPV4, ICMP, TCP socket options, UDP Echo server and client, recvfrom function, send to function, Connect function with UDP, dg_cli function, lack of flowcontrol with UDP			
Unit – IV	**DNS Socket Functions**	Periods	**9**
DNS, resolvers and name servers, gethostbyname function, gethostbyaddr function, getservbyname,getservbyport function, tcp_connect function- tcp_listen function, udp_client, udp_connect, udp_server function, BOOTP, DHCP.			
Unit – V	**Advanced Socket Functions**	Periods	**9**
Internet Protocol, IPV4, IPV6 interoperability, Daemon processes, Daemon processes and the inetdsuperserver, Advanced I/O functions			
		Total Periods	**45**
Text Books			
1.	Douglas.E.Comer " Internetworking with TCP/IP " principles, protocols and architecture, 6th Edition ,Volume 1, Pearson Education,2013		
2.	Behrouz A.Forouzan , " TCP/IP protocol suite", 4th edition, Mc Graw Hill education privatelimited, 2010.		
3.	Adam Woodbeck, Network Programming with Go, Code Secure and Reliable Network Services fromScratch, No Starch Press, ISBN-10 : 1718500882, 2021		
4.	Douglas.E.Comer " Internetworking with TCP/IP " principles, protocols and architecture, 6th Edition ,Volume 1, Pearson Education,2013		
References			
1.	W.Richard Stevens, Bill Fenner, Andrew M. Rudoff " Unix Network programming " 3rd edition, Volume – 1, Pearson Education , 2015 R.F.Gilberg, B.A.Forouzan, Data Structures, 2nd ed., Thomson India, 2005		
2.	Wendell Odom , " IP networking ", 1st edition, Pearson Education 2012		
3.	NPTEL Course Notes		
E-Resources			
1.	https://dev.to/sanjayrv/a-beginners-guide-to-socket-programming-in-c-5an5		
2.	https://www.cs.rpi.edu/~moorthy/Courses/os98/Pgms/socket.html		
3.	https://www.tutorialspoint.com/unix_sockets/index.htm		

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Programme	**B.E.**	Programme Code			**107**	Regulation	**2019**
Department	**Computer Science and Technology**					Semester	**VI**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT611	**Foundations of Data Science**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to
	• Understand the key concepts of data science and applications
	• Learn the data collection and data science pre-processing
	• Recall the mathematical concepts for descriptive and statistical analysis of givendataset and to know R-programming basics
	• Apply model development and evaluation
	• Analyze the results on model evaluation and validation and know about next generation data science.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: .Implement and apply data science and applications	K3
	CO2: Apply the results on data collection and data preprocessing	K3
	CO3: Implement graph concepts in statistical concepts	K2
	CO4: Analyze model development and evaluation.	K4
	CO5: Apply the model evaluation metrics in data science applications	K3

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	1			2	3				1	1	1	1	2
CO2	3	2	3	2	2	1			2	2	1	1	1	1
CO3	3	2	2	2	2	1			2	2	1	1	1	1
CO4	3	2	2	2	2	1			1	2	1	1	2	2
CO5	3	1	2	2	3	1			1	2	1	1	1	1

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

Signature of BoS Chairman

Content of the syllabus

Unit – I	INTRODUCTION	Periods	9

Introduction to Data Science -Bigdata– Evolution of Data Science –Data fication- Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues

Unit – II	DATA COLLECTION AND DATA PRE-PROCESSING	Periods	9

Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization- working with data from files- working with relational data bases – exploring data

Unit – III	Exploratory Data Analytics	Periods	9

Basic statistical description of data-Mean, mode, median,,Range, Quartiles, variance, Standard deviation, Interquartile range, Skewness and Kurtosis -Graphical Displays of basic statistical description of data-Quantile plot-histogram- Box Plots – Pivot Table – Heat Map -Scatterplot-Data correlation– ANOVA. Statistical models in R - Binomial , Poisson , Normal distributions – Manipulating objects - data distribution

Unit – IV	MODEL DEVELOPMENT	Periods	9

Choosing and evaluating models – Sampling for modeling and validation-mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-means algorithm – Linear and logistic regression

Unit – V	DELIVERING RESULTS	Periods	9

Documentation and deployment – producing effective presentations– Introduction to graphical analysis – plot() function – displaying multivariate data – matrix plots – multiple plots in one window -- exporting graph - using graphics parameters. Case studies.

		Total Periods	45

Text Books

1.	Cathy O‟Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015
2.	Jiawei Han, Micheline Kamber and Jian Pei, " Data Mining: Concepts and Techniques", Third Edition. ISBN 0123814790, 2011.

References

1.	Jojo Moolayil, "Smarter Decisions : The Intersection of IoT and Data Science
2.	David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013
3.	Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global

E-Resources

1.	https://www.leadquizzes.com/blog/data-collection-methods/
2.	https://www.lotame.com/what-are-the-methods-of-data-collection/
3.	https://www.sciencedirect.com/topics/social-sciences/data-collection-technique
4.	https://www.ibm.com/in-en/cloud/learn/exploratory-data-analysis
5.	https://www.nap.edu/read/11972/chapter/5
6.	https://towardsdatascience.com/tagged/model-evaluation

Signature of BoS Chairman

<table>
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Programme	**B.E.**	Programme Code			**107**	Regulation		**2019**	
Department		**Computer Science and Technology**				Semester		**VI**	

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT612	**Machine Learning Techniques**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Understand the basic concepts of machine learning. • Learn the concepts and implementation of the various supervised learning algorithms. • Learn the concepts and implementation of unsupervised learning and reinforcement learning algorithms • Learn to evaluate machine learning algorithms using performance assessment techniques. • Gain an overall understanding of the fundamentals of machine learning and its implementation in Python.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand the concepts of machine learning	K2
	CO2: Understand the supervised learning and its algorithms	K2
	CO3: Study the unsupervised learning and its algorithms.	K1
	CO4: Learn and understand the semi-supervised learning andvalidation process	K2
	CO5: Study the reinforcement algorithm and practical applications ofthe machine learning	K3

Pre-requisites	-

<table>
<tr><th colspan="14">CO /PO Mapping
(3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak</th><th colspan="2">CO/PSO
Mapping</th></tr>
<tr><th colspan="14">Programme Outcomes(POs)</th><th colspan="2">PSOs</th></tr>
<tr><th>COs</th><th>PO 1</th><th>PO 2</th><th>PO 3</th><th>PO 4</th><th>PO 5</th><th>PO 6</th><th>PO 7</th><th>PO 8</th><th>PO 9</th><th>PO 10</th><th>PO 11</th><th>PO 12</th><th>PSO 1</th><th>PSO 2</th></tr>
<tr><td>CO1</td><td>2</td><td>3</td><td>1</td><td>2</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>2</td><td>1</td></tr>
<tr><td>CO2</td><td>2</td><td>3</td><td>1</td><td>2</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>2</td><td>1</td></tr>
<tr><td>CO3</td><td>2</td><td>3</td><td>1</td><td>2</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>2</td><td>1</td></tr>
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</table>

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit – I	**INTRODUCTION**	Periods	**9**
Machine learning: What and why?, Features of Machine Learning, Machine Learning Life Cycle, Applications of Machine Learning, Classifications of Machine Learning - Supervised Learning - Unsupervised Learning – Reinforcement Learning, Data Preprocessing in Machine learning, The Curse of dimensionality, Over fitting and linear regression, Bias and Variance, Learning Curve, Classification, Error and noise, Parametric vs. non-parametric models-Linear models.			
Unit - II	**SUPERVISED LEARNING – Regression Model**	Periods	**9**
Regression Model - Linear Regression, Bayesian Linear Regression, Polynomial Regression, Multiple Linear Regression, Non-Linear Regression			
Unit – III	**SUPERVISED LEARNING – Classification & VALIDATION**	Periods	**9**
Classification - Random Forest, Decision Trees, k-nearest neighbours, Support vector Machines, Naïve Bayes Classifier Algorithm. Cross-Validation- Validation Set Approach, Leave-P-out cross-validation, Leaveone out cross-validation, K-fold cross-validation, Stratified k-fold cross-validation.			
Unit - IV	**UNSUPERVISED LEARNING**	Periods	**9**
Working of Unsupervised Learning, Types of Unsupervised Learning Algorithm: **C**lustering and Association, K-means clustering, Hierarchal clustering, Anomaly detection, Association Rule Learning, Confusion Matrix in Machine Learning.			
Unit – V	**REINFORCEMENT LEARNING**	Periods	**9**
Introduction to Reinforcement Learning, Terms used in Reinforcement Learning, Key features of Reinforcement Learning, Elements of Reinforcement Learning – Policy, Reward Signal, Value Function, Model of the environment , Approaches to implementing Reinforcement Learning, Reinforcement Learning process, The Bellman Equation, Positive Reinforcement, Negative Reinforcement, Reinforcement Learning Algorithms - Markov Decision Process, Q-Learning, Applications of Reinforcement Learning.			
		Total Periods	**45**

Text Books	
1.	Andriy Burkov, "Machine Learning Engineering", 2020, Amazon.
2.	Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
3.	Ethem Alpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005.

References	
1.	Hastie, Tibshirani, Friedman, "The Elements of Statistical Learning" (2nd ed)., Springer, 2008
2.	Stephen Marsland, "Machine Learning –An Algorithmic Perspective", CRC Press, 2009
3.	Christopher Bishop, "Pattern Recognition and Machine Learning" Springer, 2006

E-Resources	
1.	https://nptel.ac.in/courses/106106139
2.	https://www.techtarget.com/searchenterpriseai/definition/machine-learning-ML
3.	https://www.geeksforgeeks.org/machine-learning

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science and Technology**				Semester	**VI**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT613	**Cloud Computing**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Overview of computing Paradigm. • Cloud computing architecture and its service models. • Representation of virtualization concepts. • Intensive computation in Cloud computing. • Applications and management of cloud computing

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Identify the characteristics and properties of Cloud computing	K1
	CO2: Understand the architecture of Cloud computing stack.	K2
	CO3: Understand the concepts of virtualization.	K3
	CO4: Understand the concepts of data intensive computing.	K2
	CO5: List the applications of cloud.	K2

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
	Programme Outcomes(POs)												PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	2	2	-	1	2	1	3			1	2	3
CO2	2	2	2	2	-	1	2	-	2			1	2	3
CO3	2	2	2	2	1	1	2	-	2			1	2	3
CO4	2	2	3	2	2	1	2	1	2			1	2	3
CO5	3	2	2	2	1	1	2	1	3			1	2	3

Course Assessment Methods Direct

Direct

1.Continuous Assessment Test I, II & III
   2.Assignment.
   3.End-Semester examinations

Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**CLOUD COMPUTING BASICS**	Periods	**9**

Principles of Parallel and Distributed Computing - Parallel vs. Distributed Computing - Hardware Architectures for Parallel Processing - Approaches to Parallel Programming - Distributed System - Introduction to Cloud Computing - Definition of Cloud -Cloud Computing Reference Model –Historical Developments-Building Cloud Computing Environments- Application Development - Infrastructure and
System Development - Computing Platforms and Technologies.

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Unit – II	CLOUD COMPUTING ARCHITECTURE	Periods	9

Introduction - Cloud Reference Model – Architecture - Infrastructure / Hardware as a Service - Platform as a Service - Software as a Service- Types of Clouds - Public Clouds - Private Clouds - Hybrid Clouds - Community Clouds- Cloud Definition - Cloud Interoperability and Standards - Scalability and FaultTolerance - Security- Trust- and Privacy .

Unit – III	VIRTUALIZATION	Periods	9

Introduction - Characteristics of Virtualized Environments - Taxonomy of Virtualization Techniques - Execution Virtualization - Virtualization and Cloud Computing - Pros and Cons of Virtualization - Xen- Para virtualization- VMware- Full Virtualization

Unit – IV	DATA INTENSIVE COMPUTING AND CLOUD PLATFORMS	Periods	9

Characterizing Data-Intensive Computations - Technologies for Data-Intensive Computing - Storage Systems - Programming Platforms- Introducing the MapReduce Programming Model- cloud Platforms in Industry - Amazon Web Services - Compute Services - Storage Services -Communication Services -Google AppEngine

Unit – V	APPLICATIONS AND MANAGEMENT OF CLOUD	Periods	9

Scientific Applications- Business and Consumer Applications - Energy Efficiency in Clouds- Energy- Efficient and Green Cloud Computing Architecture- Federated Clouds / Inter Cloud- Characterization and Definition- Cloud Federation Stack-Technologies for Cloud Federations-Introduction to DevOps.

	Total Periods	45

Text Books

1.	Raj kumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing", Tata Mcgraw Hill, 2017.
2.	M.N. Rao, "Cloud computing", PH1Learning Private Limited, 2015.

References

1.	Nikos Antonopoulos,Lee Gillam,"Cloud Computing: Principles,Systems and Applications", Springer, 2012.
2.	Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach",Tata Mcgraw Hill, 2009..
3.	Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing", Wiley-India, 2010

E-Resources

1.	https://onlinecourses.nptel.ac.in/noc20_cs20/preview
2.	http://mallikarjunbangargi.yolasite.com/resources
3.	https://www.jigsawacademy.com/blogs/cloud-computing/implementation-levels-of-virtualization-in-cloud-computing/
4.	https://electricalfundablog.com/cloud-storage-architecture-types

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science and Technology**				Semester	**VI**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19IT620	**Software Engineering**	3	0	0	3	50	50	100

Course Objective	The student should be made to, • Defined as a simplified representation of a software process. Each modelrepresents a process from a specific perspective • Explain the students the importance of Requirements Engineering. • Know about the role of UML and Testing in Software Development. • Know about the essentials design of software architectural design and design. • explain about the fundamentals of software testing.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1:identify various software development models.	K3
	CO2: understand the requirement engineering tasks to identify the requirementsfor a given scenario.	K3
	CO3: Implement the design problem in UMI Modeling	K3
	CO4: Predict the design concepts and models	K3
	CO5: Describe different types of software testing in the software product.	K3

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	1										3	3
CO2	2	1											3	3
CO3	3	2	1										3	3
CO4	3	2	1										3	3
CO5	3	2	1										3	3

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**PROCESS MODELS**	Periods	9

Software process structure – Process models - Waterfall model, Incremental process models, Evolutionary process models, Specialized process models – Unified Process - Agile development: Agile process - Extreme programming – Other Agile process model: Scrum.

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Unit – II	REQUIREMENT GATHERING AND ANALYSIS	Periods	9

Requirements engineering – Eliciting requirements, Developing use cases – Building the analysis model –Negotiating requirements – Requirements monitoring – Validating requirements – Requirements analysis.

Unit – III	UML MODELING	Periods	9

Introduction – Unified Modeling Language – Static model – Dynamic model – UML diagrams– UML class diagram– Use case diagram – UML dynamic modeling – UML interaction diagrams –UML state chart diagram – UML activity diagram – Implementation Diagrams –Component diagram – Deployment diagram.

Unit – IV	SOFTWARE DESIGN	Periods	9

Design concepts and model – Architectural design: Software architecture, Architectural styles – Architectural design – Component level design: Designing class-based components, Conducting component level design – User interface design: User interface analysis and design – Interface analysis –Interface design steps – Design patterns.

Unit – V	SOFTWARE TESTING FUNDAMENTALS	Periods	9

Software testing strategies: Strategic approach – Issues – Test strategies for conventional and Object Oriented software –Validation and System testing – Debugging – Testing conventional applications: White box testing –Basis path testing – Control structure testing – Black box testing – Software configuration management – SCMrepository – SCM process.

	Total Periods	45

CASE STUDY:
Only for Assignment not for end semester examination.
1. Simple Chat Instant Messaging System
2. GPS Based Automobile Navigation System
3. Waste Management Inspection Tracking System (WMITS)
4.Geographical Information System

Text Books

1.	Roger S. Pressman, Bruce R. Maxim, "Software Engineering: A Practitioner„s Approach", 8 Edition,McGraw-Hill Education, India, 2019.

References

1.	Ali Bahrami, "Object Oriented Systems Development", 1 Edition, Tata McGraw-Hill, New Delhi, 2008.
2.	JalotePankaj, "An Integrated Approach to Software Engineering", 3 Edition, Narosa Publishing House,New Delhi, 2000.
3.	Andrew Stellman and Jennifer Greene, "Learning Agile: Understanding Scrum, XP, Lean and Kanban",1st Edition, O'Reilly Media, 2005

E-Resources

1.	https://www.javatpoint.com/software-engineering-tutorial
2.	https://www.tutorialspoint.com/uml/uml_building_blocks.
3.	https://www.geeksforgeeks.org/software-testing-basics/
4.	https://www.geeksforgeeks.org/software-engineering-system-configuration-management/

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Programme	B.E.	Programme Code		107	Regulation	2019
Department	Computer Science and Technology				Semester	VI

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT614	Data Science Laboratory	3	0	0	2	50	50	100

Course Objective	The students should be made to: • Understand the R Programming Language. • Exposure on Solving of data science problems. • Understand the classification and Regression Model...

	At the end of the course, the student should be able to,	Knowledge level
Course Outcome	CO1: Apply the basic functions of R-programming.	K3
	CO2: Apply the different types of datasets and inbuilt functions.	K3
	CO3: Draw and plot different data visualization methods and findcovariance &correlation of datasets.	K4
	CO4: Apply the various regression models among datasets	K3
	CO5: Apply clustering model for datasets.	K3

Pre-requisites	-

CO /PO Mapping
(3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak

CO/PSO Mapping

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
						Programme Outcomes(POs)							PSOs	
CO1	1	1	3	2	1	2						2	3	2
CO2	1	1	3	2	1	2						2	3	1
CO3	3	2	1	3	3	2						2	3	2
CO4	3	3	2	1	3	2						2	3	2
CO5	3	2	1	1	2	2						2	3	2

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

List of Experiments

DATA SCIENCE LABORARTORY

1.	RAS CALCULATOR APPLICATION a. Using with and without R objects on console b. Using mathematical functions on console c. Write an R script to create R objects for Calculator application and save in a specified location in disk.	CO1

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2.	**DESCRIPTIVE STATISTICS IN R**
	    a. Write an R script to find basic descriptive statistics using summary, str, quartile function onmtcars & cars datasets.
	     b. Write an R script to find subset of dataset by using subset(),aggregate() functions on iris dataset
		CO1

3.	**READING AND WRITING DIFFERENT TYPES OF DATASETS**
	    a. Reading different types of datasets (.txt,.csv) from Web and disk and writing in file in specificdisk location.
	    b. Reading Excel datasheet in R.
	    c. Reading XML dataset in R.
		CO2

4.	**VISUALIZATIONS**
	    a.Find the data distributions using box and scatter plot.
	    b.Find the outliers using plot.
	    c.Plot the histogram, bar chart and pie chart on sample data.
		CO3

5.	**CORRELATION AND CO –VARIANCE**
	    a. Find the correlation matrix.
	    b. Plot the correlation plot on data set and visualize giving an overview of relationships Among data on iris data.
	    c. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data
		CO3

6.	**REGRESSION MODEL** Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his orher GRE score, GPA obtained and rank of the student. Also check the model is fit or not. Require (foreign),require(MASS	**CO4**
7.	**MULTIPLE REGRESSION MODEL** Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset	**CO4**
8.	**REGRESSION MODEL FOR PREDICTION** Apply regression Model techniques to predict the data on above dataset	**CO4**

9.	**CLASSIFICATION MODEL**
	    a. Install relevant package for classification.
	    b. Choose classifier for classification problem.
	    c. Evaluate the performance of classifier
		CO4

10.	**CLUSTERINGMODEL** a. Clustering algorithms for unsupervised classification. Plot the cluster data using R visualizations	**CO5**
	Total Periods	**45**

E-RESOURCES	
1.	http://www.r-bloggers.com/how-to-perform-a-logistic-regression-in-r/
2.	http://www.ats.ucla.edu/stat/r/dae/rreg.htm
3.	http://www.coastal.edu/kingw/statistics/R-tutorials/logistic.html
4.	http://www.ats.ucla.edu/stat/r/data/binary.csv

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**B.E.**			Programme Code	**107**	Regulation		**20 19**
Department	**Computer Science & Technology**					Semester		**VI**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT615	**Machine Learning Laboratory**	3	0	0	2	50	50	100

Course Objective	The students should be made to: • Solve the problems of machine learning using python. • Understand the machine learning techniques. • Understand the classification and Regression Model..	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Apply the python basic libraries	K3
	CO2: Apply the python library for ML application	K3
	CO3: Design the various regression models using sklearn	K4
	CO4: implement a decision tree using various techniques	K4
	CO5: Apply clustering model for datasets.	K3
Pre-requisites	Programming For problem Solving	

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
COs	Programme Outcomes (POs)												PSOs	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO 1	3	2	2	3	3	2	2	1	2	2	1	2	2	2
CO 2	3	2	2	3	3	2	2	1	2	2	1	2	2	2
CO 3	3	2	2	3	3	2	2	1	2	2	1	2	2	2
CO 4	3	2	2	3	3	2	2	1	2	2	1	2	2	2
CO 5	3	2	2	3	3	2	2	1	2	2	1	2	2	2

Course Assessment Methods

Direct
1. Pre lab –Post Lab Exercises 2. Assignment. 3. End-Semester examinations
Indirect
1.Course - end survey

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List of Experiments	
DATA SCIENCE LABORARTORY

1.	Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion:Variance, Standard Deviation	CO1
2.	Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy	CO1
3.	Study of Python Libraries for ML application such as Pandas and Matplot lib	CO2
4.	Write a Python program to implement Simple Linear Regression	CO3
5.	Implementation of Multiple Linear Regression for House Price Prediction using sklearn	CO3
6.	Implementation of Decision tree using sklearn and its parameter tuning	CO4
7.	Implementation of SVM Classification using sklearn	CO5
8.	Implementation of KNN using sklearn	CO5
9.	Implementation of K-Means Clustering	CO5
10.	Write a program to demonstrate the working of Association rule with a real time dataset	CO5
11.	Implement reinforcement learning by apply this knowledge to classify a new sample and compare theperformance with other algorithms	CO5
	Total Periods	**45**

E-RESOURCES	
1.	http://www.r-bloggers.com/how-to-perform-a-logistic-regression-in-r/
2.	http://www.ats.ucla.edu/stat/r/dae/rreg.htm
3.	http://www.coastal.edu/kingw/statistics/R-tutorials/logistic.html
4.	http://www.ats.ucla.edu/stat/r/data/binary.csv

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	VIVEKANANDHACOLLEGEOFENGINEERINGFORWOMEN (AutonomousInstitution,AffiliatedtoAnnaUniversity,Chennai)Elay ampalayam,Tiruchengode–637205	

Programme	B.E.	Programme Code		107	Regulation	2019
Department	Computer Science and Technology				Semester	VI

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19EN603	Communication Skillslaboratory	0	0	3	1	100	-	100

Course Objective	• Equip with effective Soft skills in English. • Enhance them with intrapersonal skills. • Effective management of time and stress.

	The students who complete this course successfully are expected to:	Knowledge Level
Course Outcome	**CO1:** Able to communicate, present, describe and discuss fluently in English.	K1
	CO2: Equipped for an easy transition from studying to working atmosphere.	K1
	CO3: Accomplished with planning and corporate Managerial skills.	K2
	CO4:attain professional correspondence and execute the same inprofessional manner.	K4
	CO5: Employ the professional needs and accomplishments at global standards.	K4

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	2	-	-	3	3	-	3	-	2
CO2	-	-	-	-	-	2	-	-	2	3	-	3	-	2
CO3	-	-	-	-	-	2	-	-	2	2	-	3	-	2
CO4	-	-	-	-	-	2	-	-	3	3	-	3	-	2
CO5	-	-	-	-	-	2	-	-	3	3	-	3	-	2

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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LIST OF EXPERIMENTS	
Internet ProgrammingLaboratory	
English Language Proficiency: Listening Comprehension, Reading Comprehension, Common Errors in English, Diction and its usage, Framing sentences – Idiomatic Expressions.	
Resume – Structuring and Drafting the resume – Cover letter- Writing Professional Letters	
Group Discussion: Introduction – Topic Analysis – Thematic Expressions-Objective and content of discussion – Persuasion – Discussion – Controlling Emotions - Presentation of the group – Offering support – Use of functional Language - Summary and conclusion	
Presentation skills: Making Self Introduction effectively**-**Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Bodylanguage – Accents analysis – Stylistics.	
Soft Skills: Introduction - Change in Today‟s Workplace: Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft skills - Ability to work as a team - Innovation, Creativity and Lateral thinking – Flexibility - Personality Traits and Soft Skills for future CareerAdvancement-Personality and Soft Skills for career growth- Time management.	
Total Periods	

Lab Manuals suggested:	
1.	Anderson, P.V, Technical Communication, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2.	John Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, NewDelhi, 2004.

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Programme	**B.E.**		Programme Code	**107**	Regulation	**2019**
Department	**CST**				Semester	**VI**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MCTY6	**PERSONALITY DEVELOPMENT**	3	0	0	-	100	-	100

Content of the syllabus			
Unit – I	**NUMERICAL ABILITY**	Periods	**8**

Number Properties – Time & Work – Pipes & Cisterns - Time, Speed & Distance – Ratios & Proportions – Mixtures & Alligations – Averages – Percentages – Profit & Loss – Simple & Compound Interest – Problems on Ages – Partnership – Mensuration – Geometry - Miscellaneous

Unit - II	**LOGICAL REASONING**	Periods	**8**

Coding Decoding – Blood Relations – Direction Sense Test – Seating Arrangement – Number Series – Syllogisms – Venn Diagrams – Statements – Data Interpretation – Data Sufficiency – Clocks & Calendars - Miscellaneous

Unit – III	**SOFT SKILLS & VERBAL ABILITY**	Periods	**8**

Resume Preparation – Mock GD – Interview Etiquette – Mock Interview – Reading Comprehension – Essay Writing

Unit - IV	**TECHNICAL SKILLS I**	Periods	**8**

Recap of C – Variables & Datatypes – Console IO Operations – Operators & Expressions – Control Flow Statements – Working with Functions – Working with Arrays

Unit – V	**TECHNICAL SKILLS II**	Periods	**8**

Pointers – String Handling – Structures & Unions – File Handling – Pre Processor Directives – Command Line Arguments & Variables – Searching & Sorting – Stack – Queue – Linked List - Trees

	Total Periods	**40**

REFERENCES

1. Quantum Cat by Sarvesh Verma –Arihant Publications
2. Qualitative aptitude by R.S. Aggarwal
3. A Modern Approach to Verbal & Non-Verbal Reasoning by R.S.Aggarwal
4. Word Power Made Easy by Norman Lewis
5. Let us C By Yashavant P Kanetkar
6. Programming in ANSI C By E. Balaguruswamy

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Programme	**B.E.**	Programme Code			**107**	Regulation	**2019**
Department	**Computer Science and Technology**					Semester	**VI**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE06	**Open Source Systems**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Understand the difference between open-source software and commercial software. • Understand the policies, licensing procedures and ethics of FOSS. • Understand open-source philosophy, methodology and ecosystem. • Awareness with Open-Source Technologies. • To analyze the various cloud service providers and emerging cloud technologies

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand the basics about open source systems.	K2
	CO2: Differentiate between Open Source and Proprietary software	K3
	CO3: Understand the open source software projects and Licensing..	K2
	CO4: Recognize the applications, benefits and features of Open-Source Technologies	K3
	CO5: Gain knowledge to start, manage open-source projects	K4

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	1	1										1	2
CO2	3	2	1	1										1	2
CO3	3	2	1	1										1	2
CO4	3	2	1	1										2	1
CO5	3	2	1	1										1	2

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	Introduction	Periods	9

Introduction to Open-Source: Open Source, Need and Principles of OSS, Open-Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Free Software Vs. Open-Source Software, Public Domain. History of free software, Proprietary Vs Open-Source Licensing Model, use of Open- Source Software, FOSS does not mean no cost. History: BSD, The Free Software Foundation and the GNU Project.

Unit - II	Open-Source Principles AndMethodology	Periods	9

Open-Source History, OpenSource Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open-Source Software Development, Licenses, Copyright vs. Copy left, Patents, Zero marginal cost, Income-generation Opportunities, Internationalization.

Unit – III	Open-Source Projects And Licences	Periods	9

Starting and maintaining own Open-Source Project, Open-Source Hardware, Open-Source Design, Open-source Teaching, Opensource media.Licensing: What Is A License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

Unit - IV	Collaboration, Open-Source Ethics And Social Impact	Periods	9

Community and Communication, Contributing to Open Source Projects Introduction to GitHub, interacting with the community on GitHub, Communication and etiquette, testing open-source code, reporting 15 issues, contributing code. Introduction to Wikipedia, contributing to Wikipedia or contributing to any prominent open-source project of students choice. Open-Source Ethics and Social Impact: Open source vs. closed source, Open-source Government, Ethics of Open-source, Social and Financial impacts of open-source technology, Shared software, Shared source, Open Source as a Business Strategy.

Unit – V	Open-Source Ecosystem And Case Study	Periods	9

Open-Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris. Open-Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, Debuggers, Programming languages, LAMP, Open-Source Database technologies Case Studies: Example Projects: Apache Web server, BSD, GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, WordPress, Git, GCC, GDB, GitHub, Open Office, Libre Office Study: Understanding the developmental models, licensing, mode of funding, commercial/non-commercial use.

		Total Periods	45

Text Books

1.	Heather Meeker, Open (Source) for Business: A Practical Guide to Open Source SoftwareLicensing - Third Edition, 2020.
2.	KailashVadera&Bhavyesh Gandhi, "Open-Source Technology", University Science Press,Laxmi Publications, 2009.
3.	Fadi P. Deek and James A.CambridgeUniversity Press, 2008.

References

1.	Clay Shirky and Michael Cusumano,"Perspectives on Free and Open-Source Software", 2007,MIT press.
2.	Andrew M. St. Laurent,"Understanding Open Source and Free Software Licensing",2008,O"Reilly Media.
3.	Dan Woods, Gautam Guliani,,"Open Source for the Enterprise", 2005,O"Reilly Media.

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E-Resources	
1.	Linux kernel Home: http://kernel.org4
2.	Open-Source Initiative: https://opensource.org/5
3.	The Linux Foundation: http://www.linuxfoundation.org/
4.	Docker Project Home: http://www.docker.com.
5.	Linux Documentation Project: http://www.tldp.org/

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Programme	B.E.	Programme Code		107	Regulation	2019
Department	Computer Science and Technology			Semester		VI

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE07	Network Programming and Protocol	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Describe the importance of various Internet protocols like ARP, RARP, ICMP,Multicasting and multi routing, SCTP • Understand the transport layer protocols , application layer protocol and itscharacteristics • Learn and Understand IPV6 technologies • Work with client server sockets and develop related applications to communicate witheach other. • Understand the wide area network protocols • Learn the basics of MPLS protocol

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Identify the basics of different types of network and transport layer protocols.	K2
	CO2: Differentiate Design and implement the socket programming	K4
	CO3: Enumerate the types of application layer protocols..	K3
	CO4: Analyze and compare the IPv4 and IPv6 protocols	K4
	CO5: Familiarize with wide area technologies and working of MLPS	K1

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1	1							3	2	2
CO2	2	2	2	2	1							3	2	2
CO3	3	2	2	2	1							3	2	2
CO4	2	2	2	1	1							3	2	2
CO5	3	3	2	1	1							3	2	2

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	INTRODUCTION TO NETWORK PROTOCOL	Periods	9

IP header, IP fragmentation, ARP, RARP, ICMP –introduction, ICMP-Messages, Debugging tools, ICMP package, UDP Datagram, UDP characteristics, TCP Header,TCP connection establishment process,TCP Error Control, TCP Congestion Control, TCP Flow Control.

Unit – II	MULTICAST ROUTING PROTOCOL	Periods	9

Multicasting, Multicasting and Multicast Routing Protocol, Stream Control Transmission Protocol, Byte ordering, Byte ordering conversion functions, System calls, Sockets, System calls used with Sockets, Iterative and concurrent server, Socket Interface, Structure and Functions of Socket, Remote Procedure Call, RPC Model, Features, TCP Client Server Program, Input, Output Processing Module.

Unit – III	CONNECTIONLESS PROTOCOL MODELS	Periods	9

UDP Client Server Program, UDP Control block table & Module, UDP Input & Output Module, SCTP Sockets, SCTP Services and Features, Packet Format, SCTP Client/Server, DNS,DNS in the Internet, DNS Resolution, DNS Messages, TELNET, SSH, FTP, TFTP, WWW Architecture WWW Documents, HTTP, HTTP Request and Reply, DHCP Operation, DHCP Configuration, SMTP, POP3, IMAP, MIME.

Unit – IV	INTERNET PROTOCOL	Periods	9

IPV6 Overview, IPV6 Features, IPV6 Addressing Modes, IPV6 Address Types, Introduction Address Space Allocation, Global Unicast Addresses, Auto configuration, Renumbering, IPV6 Routing Protocols,Introduction IPV6 Packet Format, Comparison between IPV4 and IPV6 Header, IPV4 to IPV6 Tunneling, IPV4 to IPV6 Translation Techniques, NAT Protocol Translation, IPV6 Mobility, Protocols Changed to Support IPV6.

Unit – V	WIDE AREA TECHNOLOGY	Periods	9

DSL, Other DSL Technology, DSL Benefits, Cable Technology, Compare DSL Vs Cable, Frame Relay, ATM Introduction, ATM Cell Format, ATM Layer, AAL Layer, ATM Application, PPP, PPP Services, Components, PPP frame and byte stuffing, HDLC, HDLC Transfer Modes, Frame, Types of HDLC Frame, MPLS.

	Total Periods	45

Text Books

1.	BehrouzA.Forouzan , " TCP/IP Protocol Suite", E/4,2017, McGraw-Hill ISBN: 0070706522 .
2.	Douglas E.Comer, Internetworking with TCP/IP,Principles, protocols and architecture,Vol.6th Edition,2013 ISBN: 0131876716, ISBN:978-0131876712.
3.	Richard Stevens, Unix Network Programming, vol.1, 3rd edition, 2003, McGraw-HillISBN 0-07-246060-1.

References

1.	Jason Edelman, Matt Oswalt and Scott Lowe, Network Programmability and Automation: Skillsfor the Next-Generation Network Engineer, Oreilly Publications, 2018, ISBN : 9781491931257.
2.	Silvia Hagen,IPv6 Essentials, Oreilly Publications, 2017, ISBN : 9780596100582.

E-Resources

1.	https://www.youtube.com/watch?v=DceSLMRNB8w
2.	https://nptel.ac.in/courses/106105183
3.	https://www.cloudns.net/blog/what-is-an-ipv6-address/

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Programme	B.E.	Programme Code		107	Regulation	2019
Department	Computer Science and Technology				Semester	VI

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE08	Wireless Sensor Networks	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to
	• Understand basic sensor network concepts
	• Know physical layer issues, Medium Access Control Protocols
	• Comprehend network and transport layer characteristics and protocols
	• Understand the network management and Middleware services

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand the basic ideas about sensor network concepts with Applications and Apply the knowledge for WSN tools.	K2
	CO2: Understand the characteristics and deployment mechanism of communication	K2
	CO3: Acquire the knowledge on wireless transmission technology hardware and Medium Access Protocols..	K1
	CO4: Understand the basic ideas about Wireless Sensor Networks Routing protocols and network -transport layer characteristics	K2
	CO5: Apply the knowledge for network management andMiddleware services	K3

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
	Programme Outcomes(POs)												PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	1								2	2	1
CO2	3	2	1	1								2	2	1
CO3	3	2	1	1								2	2	1
CO4	3	2	1	1								2	2	1
CO5	3	2	1	1								2	2	1

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	FUNDAMENTALS OF SENSOR NETWORKS	Periods	9

Introduction to computer and wireless sensor networks and Overview , Motivation for a network of
Wireless Sensor nodes- Sensing and sensors-challenges and constraints, node architecture-sensing sub

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system, processor subsystem communication, interfaces- prototypes, Application of Wirelesssensors.			
Unit – II	**COMMUNICATION CHARACTERISTICS AND DEPLOYMENT MECHANISMS**	Periods	**9**
Wireless Transmission Technology and systems-Radio Technology Primer-Available Wireless Technologies, Hardware- Telosb, Micaz motes, Time Synchronization- Clock and the Synchronization Problem, Basics of time synchronization-Time synchronization protocols, Localization- Ranging Techniques- Range based Localization-Range Free Localization- Event driven Localization.			
Unit – III	**MAC LAYER**	Periods	**9**
Overview-Wireless Mac Protocols-Characteristics of MAC protocols in Sensor networks, Contention free MAC Protocols- characteristics- Traffic Adaptive Medium Access-Y-MAC, Low energy Adaptive Clustering, Contention based MAC Protocols- Power Aware Multi-Access with signaling, Sensor MAC-Timeout MAC-Data gathering MAC.			
Unit – IV	**ROUTING IN WIRELESS SENSOR NETWORKS**	Periods	**9**
Design Issues in WSN routing- Data Dissemination and Gathering-Routing Challenges in WSN, Flooding-Flat Based Routing – SAR, Directed Diffusion-MCFA Coherent and non-Coherent Processing, Hierarchical Routing- LEACH, PEGASIS, TEEN, APTEEN, Query Based Routing- Negotiation Based Routing-Geographical Based Routing			
Unit – V	**MIDDLEWARE AND SECURITY ISSUES**	Periods	**9**
WSN middleware principles-Middleware architecture-Existing middleware, operating systems for wireless sensor networks-performance and traffic management, Fundamentals of network security-challenges and attacks Protocols and mechanisms for security.			
		Total Periods	**45**

Text Books

1.	Kazem Sohraby, Daniel manoli , "Wireless Sensor networks- Technology, Protocols and Applications", Wiley Inter Science Publications 2010..
2.	Waltenegus Dargie, Christian Poellabauer , "Fundamentals of Wireless Sensor Networks, Theoryand Practice", Wiley Series on wireless Communication and Mobile Computing, 2011
3.	Senchun Chai , Zhaoyang Wang , Baihai Zhang , Lingguo Cui , Runqi Chai, Wireless Sensor Network, SpringerLink, 2020, ISBN: 978-981-15-5757-6

References

1.	BhaskarKrishnamachari , " Networking Wireless Sensors", Cambridge University Press, 2005.
2.	C.S Raghavendra, Krishna M.Sivalingam, Taiebznati , "Wireless Sensor Networks", Springer Science 2004
3..	Ibrahiem M. M. El Emary, S. Ramakrishnan, Wireless Sensor Networks: From Theory to Applications, CRC Press, 2013, ISBN:1466518103.

E-Resources

1.	https://www.youtube.com/watch?v=ZwjlONyV05Q
2.	https://www.digimat.in/nptel/courses/video/106105160/L26.html

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Programme	**B.E.**	Programme Code				**107**	Regulation		**2019**	
Department	**Computer Science and Technology**						Semester		**VI**	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE09	**Distributed Systems**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Understand the basics of distributed systems. • Understand the remote method invocation and communication in distributed systems. • Know the transaction and synchronization tools.	

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand the basic concepts of distributed Systems	K2
	CO2: Understand the Remote Method Invocation and communication in distributed systems.	K2
	CO3: Enumerate Peer to Peer services and File Systems.	K1
	CO4: Know the transaction and synchronization in distributedsystems.	K2
	CO5:Apply replication concepts and security algorithms in distributed systems	K3

Pre-requisites	-

CO /PO Mapping
(3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak

						Programme Outcomes(POs)								**CO/PSO Mapping** PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3	2	1	-	2	2					2	3	2
CO2	3	3	2	2	3	2	2					2	3	2
CO3	2	3	2	2	-	2	2					2	3	2
CO4	2	3	2	2	-	2	2					2	3	2
CO5	2	3	2	2	-	2	2					2	3	2

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**INTRODUCTION**	Periods	**9**
Examples of Distributed Systems–Trends in Distributed Systems – Focus on resource sharing. System Models- Physical model-Architectural model-inter process Communication – External data representation and marshalling- Network virtualization.			
Unit - II	**COMMUNICATION IN DISTRIBUTED SYSTEMS**	Periods	**9**

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	Remote Method Invocation And Objects: Remote Invocation –Request-reply protocols – Remote procedure call. - Group communication – Publish-subscribe systems – Shared memory approaches .		
Unit – III	**PEER TO PEER SERVICES AND FILE SYSTEMS**	Periods	**9**
	Introduction – Napster and its legacy – Peer-to-peer Middleware – Routing overlays. - Distributed File Systems – File service architecture .		
Unit - IV	**SYNCHRONIZATION AND TRANSACTION**	Periods	**9**
	Introduction – Clocks, events and process states – Synchronizing physical clocks- Distributed Mutual Exclusion- Elections-Coordination and Agreement In Group Communication-Basic multicast-Reliable multicast-Locks –Flat and nested distributed Transactions – Atomic Commit protocols .		
Unit – V	**REPLICATION & SECURITY**	Periods	**9**
	System model and role of group communication-Fault tolerant services-Passive replication- Overview of security techniques-Cryptographic algorithms-Digital Signatures.		
		Total Periods	**45**

Text Books

1.	George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design",Fifth Edition, Pearson Education, 2012.
2.	Sunil kumar, "Distributed systems: Design Concepts", Alpha sciences, 2016

References

1.	Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
2.	Tanenbaum A.S., Van Steen M., "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.
3..	Liu M.L., "Distributed Computing, Principles and Applications", Pearson Education, 2004.
4.	Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, USA, 2003.

E-Resources

1.	https://www.youtube.com/watch?v=fO5lZI2cVC0
2.	https://www.youtube.com/watch?v=Azyizl9w2xo

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Programme	B.E.	Programme Code				107	Regulation		2019

VIVEKANANDHACOLLEGEOFENGINEERINGFORWOMEN
(AutonomousInstitution,AffiliatedtoAnnaUniversity,Chennai)Elayamp
alayam,Tiruchengode–637205

Programme	**B.E.**	Programme Code				**107**	Regulation	**2019**
Department	**Computer Science and Technology**						Semester	**VI**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE10	**Computer Graphics and Multimedia**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Develop an understanding and awareness how issues such as content, information architecture, motion, sound, design, and technology merge to form effective and compelling interactive experiences for a wide range of audiences and end users. • Become familiar with various software programs used in the creation and • implementation of multi- media • To appreciate the importance of technical ability and creativity within design practice.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Gain knowledge about graphics hardware devices and softwareused	K2
	CO2: Understand the two-dimensional graphics and their transformations	K3
	CO3: Understand the three-dimensional graphics and their transformations	K2
	CO4: Understand basics of multimedia system design	K3
	CO5: Become familiar with understand hypermedia concepts	K4

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
	Programme Outcomes(POs)												PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1									2	1
CO2	1	3	2	1									2	1
CO3	1	2	2	2									2	1
CO4	1	3	2	3									2	1
CO5	3	2	1	2									2	1

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	**ILLUMINATION AND COLOR MODELS**	Periods	**9**

Light sources - basic illumination models - halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts RGB colour model - YIQ colour model - CMY colour model - HSV colour model-HLS colour model; Colour selection. Output primitives - points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives

Unit - II	**TWO-DIMENSIONAL GRAPHICS**	Periods	**9**

Two dimensional geometric transformations - Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing - viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations - point, line, and polygon clipping algorithms.

Unit – III	**THREE-DIMENSIONAL GRAPHICS**	Periods	**9**

Three dimensional concepts; Three dimensional object representations- Polygon surfaces-Polygon tables-Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations - Bezier curves and surfaces -B-Spline curves and surfaces.

Unit - IV	**MULTIMEDIA SYSTEM DESIGN**	Periods	**9**

Multimedia basics− Multimedia applications− Multimedia system architecture− Evolving technologies for multimedia − Defining objects for multimedia systems − Multimedia data interface standards −Multimedia databases. Compression and decompression − Data and file format standards.

Unit – V	**HYPERMEDIA**	Periods	**9**

Multimedia authoring and user interface- Hypermedia messaging-Mobile messaging−Hypermedia message component − Creating hypermedia message − Integrated multimedia message standards − Integrated document management − Distributed multimedia systems.

		Total Periods	**45**

Text Books

1.	Donald Hearn and Pauline Baker M, ―Computer Graphics", Prentice Hall, New Delhi, 2007.
2.	Andleigh, P. K and Kiran Thakrar, ―Multimedia Systems and Design‖, PHI, 2003.

References

1.	Judith Jeffcoate, ―Multimedia in practice: Technology and Applications‖, PHI, 1998

E-Resources

1.	https://www.youtube.com/watch?v=DceSLMRNB8w
2.	https://nptel.ac.in/courses/106105183.

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	VIVEKANANDHACOLLEGEOFENGINEERINGFORWOMEN						
	(AutonomousInstitution,AffiliatedtoAnnaUniversity,Chennai)Elayamp alayam,Tiruchengode–637205						

Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**	
Department	**Computer Science and Technology**				Semester	**VII**	

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT716	**Internet of Things**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to - To study the fundamentals about IoT - To study about IoT Access technologies - To study the design methodology and different IoT hardware platforms. - To study the basics of IoT Data Analytics and supporting services. - To study about various IoT case studies and industrial applications	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand the basics of IoT.	K2
	CO2: Implement the state of the Architecture of an IoT.	K3
	CO3: Understand design methodology and hardware platformsinvolved in IoT.	K1
	CO4: Understand how to analyze and organize the data.	K2
	CO5: Compare IOT Applications in Industrial & real world	K3&K4
Pre-requisites	-	

CO /PO Mapping
(3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak

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

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	FUNDAMENTALS OF IoT	Periods	9

Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart
Objects.

Unit - II	IoT PROTOCOLS	Periods	9

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah andLora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks,6LoWPAN, Application Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT.

Unit – III	DESIGN AND DEVELOPMENT	Periods	9

Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details

Unit - IV	DATA ANALYTICS AND SUPPORTING SERVICES	Periods	9

Data Analytics: Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoTData Analytics Challenges, Data Acquiring, Organizing in IoT/M2M, **S**upporting Services: Computing Using a Cloud Platform for IoT/M2M, Applications/Services, Everything as a service and Cloud Service Models

Unit – V	CASE STUDIES/INDUSTRIAL APPLICATIONS	Periods	9

IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments, Industry 4.0 concepts.

		Total Periods	**45**

Text Books

1.	Simone Cirani, Gianluigi Ferrari, Internet of Things Architectures, Protocols and Standards, Wiley publications, 2019
2.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, , Cisco Press, 2017
3.	Arshdeep Bahga, Vijay Madisetti, Internet of Things – A hands-on approach, Universities Press, 2015
4.	Rajkamal, Internet of Things: Architecture, Design Principles And Applications, McGraw Hill Higher Education

References

1.	The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit2).
2.	"From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence",Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
3.	Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, Michael Margolis, Arduino Cookbook and O"Reilly Media,2011

E-Resources

1.	https://onlinecourses.nptel.ac.in/noc22_cs53/preview
2.	https://www.youtube.com/watch?v=bVFfcYh6UBw

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Programme	B.E.	Programme Code			107	Regulation	2019	
Department	Computer Science and Technology					Semester	VII	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT717	Blockchain Technology	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Understand how blockchain systems (mainly Bitcoin and Ethereum) work, • To securely interact with them, • Design, build, and deploy smart contracts and distributed applications, • Integrate ideas from blockchain technology into their own projects. 11

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Explain design principles of Blockchain Technology, Bitcoin, Ethereum and Nakamoto consensus.	k2
	CO2: Explain the Simplified Payment Verification protocol.	k2
	CO3: Interact with a blockchain system by sending and reading transactions	k3
	CO4: Design, build, and deploy a distributed application.	k3
	CO5: Evaluate security, privacy, and efficiency of a given blockchain system	k3

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	2						1	2	3	2
CO2	3	2	2	2	2						1	2	3	2
CO3	3	2	2	2	2						2	2	3	2
CO4	3	2	2	1	1						2	2	3	1
CO5	3	2	2	2	2						2	2	3	2

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit – I	**BAISCS**	Periods	**8**
Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.			
Unit – II	**BLOCKCHAIN ARCHITECTURE**	Periods	**10**
Blockchain : Blockchain-Based Applications, Functionality , Non-functional Properties, Fundamental Properties of Blockchain , Ledger Structure, Consensus Protocol, Block Configuration, Blockchain as an Architectural Element, Storage Element, Computational Element, Communication Mechanism, Asset Management and Control Mechanism, Integrating Blockchain into a System as a Component			
Unit – III	**BLOACKCHAIN**	Periods	**9**
Distributed Database, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain			
Unit – IV	**DISTRIBUTED CONSENSUS**	Periods	**9**
Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate			
Unit – V	**CRYPTOCURRENCY**	Periods	**9**
History, Distributed Ledger, Dapp, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Name coin. **Case Study :** Agricultural Supply Chains , Open Data, International Money Transfers, Electricity ContractSelection and Continuous Reporting.			
		Total Periods	**45**

Text Books

1.	Xiwei Xu, Ingo Weber, Mark Staples, Architecture for Blockchain Applications, Springer Nature 2019.
2.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

References

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

E-Resources

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

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**VII**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CT718	**Internet of Things Laboratory**	0	0	4	2	50	50	100

Course Objective	The student should be made to, • Use microcontroller and microprocessor based embedded platforms in IOT • Use wireless peripherals for exchange of data. • Make use of Cloud platform to upload and analyze any sensor data • Use of Devices, Gateways and Data Management in IoT. • Use the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis.

Course Outcome	At the end of the course, the student should	Kowledge Level
	CO1: Understand and do the experiments using Arduino board and Node MCU	K4
	CO2: Be able to analyze different types of sensors and modules and manipulate sensor data using Arduino board	K3
	CO3: Be able to analyse different types of sensors and modules and manipulate the data using Node MCU	K6
	CO4: Be able to create an Open source platform using IOT Apps ,and know about latest technologies in IOT	K6
	CO5: Be able to create a real time application using IOT Platforms	K6

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	1	1		2		1	3	3	3
CO2	3	3	3	3	3				1			3	3	3
CO3	3	3	3	3	3				1			3	3	3
CO4	3	3	3	3	3							3	3	3
CO5	3	3	3	3	3							3	3	3

Course Assessment Methods Direct

Direct
1.Prelab and post lab test   2.End-Semester examinations
Indirect
1.Course - end survey

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LIST OF EXPERIMENTS		
Internet of things		
ARDUINO		
1.	Study of Arduino Board and its IDE and the type of Sensors used for IoT applications	CO1
2.	Experiment using LED Blinking, Temperature Sensor(DHT 11 DHT 22),Pressure sensor, Heartrate sensors	CO2
3.	Experiment using Ultrasonic Sensor, IR Sensor	CO2
4.	Experiment using Smoke sensor and Tilt Sensor	CO2
5.	Experiment using Relay module and Bluetooth Module	CO2
NODE MCU –ESP 8266		
6.	Experiment using LED Blinking, Temperature Sensor, Pressure sensor, Heartrate sensors using Node MCU	CO3
7.	Create a Open source IOT Platform design using BLYNK App and do the experiment with Ultrasonic sensor, IR sensor, Smoke sensor, and Tilt Sensor using NODE MCU	CO3
8.	Study of ESP 32 and Camera Module	CO4
9.	Mini Project-Home Automation System	CO5
	Total Periods	**45**
Text Books		
1.	https://howtomechatronics.com/tutorials/arduino/ultrasonic-sensor-hc-sr04/	
2.	https://www.maxbotix.com/articles/how-ultrasonic-sensors-work.htm	

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science and Technology**				Semester	**VII**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE11	**Deep Learning**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Understand the concepts of Neural Networks and Deep Learning • Understand Deep neural network and layered learning approach • Study and understand CNN and RNN for deep learning • Learn and understand Auto Encoders and its applications • Understand concept of transfer learning and its applications with keras	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Apply basic mathematical concepts in Deep Learning	K4
	CO2: Work with powerful framework for supervised learning	K2&K3
	CO3: Deal with Convolution Neural Networks	K2
	CO4: Analyze various types efficient data encoders	K3
	CO5: Apply various network models in deep learning	K3&K4
Pre-requisites	-	

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3					1	1	2	2	3
CO2	3	2	2	2	2					2	2	2	2	3
CO3	3	3	2	3	2					2	2	2	2	3
CO4	3	3	3	2	2					3	3	3	2	3
CO5	3	3	2	2	2					3	3	3	2	3

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	INTRODUCTION	Periods	9

Historical trends in deep learning – Machine Learning basics, Learning algorithms – Supervised and Unsupervised Training, Linear Algebra for machine learning, Testing - Cross Validation, Dimensionality Reduction, Over fitting /Under Fitting, Hyper parameters and validation sets, Estimators – Bias – Variance, Loss Function—Regularization, Biological Neuron – Idea of Computational units, McCulloch-Pitts units and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Convergence theorem for Perceptron Learning Algorithm, Linear Separability Multilayer perceptron –The first example of network with Keras code, Backprobagation

Unit - II	DEEP NEURAL NETWORKS	Periods	9

Introduction to Simple DNN, Platform for Deep Learning, Deep Learning Software Libraries, Deep Feed Forward Networks Introduction, Learning XOR, Gradient-Based Learning, Various Activation Functions, ReLU, Sigmoid – Error Functions, Architecture Design, Differentiation Algorithms, Regularization methodsfor Deep Learning, Early Stopping, Drop Out, Difficulty of training deep neural networks, Greedy layer wise training, Optimization methods for Neural Networks-Adagrad, Adam .

Unit – III	CNN and RNN	Periods	9

Convolution Neural Networks Introduction, Convolution Operation, Motivation Pooling, Normalization, Applications in Computer Vision – ImageNet, Sequence Modelling –VGGNet, LeNet Recurrent Neural Networks, RNN topologies- Difficulty in Training RNN, Long Short Term Memory, Bidirectional LSTMs, Bidirectional RNNs, Application case study – Image dimensionality reduction using encoders LSTM with Keras – sentiment Analysis

Unit - IV	ENCODER AND DECODERS	Periods	9

Auto Encoders Introduction, Auto Encoders, Under Complete Auto Encoder, Regularized Auto Encoder, Stochastic Auto Encoder, Denoising Auto Encoder, Contractive Auto Encoder, Auto Encoder Applications, Dimensionality Reduction and Classification using Auto encoders, Recommendation, Optimization for DeepLearning-Optimizers–RMS prop for RNNs, SGD for CNNs

Unit – V	DEEP ARCHITECTURES IN VISION	Periods	9

AlexNet to ResNet, Transfer Learning, Siamese Networks, Metric Learning, Ranking / Triplet Loss, RCNNswith keras, CNN-RNN, Applications in captioning and Video tasks, 3D CNNs, Application case study – Image recognition using RCNN and transfer learning.

		Total Periods	45

Text Books

1.	Amlan Chakrabarti Amit Kumar Das, Saptarsi Goswami, Pabitra, MitraDeep Learning, First Edition, Pearson, 2021
2.	IanGoodfellow,YoshuaBengio,AaronCourville,"DeepLearning",MITPress,2016.
3.	KevinP.Murphy,"MachineLearning:AProbabilisticPerspective",MITPress,2012

References

1.	JasonBrownlee,"DeepLearningwithPython",ebook,2016
2.	ChristopherandM.Bishop,"PatternRecognitionandMachineLearning",Springer Science Business Media, 2006
3.	Neural Networks: A Systematic Introduction, Raul Rojas, 1996

E-Resources

1.	https://nptel.ac.in/courses/106106184
2.	https://www.simplilearn.com/tutorials/deep-learning-tutorial/what-is-deep-learning
3.	https://www.youtube.com/watch?v=-tlIM9eDXlM

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Programme	**B.E.**	Programme Code			**107**	Regulation		**2019**	
Department	**Computer Science and Technology**					Semester		**VII**	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE12	**Software Performance Testing**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Understand the basic concepts of performance efficiency and performance testing. • Define performance risks, goals, and requirements to meet stakeholder needs and expectations. • Understand performance metrics and how to collect them. • Develop a performance test plan for achieving stated goals and requirements. • Conceptually design, implement, and execute basic performance tests.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Design test cases suitable for a software development in various domains	K4
	CO2: Identify suitable tests to be carried out	K2
	CO3: Prepare test planning based on the document ,design test plans and document test plans.	K3
	CO4: Develop and validate a test plan.	K4
	CO5: Use automation testing tools.	K3&K4
Pre-requisites	-	

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	-	1	-	-	-	-	-	-	-	-	1	1
CO2	2	1	1	-	2	-	-	-	-	-	-	-	-	2
CO3	3	1	1	-	2	-	-	-	-	-	-	-	1	1
CO4	2	1	1	1	3	-	-	-	-	-	-	-	-	2
CO5	2	1	-	1	1	-	-	-	-	-	-	-	-	2

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit – I	**FUNDAMENTALS OF TESTING**	Periods	**9**

Necessity of Testing-Case Studies on "Impact of Software bugs", Objectives of Testing, Basics Definitions, Testing Principles-Illustrations, Fundamental Test Process, The tester's role in a software development organization, Test planning, Establishing Test Policy, Structured approach to testing Test Factors and Eleven Step software testing process, Origin of Defects, Defect Repository and Test Design, Defect Examples, CaseStudies – "Identify the defect", Developer/Tester support of developing a defect repository, Defect Analysis and Prevention Strategies.

Unit – II	**ANALYSIS AND TEST CASE DESIGN**	Periods	**9**

Test Case Design Strategies Introduction to basic design strategies, White Box Strategies - Peer Reviews, Inspections, Walkthrough, Static Analysis Tools, Code functional Testing, Coverage and Control Flow Graphs, Paths Code Complexity, Evaluating test adequacy criteria, Case Studies-"Applying the suitable White Box Strategy", Black Box Testing Strategies: Requirements Based Testing, Boundary Value Analysis, Equivalence Class Partitioning, Cause Effect graphing, Random Testing, Evaluating test adequacy criteria. Case Studies- "Applying suitable Black Box Testing Strategy".

Unit – III	**LEVELS OF TESTING**	Periods	**9**

The need for levels of testing, Unit Testing: Planning, Test Harness, Running the tests
Recording Results, Integration Testing: Goals, Design and Plan, System Testing goals, Types of System Testing: Functional, Performance, Stress, Configuration, Stress, Security, Recovery, Reliability and UsabilityTesting, Regression Testing Alpha, Beta and Acceptance Testing, Role of use cases in testing, Applying Testing Skills: Compatibility testing, Internationalization testing, Applying Testing Skills, Testing Documentation plan, Recording test cases, Reporting and Measurement of Success.

Unit – IV	**TEST MANAGEMENT AND DEFECT ANALYSIS**	Periods	**9**

Test Management: Choice of Standards, Infrastructure Management, Test People Management, Test Plan Components, Test Plan Attachments, Locating Test Items, Managing Issues, Addressing Perception, Taking team together, Focus on technology, process and management, Customer perspective, Documentation uses and Documentation Types, Test Analysis report Documentation, Analyze reports, problem tracking, Controlling and Monitoring Test Progress.

Unit – V	**TEST AUTOMATION**	Periods	**9**

Software Test Automation: Skills and Scope, Design and Architecture for Automation, Challenges in Automation, Requirements for a test tool, Process Model for Automation, Selecting the test tool, Test Metricsand measurements: Role, need and types, Project Metrics, Progress Metrics, Productivity Metrics, The Future: Software Quality Assurance Career as a Software Tester.

		Total Periods	**45**

Text Books		
1.	Dorothy Graham , Rex Black, Erik van Veenendaal, Foundations of Software Testing, 4th Edition, CENGAGE, 2020
2.	Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2006.
3.	Ron Patton, "Software Testing", Second Edition, Sams Publishing, Pearson Education, 2007.

References		
1.	Ilene Burnstein, "Practical Software Testing", Springer International Edition, 2003.
2.	Aditya P. Mathur, "Foundations of Software Testing _ Fundamental Algorithms and Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.
3.	RenuRajani, Pradeep Oak, "Software Testing-Effective Methods, Tools and Techniques", Tata

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	McGraw Hill Education, 2011.
E-Resources	
1.	https://onlinecourses.nptel.ac.in/noc22_cs61/preview
2.	https://www.softwaretestingmaterial.com/performance-testing-tutorial/
3.	https://www.tutorialspoint.com/software_testing_dictionary/performance_testing.htm

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Programme	B.E.	Programme Code			107	Regulation		2019	

Department	Computer Science and Technology					Semester		VII	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
U19CTE13	Information Storage and Management	3	0	0	3	50	50	100	

Course Objective	The Main Objective of the course is to • Identify the components of managing the data center and understand logical andphysical components of a storage infrastructure • Evaluate storage architectures including storage subsystems • Understand the business continuity, backup and recovery methods. • Monitor the storage infrastructure and management activities • Understand the remote services models

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1:Understand the basics about the information storage management	K2
	CO2: Enhance the usage of Storage networking technologies	K2
	CO3: Understand Business Continuity And Back Up Recovery	K2
	CO4: Know the importance of the storage security and to manage	K3
	CO5: Understand about the replication and remote storage	K1&k2

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													CO/PSO Mapping	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	-	-	1	-	-	-	-	1	1	3	2
CO2	3	2	1	-	2	1	-	-	-	-	1	1	3	2
CO3	3	2	1	-	2	1	-	-	-	-	1	1	3	2
CO4	3	2	1	1	2	1	-	-	-	-	1	1	3	2
CO5	3	2	1	-	2	1	-	-	-	-	1	1	3	2

Course Assessment Methods Direct

Direct

1.Continuous Assessment Test I, II & III
  2.Assignment.
  3.End-Semester examinations

Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	INTRODUCTION	Periods	**9**

Introduction to Information Storage Management, Evolution of Storage Technology, Data Centre Infrastructure, Key challenges in managing information.Data Center Environment: Application, Database Management System (DBMS) - Host : Connectivity, Storage, Disk Drive Components, Intelligent Storage System: Components of an Intelligent Storage System,Storage Provisioning, Types of Intelligent Storage Systems.

Unit – II	STORAGE NETWORKING TECHNOLOGIES	Periods	**9**

Fiber Channel: Overview ,SAN and its Evolution, Components of FC SAN, FC Connectivity, FC Architecture, IPSAN-iSCSI components, iSCSI Topologies, iSCSI Protocol Stack,iSCSI Names, NAS: General Purpose Servers versus NAS Devices ,Benefits of NAS- File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File Sharing Protocols, Object Based Storage Devices , Content addressed Storage.

Unit – III	BUSINESS CONTINUITY AND BACK UP RECOVERY	Periods	**9**

Business Continuity: Information Availability ,BC Terminology, BC Planning life cycle, Failure Analysis, Business Impact Analysis, Backup and Archive: Backup Purpose ,Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations.

Unit – IV	STORAGE SECURITY AND MANAGEMENT	Periods	**9**

Storage Security Framework and Domain, Monitoring the Storage Infrastructure: Monitoring Parameters ,Components Monitored, Monitoring examples, Storage Infrastructure Management Activities, Storage Management Examples: Storage Allocation to a New Server/Host , File System Space Management.

Unit – V	REPLICATION	Periods	**9**

Local Replication: Source and Target, Uses of Local Replicas, Data Consistency, Local Replication Technologies, Restore and Restart Considerations, Creating Multiple Replicas, Management Interface. Remote Replication: Modes of Remote Replication and its Technologies, Network Infrastructure.

		Total Periods	**45**

Text Books

1.	Information Storage and Management: Storing, Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments 2nd Edition, EMC, 2019.
2.	UifTroppen Rainer Wolfgang Muller,"Storage Networks Explained", India, Wiley, 20 0, ISBN 3: 978- 047074 436.
3.	Robert Spalding,Storage Networks: The Complete Reference, Osborne, Tata McGraw Hill, 2003, ISBN- 3: 978-0072224764.

References

1.	Farley,'Building Storage Networks", Osborne, Tata McGraw Hill, 2009, ISBN- 3: 978-0072 30720.
2.	Meeta Gupta, Storage Area network Fundamentals, Pearson Education Limited,2002, ISBN 3: 978- 587050657.
3.	Anthony T .Velte, Toby J.Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Fourth Reprint, Tata McGraw Hill Edition, 20 0, ISBN- 3: 978-007 62694.

E-Resources

1.	https://nptel.ac.in/courses/106108058
2.	https://www.youtube.com/watch?v=A6rfvcF3zi4
3.	https://www.youtube.com/watch?v=VUo8Wb6KVWk

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Programme	**B.E.**	Programme Code			**107**	Regulation		**2019**
Department	**Computer Science and Technology**					Semester		**VII**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE14	**High Performance Computing**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to - To learn about Modern Processors and concepts - To understand the basic concepts of optimizations - To learn about Parallel Computers and programming - To understand the basic concepts of parallelization - To Study about Memory Parallel Programming using Open MP - To Study about Memory Parallel Programming using and MPI

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Acquire the knowledge of Modern processors and concepts	K1
	CO2: Understand the basic ideas about Optimizations	K2
	CO3: Acquire the ability to identify parallel computers	K2
	CO4: Appreciate the concepts of parallelization	K3
	CO5: Apply the knowledge on parallel programming using Open MP	K3

Pre-requisites	-

CO /PO Mapping (3/2/1indicates strength of correlation) 3-Strong,2 – Medium,1-Weak													**CO/PSO Mapping**	
Programme Outcomes(POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3	3	3	3								3	3
CO2	3	3	3	3	3								3	3
CO3	3	2	-	3	3								3	3
CO4	3	3	3	3	1								3	3
CO5	3	3	3	3	3								3	3

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	STORED PROGRAM COMPUTER ARCHITECTURE	Periods	9

General- purpose cache-based microprocessor architecture, Performance based metrics and Benchmarks, Transistors galore: Moore's Law, Pipelining, Super scalarity, SIMD, Memory hierarchies, Cache, Cache mapping, Prefetch, Multicore processors, Multithreaded processors, Vector processors- Design principles,Maximum performance estimates, Programming for vector architectures

Unit – II	SCALAR PROFILING AND OPTIMIZATION	Periods	9

Function- and line-based runtime profiling, Hardware performance counters , Manual instrumentation, Common sense optimizations-Avoid expensive operations, Shrink the working set, Simple measures, large impact- Elimination of common sub expressions, Avoiding branches, Using SIMD instruction sets, The role of compilers, General optimization options, Inlining, Aliasing, Computational accuracy, Register optimizations, Using compiler logs, C++ optimizations- Temporaries, Dynamic memory management, Loop kernels and iterators, Storage order- Case study: Jacobi algorithm and Dense matrix transpose.

Unit – III	TAXONOMY OF PARALLEL COMPUTING PARADIGMS	Periods	9

Shared-memory computers, Cache coherence, UMA – ccNUMA, Distributed-memory computers, Hierarchical (hybrid) systems, Networks- Basic performance characteristics of networks, Buses, Switched and fat-tree networks, Mesh networks, Hybrids, Parallelism- Data parallelism, Functional parallelism, Parallel scalability, Factors that limit parallel execution, Scalability metrics, Simple scalability laws, Parallel efficiency, Serial performance, versus strong scalability, Refined performance models, Choosing the right scaling baseline, Load imbalance.

Unit – IV	INTRODUCTION TO OPENMP	Periods	9

Parallel execution, Data scoping, OpenMP worksharing for loops, Synchronization, Reductions, Loop scheduling, Tasking, Miscellaneous, Case study: OpenMP-parallel Jacobi algorithm, Advanced OpenMP: Wavefront parallelization, Efficient OpenMP programming, Profiling OpenMP programs, Performance pitfalls, Ameliorating the impact of OpenMP worksharing constructs, Determining, OpenMP overhead for short loops, Serialization, False sharing, Case study: Parallel sparse matrix-vector multiply.

Unit – V	DISTRIBUTED-MEMORY PARALLEL PROGRAMMING	Periods	9

Distributed-memory parallel programming with MPI- Message passing, introduction to MPI, Messages and point-to-point Communication, Collective Communication, Nonblocking point-to-point Communication, Virtual topologies, Example: MPI parallelization of a Jacobi solver, MPI implementation, Performance properties, MPI performance tools, Communication parameters, Synchronization, serialization, contention, Implicit serialization and synchronization, Contention, Reducing Communication overhead, Optimal domain decomposition, Aggregating messages, Collective Communication, Nonblocking vs. asynchronous, Communication, Understanding intra node point-to-point Communication.

		Total Periods	45

Text Books	
1.	GeorgHager, GerhardWellein,"Introduction to High Performance Computing for Scientists and Engineers", Chapman & Hall/CRC Computational Science series, 2011.
2.	John Levesque,Gene Wagenbreth,"High Performance Computing: Programming and Application"CRC Press,2010
3.	Hager, Intro to High Performance Computing, CRC Press , 2019.

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References	
1.	KaiHwang,Zhiweixu"Scalable Parallel Computing:Technology, Architecture, Programming".
2.	Charles Severance,Kevin Dowd,"High Performance Computing", O'Reilly Media, 2nd Edition,1998.
E-Resources	
1.	https://www.cambridge.org/core/journals/mrs-bulletin/article/highperformance-computing-for-materials-design-to-advance-energy-science/ B5A20CE31BB92BC9A1365668A16019D3
2.	https://nptel.ac.in/courses/112105293
3.	https://www.oracle.com/in/cloud/hpc/what-is-hpc/

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Programme	**B.E.**	Programme Code		**107**	Regulation		**2019**
Department	**Computer Science & Technology**				Semester		**VII**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE15	**Big Data Tools And Techniques**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Gain knowledge about the various tools and techniques used in big data analytics • Learn the fundamentals of Hadoop and the related technologies • Understand the basics of development of applications using MapReduce, HDFS, YARN • Learn the basics of Pig, Hive and Sqoop • Learn the basics of Apache Spark, Flink and understand the importance of NoSQLdatabases

	At the end of the course, the student should be able to,	Knowledge level
Course Outcome	**CO1:** Use the various tools and techniques in big data analytics	K1
	CO2: Apply Hadoop and related technologies to big data analytics	K3
	CO3: Apply MapReduce, HDFS and YARN develop big data applications	K2&k3
	CO4: Develop applications using Pig, Hive and Sqoop	K3
	CO5: Apply Apache Spark and Flink to applications and understand the importance of NoSQL databases	K3

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3	3	2									1	2
CO2	2	2	2	3									2	2
CO3	2	2	3	2									3	2
CO4	2	3	2	3									2	3
CO5	2	3	2	3									3	3

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2. Assignment. 3. End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit – I	**OVERVIEW OF BIG DATA ANALYTICS**	Periods	**9**
Introduction to data analytics and big data, Big data mining, Technical elements of the Big Data platform, Analytics Toolkit, Components of the analytics toolkit, , Introduction to Hadoop ,Fundamentals of Hadoop, Hadoop Ecosystem, The core modules of Hadoop, MapReduce,.			
Unit – II	**INTRODUCTION TO HADOOP YARN**	Periods	**9**
Analyzing data with Unix tools and Hadoop, Scaling Out – Data Flow, Combiner Functions, Hadoop Streaming, HDFS, Hadoop file systems, Java Interface to Hadoop, YARN, Job Scheduling, Hadoop I/O, Data Integrity, Compression, Serialization, File based Data Structures, Developing a MapReduce Application,			
Unit – III	**INTRODUCTION TO TOOLS**	Periods	**9**
Installing and running pig, Basics of Pig, Introduction to Hive, Installing and running Hive, Introduction to HiveQL, Introduction to Zookeeper, Installing and running Zookeeper, The Zookeeper Service.			
Unit – IV	**BIG DATA DATABASE TOOLS**	Periods	**9**
Introducing Oozie, Apache Spark, Limitations of Hadoop and overcoming the limitations, Core components and architecture of Spark, Introduction to Apache Flink, Batch analytics using Flink, Big Data Mining with NoSQL, Why NoSQL?, NoSQL databases, Introduction to MongoDB			
Unit – V	**ENTERPRISE DATA SCIENCE OVERVIEW**	Periods	**9**
Data Science Solutions in the enterprise, Enterprise data science – Machine Learning and AI, Enterprise Infrastructure solutions, Visualizing Big Data, Using Python and R for visualization, Big Data Visualization Tools..			
		Total Periods	**45**

Text Books	
1	Nataraj Dasgupta, Practical Big Data Analytics, Packt, 2018.
2	Tom White, Hadoop:The Definitive Guide,3rd Edition, O'Reilly, 2012
3	Sridhar Alla,Big Data Analytics with Hadoop 3,Packt, 2018.
References	
1.	G. Sudha Sadasivam, R. Thirumahal, BIG DATA ANALYTICS, Oxford Press, 2020
2	DT Editorial Services, Big Data: Black Book,2016.
E-Resources	
1	https://www.researchgate.net/publication/339363557_Big_Data_Tools_and_Techniques_A_roadmap_for_Predictive_Analytics
2	https://nptel.ac.in/courses/106104189
3	https://www.simplilearn.com/what-is-big-data-analytics-article

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN				
	(Autonomous Institution, Affiliated to Anna University ,Chennai)				
	Elayampalayam, Tiruchengode – 637 205				

Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**VII**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE16	**Inspired Computing Techniques**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • To Understand the basics of Natural systems • To appreciate the concepts of Natural systems and its applications • To understand newBasic Natural systems functions(operations) • To understand the fundamentals of nature inspired techniques which influencecomputing • To understand an Integration of Hardware and software in Natural applications.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Illustrate the basic concepts of Swarm Intelligence processes	K3
	CO2: Examine the principle of Immuno computing techniques	K2
	CO3: Skills for planning, estimating, and resourcing for Naturaldesign considerations	K1
	CO4: Manage the scope changes of nature inspired techniques whichinfluence computing	K2
	CO5: Ability to identify optimization Techniques as a means to provide functionality and value to apply context in specific casestudies	K3

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1											1	2
CO2	2	1	2	1									2	2
CO3	1	2	1	2									2	3
CO4	1	1		2									1	2
CO5	1	2		3									1	1

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2. Assignment. 3. End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus			
Unit – I	**INTRODUCTION**	Periods	**9**
Overview of Philosophy, Nature to Nature Computing, A Brief Overview of Three Branches, Individuals, Entities and agents, Parallelism and Distributivity Interactivity, Adaptation- Feedback, Self-Organization, Complexity, Emergence, Bottom-up Vs Top-Down Approach, Determination, Chaos and Fractals.			
Unit – II	**EVOLUTIONARY COMPUTING**	Periods	**9**
Hill Climbing, Simulated Annealing, Simulated Annealing, Genetics Principles, Standard Evolutionary Algorithm, Genetic Algorithms, Reproduction, Crossover Mutation, Evolutionary Programming, Genetic Programming, Swarm Intelligence.			
Unit – III	**OPTIMIZATION**	Periods	**9**
Ant Colony Optimization, Ant Foraging Behavior, Ant Colony Optimization, SACO algorithm, Ant Colony Algorithm (ACA), scope of ACO algorithms, Swarm Robotics, Social Adaptation of Knowledge, Particle Swarm Optimization, Particle Swarm Optimization.			
Unit – IV	**INTRODUCTION TO IMMUNE SYSTEM**	Periods	**9**
Physiology and main components, Pattern Recognition and Binding, Immune Network Theory, Danger Theory, Immune Algorithms, Genetic algorithms, Bone Marrow Models, Forest's Algorithm, Artificial Immune Networks.			
Unit – V	**INTRODUCTION TO DNA COMPUTING**	Periods	**9**
DNA Molecule, Adleman's experiment, PAM Model, Splicing Systems, From Classical to DNA Computing, Universal DNA Computers, Scope of DNA Computing, Lipton's Solution to SAT Problem.			
		Total Periods	**45**

Text Books	
1.	Leandro Nunesde Castro,"Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/CRC, Taylor and Francis Group, 2007.
2.	FloreanoD. And Mattiussi C.,"Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
3.	G Venkatesh, Computational Thinking, Notion Press, 2021

References	
1.	AlbertY.Zomaya,"Handbook of Nature-Inspired and Innovative Computing", Springer,2006.
2.	Marco Dorrigo, Thomas Stutzle," Ant Colony Optimization", PHI,2005.

E-Resources	
1.	https://www.nature.com/articles/s41427-021-00322-y
2.	https://nptel.ac.in/courses/112103301
3.	https://www.youtube.com/watch?v=3OkQ72y77LM

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**VII**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE17	**Data Base Security and Privacy**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • To understand the fundamentals of security, and how it relates to information systems • To learn good password policies, and techniques to secure passwords in an organization • To handle privacy issues.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand the security architecture	K2
	CO2: Learn the Administration of Database	K1
	CO3: Understand security models	K2
	CO4: Analyze the methods of auditing database	K3
	CO5: Learn about data mining techniques	K1
Pre-requisites	-	

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3		3										3	1
CO2	1	3	1										1	2
CO3	1		2										1	3
CO4	1	3	3	3									1	2
CO5	3		3										3	1

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2. Assignment. 3. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**Security Architecture & Operating System Security Fundamentals**	Periods	**9**

Security Architecture: Introduction-Information Systems- Database Management Systems, Information Security Architecture- Database Security–Asset Types and value-Security Methods, Operating System Security Fundamentals: Introduction- Operating System Overview-Security Environment – Components- Authentication Methods, User Administration-Password Policies-Vulnerabilities-E-mail Security.

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Unit – II	ADMINISTRATION OF USERS & PROFILES, PASSWORD POLICIES, PRIVILEGES AND ROLES	Periods	9

Administration of Users- Introduction-Authentication- Creating Users, SQL Server User-Removing, Modifying Users-Default, Remote Users-Database Links-Linked Servers-Remote Servers- Practices for Administrators and Managers-Best Practices, Profiles, Password Policies, Privileges and Roles: Introduction-Defining and Using Profiles-Designing and Implementing Password Policies, Granting and Revoking User
Privileges-Creating, Assigning and Revoking User Roles-Best Practices.

Unit – III	DATABASE APPLICATION SECURITY MODELS& VIRTUAL PRIVATE DATABASES	Periods	9

Database Application Security Models: Introduction-Types of Users-Security Models, Application Types-Application Security Models-Data Encryption, Virtual Private Databases: Introduction-Overview of VPD-Implementation of VPD using Views, Application Context in Oracle, Implementing Oracle VPD-Viewing VPD Policies and Application contexts using Data Dictionary, Policy Manager Implementing Row and
Column level Security with SQL Server.

Unit – IV	AUDITING DATABASE ACTIVITIES	Periods	9

Auditing Database Activities: Using Oracle Database Activities-Creating DLL Triggers with Oracle, AuditingDatabase Activities with Oracle-Auditing Server Activity with SQL Server 2000, Security and Auditing
Project Case Study strategy.

Unit – V	PRIVACY PRESERVING DATA MINING TECHNIQUES	Periods	9

Privacy Preserving Data Mining Techniques: Introduction- Privacy Preserving Data Mining Algorithms,General Survey-Randomization Methods-Group Based Anonymization, Distributed Privacy Preserving Data
Mining-Curse of Dimensionality, Application of Privacy Preserving Data Mining.

Total Periods			**45**
Text Books			
1.	Hassan A. Afyouni, "Database Security and Auditing", Third Edition, Cengage Learning, 2009. (UNIT 1 to IV)		
2.	Charu C. Aggarwal, Philip S Yu, "Privacy Preserving Data Mining": Models and Algorithms, Kluwer Academic Publishers, 2008.(UNIT V).		
3.	Gerardus Blokdyk, Database Security A Complete Guide, 5 star cooks, 2020		
References			
1.	Ron Ben Natan, "Implementing Database Security and Auditing", Elsevier Digital Press, 2005.		
2.	Natan, Implementing Database Security and Auditing 1St Edition, Elsevier India, 2022		
E-Resources			
1.	http://charuaggarwal.net/toc.pdf		
2.	http://adrem.ua.ac.be/sites/adrem.ua.ac.be/files/securitybook.pdf		

Signature of BoS Chairman

Programme	**B.E.**	Programme Code		**107**	Regulation		**2019**
Department	**Computer Science & Technology**				Semester		**VII**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE18	**Business Intelligence and analytics**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Become familiar with the processes needed to develop, report and analyze businessdata • Apply BI enabling technologies in organizational settings • Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization • Learn how to use and apply selected business analytics software.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand the Business intelligent systems	K2
	CO2: Learn about the technologies in decision making	K1
	CO3: Learn the predictive techniques	K1
	CO4: Understand the multi Decision making system	K2
	CO5: Learn about the automated decision making systems	K1

Pre-requisites	-

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

COs	Programme Outcomes (POs)												CO/PSO Mapping PSOs	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	1	1	3								1	
CO2	1		1			1							1	1
CO3	3		1	2	1								2	2
CO4		2				2							2	
CO5	1			3	3									1

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2. Assignment. 3. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**OVERVIEW OF BUSINESS INTELLIGENCE, ANALYTICS, AND DECISION SUPPORT**	Periods	**9**

Information Systems Support for Decision Making, An Early Framework for Computerized Decision Support,The Concept of Decision Support Systems, A Framework for Business Intelligence, Business Analytics Overview, Brief Introduction to Big Data Analytics, Clickstream Analysis: Metrics, Clickstream, Analysis: Practical Solutions, Competitive Intelligence Analysis.

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Unit – II	FOUNDATIONS AND TECHNOLOGIES FOR DECISION MAKING	Periods	9

Decision Making: Introduction and Definitions, Phases of the Decision, Making Process, The Intelligence Phase, Design Phase, Choice Phase, Implementation Phase, Decision Support Systems: Capabilities, Decision Support Systems: Classification, Decision Support Systems: Components

Unit – III	TECHNIQUES FOR PREDICTIVE MODELING AND SENTIMENT ANALYSIS	Periods	9

Basic Concepts of Neural Networks, Developing Neural Network, Based Systems, Illuminating the Black Box of ANN with Sensitivity, Support Vector Machines, A Process, Based Approach to the Use of SVM, Nearest Neighbor Method for Prediction, Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process, Sentiment Analysis and Speech Analytics.

Unit – IV	OPTIMIZATION AND MULTI-CRITERIA DECISION MAKING SYSTEMS	Periods	9

Decision Support Systems Modeling, Structure of Mathematical Models for Decision Support, Decision Making Under Certainty, Uncertainty and Risk, Decision Modeling with Spreadsheets, Mathematical Programming Optimization, Decision Analysis with Decision Tables and Decision Trees, Multi-Criteria Decision Making With Pairwise Comparisons.

Unit – V	AUTOMATED DECISION SYSTEMS AND EXPERT SYSTEMS	Periods	9

Automated Decision Systems, The Artificial Intelligence Field, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems, Location, Based Analytics for Organizations, Cloud Computing and BI.

		Total Periods	45

Text Books

1. Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence and Analytics: Systems for Decision Support, Tenth edition, Pearson Education, 2018.
2. Ramesh Sharda, Dursun Delen, Efraim Turban, J. E. Aronson, Ting-Peng Liang, David King, "Business Intelligence and Analytics: System for Decision Support", 10thEdition, Pearson Global Edition, 2013, ISBN: 9781292009209.
3. Avinash Kaushik, "Web Analytics 2.0 - The Art of Online Accountability & Science ofCustomer Centricity", 2010, Wiley, ISBN: 9780470529393.

References

1. Stephen Marsland, "Machine Learning - An Algorithmic Perspective", 2nd Edition, 2015, Chapman& Hall I, CRC Press, Taylor& Francis Group, ISBN:9781466583283.
2. Vicki L. Sauter, "Decision Support Systems for Business Intelligence", 2nd Edition, 2011, Wiley, ISBN: 9780470433744.

E-Resources

1. https://www.tableau.com/learn/articles/business-intelligence
2. https://nptel.ac.in/courses/110105089
3. https://www.techtarget.com/searchbusinessanalytics/definition/business-intelligence-BI

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Programme	**B.E.**	Programme Code		**107**	Regulation		**2019**
Department	**Computer Science & Technology**				Semester		**VIII**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE19	**Data Visualization**	3	0	0	3	50	50	100

Course Objective	The student should be made to ● Ability to learn about different Visualization Techniques. ● Ability to study the Interaction techniques in information visualization fields. ● Ability to understand Various abstraction mechanisms. ● Ability to create interactive visual interfaces.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Use python libraries for data visualization.	K2
	CO2: Conduct exploratory data analysis using Python.	K3
	CO3: Interpret results of exploratory data analysis.	K2
	CO4: Learn and understand the data visualization graphics and animating concepts.	K3
	CO5: Paraphrase the results for documentation.	K4
Pre-requisites	-	

	CO / PO Mapping												CO/PSO Mapping	
	(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													
	Programme Outcomes (POs)												PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3	3	2									-	-
CO2	1	3	3	2									1	2
CO3	2	-	-	-									2	-
CO4	3	4											1	2
CO5	1			2									3	1

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**FOUNDATIONS FOR DATA VISUALIZATION**	**Periods**	**9**

Introduction to Visualization- Visualization stages- Experimental Semiotics based on Perception-GibsonAffordance theory- A Model of Perceptual Processing- Costs and Benefits of Visualization- Types of Data.

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Unit - II	COMPUTER VISUALIZATION	Periods	9

Non-Computer Visualization- Computer Visualization: Exploring Complex Information Spaces- Fisheye Views – Applications-Non Linear Magnification- Comparing Visualization of Information Spaces-Abstraction in computer Graphic-Abstraction in user interfaces-Comprehensible Fisheye views – Fisheye views for 3D data.

Unit - III	MULTIDIMENSIONAL VISUALIZATION	Periods	9

1D, 2D, 3D Visualization techniques-Trees-Web Works-Data Mapping: Document Visualization-Workspaces

Unit - IV	TEXTUAL METHODS OF ABSTRACTION	Periods	9

From Graphics to Pure Text-Figure Captions in Visual Interfaces-Interactive 3D illustrations with images and text – Related work-Consistency of rendered – images and their textual labels Architecture-Zoom techniques for illustration purpose-Interactive handling of images and text.

Unit - V	ABSTRACTION IN TIME AND INTERACTIVE SYSTEMS	Periods	9

Animating non Photo realistic Computer Graphics-Interaction Facilities and High Level Support for Animation Design- Zoom Navigation in User Interfaces-Interactive Medical Illustrations-Rendering Gestural Expressions-Animating design for Simulation-Tactile Maps for Blind People-Synthetic holography-Abstraction Versus Realism, Integrating spatial and non-spatial data.

		Total Periods	45

Text Books

1.	Colin Ware "Information Visualization Perception for Design", 3 rd edition, Morgan Kaufman 2012.
2.	Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, "Readings in Information Visualization Using Vision to think", Morgan Kaufmann Publishers, 1999.
3.	Thomas Strothotte, "Computer Visualization–Graphics Abstraction and Interactivity", Springer VerlagBerlin Heiderberg 1998.
4.	Laurene Fausett, "Fundamentals of Neural Networks, Architectures, Algorithms and Applications", Pearson Education, 2008.

References

1.	Chaomei Chan, "Information Visualization", Beyond the horizon, 2nd edition, Springer Verlag, 2004.
2.	Pauline Wills, "Visualisation: A Beginner's Guide", Hodder and Stoughlon, 1999.
3.	Benedikt. M, "Cyberspace: Firot Steps", MIT Press, 1991
4.	http://www.silvalifesystem.com/articles/visualization-techniques/
5.	http://www.barnesandnoble.com/w/computational-visualization-thomasstrothotte/1111486638.

E-Resources

1.	http://www.ornl.gov/info/ornlreview/v30n3-4/visual.htm
2.	http://www.silvalifesystem.com/articles/visualization-techniques/
3.	www.ulb.tu-darmstadt.de/tocs/5943970X.pdf

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**VIII**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE20	**Software Defined Network**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Analyze the evolution of software defined networks • Express the various components of SDN and their uses • Explain the use of SDN in the current networking scenario • Design and develop various applications of SDN	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand the concepts of machine learning	K2
	CO2: Understand the supervised learning and its algorithms	K2
	CO3: Study the unsupervised learning and its algorithms.	K1
	CO4: Learn and understand the semi-supervised learning and validations process	K2
	CO5: Study the reinforcement algorithm and practical applications of the machine learning	K3
Pre-requisites	-	

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	3	2	2	2				2	1	2		1	1
CO2		3	2	2	2				2	1	2		2	1
CO3	1	3	2	2	2				2	1	2		2	1
CO4	2		2	3	2				2	1	2		1	1
CO5	2	3	2	2	2				2	1	2		2	1

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**INTRODUCTION**	Periods	**9**

History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Date Planes.

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Unit - II	OPEN FLOW & SDN CONTROLLERS	Periods	9

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 – III	DATA CENTERS	Periods	9

Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE.

Unit - IV	SDN PROGRAMMING	Periods	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 – V	SDN	Periods	9

Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration.

		Total Periods	45

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.	Siamak Azodolmolky, ―Software Defined Networking with Open Flow, Packet Publishing, 2013.
2.	Vivek Tiwari, ―SDN and Open Flow for Beginners¦, Amazon Digital Services, Inc., 2013.
3.	Fei Hu, Editor, ―Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

E-Resources

1.	https://www.coursera.org/lecture/sdn/overview-part-1-RxOqz
2.	https://www.youtube.com/watch?v=CaukSKg_sI0

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Programme	B.E.	Programme Code		107	Regulation		2019
Department	Computer Science & Technology				Semester		VIII

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE21	Biometrics Systems	3	0	0	3	50	50	100

Course Objective	• Understand the basic concept of biometrics systems. • To Describe the principles of the core biometric modalities. • To identify the privacy and security concerns surrounding biometric systems. • To discuss about Deal with poor image qualities and its effect in biometrics. • To Organize and conduct biometric data collections, and apply biometric databasesin system evaluation.

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Understand biometrics systems operation from sensor to decision.	K2
	CO2: Describe the principles of the core biometric modalities (face, fingerprint, retina and iris), and to deploy them in authentication scenarios.	K3
	CO3: Identify the privacy and security concerns surrounding biometric systems.	K2
	CO4: Deal with poor image qualities and its effect in biometrics.	K3
	CO5: Enumerate the most up-to-date examples of real biometric applications in human authentication.	K4

Pre-requisites	

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													CO/PSO Mapping	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	2	2	2								1	2
CO2	2	1	1	2	2								2	2
CO3	1	2	1	2	1								1	1
CO4	1	2	1	1	1								1	1
CO5	1	2	1	1	1								2	1

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	Introduction To Biometrics	Periods	9

History of Biometrics ,Types of Biometric Traits, General Architecture of Biometric System, Biometric Characteristics- Basic working of Biometric Matching , Biometric System Error and Performance Measures- Design of Biometric Systems , Identification and Verification Concepts- Applications of Biometrics, Benefits of Biometrics versus Traditional Authentication Methods.

Unit - II	Face, Fingerprint, Retina and Iris Biometrics	Periods	9

Introduction to Face, Finger Print Retina and Iris biometrics-Design of Face Recognition System, Neural Network for Face Recognition-Face Detection in video sequences, Challenges in Face Biometrics, Face Recognition Methods, Advantages and Disadvantages8.-Fingerprint Biometrics, Fingerprint Recognition System, Minutiae Extraction.-Design of Retina and Iris Recognition System, Iris Segmentation Method.- Determination of Iris Region, Experimental Results of Iris Location, Applications of Iris Biometrics, Advantages and Disadvantages.

Unit - III	Privacy Enhancement and Cryptography For Biometrics	Periods	9

Introduction to privacy enhancement and biometric cryptography.-Privacy concerns associated with deployment, identity and privacy, privacy concerns, biometrics with privacy enhancement.-Comparison of biometrics in terms of privacy, soft biometrics.-General purpose crypto system, Model cryptography and attacks.- Symmetrickey ciphers, cryptographic algorithms-Introduction to Multimodal biometrics, Basic architecture of multimodal biometrics-Multimodal biometrics using face and ear, Characteristic and advantages of multimodal biometrics.

Unit - IV	Image Enhancement Techniques	Periods	9

Introduction to Image Enhancement Techniques, Current Research in Image Enhancement Techniques-Image Enhancement, Frequency Domain Filters, Databases and Implementation.-Experimental results of Image Enhancement Techniques.

Unit - V	Biometrics: Scope And Future, Repositories For Database AndBiometric Standards	Periods	9

Scope and future market of biometrics-Applications of biometrics, Biometrics and information technology infrastructure, Role of biometrics in enterprise security, Role of biometrics in border security-Smart card technology and biometrics, Radio frequency identification biometrics, DNA biometrics, Comparative study of various biometric techniques. Biometric Databases and Biometric Standards.

	Total Periods	45

Text Books

1.	G.R.Sinha, Sandeep B Patil,"Biometrics:Concepts and Applications", Wiley publications, New Delhi,2013.
2.	Robert Newman" Security and Access control using Biometric Technologies", Cengage Learning,,2010.

References

1.	Jain, A.K., Flynn, P. and Ross, A. Handbook of Biometrics. 2008.
2.	Ruud M.Bolle, Sharath Pankanti, Nalini K. Ratha, Andrew W. Senior, Jonathan H. Connell, "Guide to Biometrics ",Springer ,2009.
3.	Rafael C. Gonzalez, Richard Eugene Woods," Digital Image Processing using MATLAB", 2nd Edition,Tata McGraw-Hill Education ,2010.

E-Resources

1.	https://archive.nptel.ac.in/
2.	https://www.kaspersky.com/resource-center/definitions/biometrics
3.	https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**VIII**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE22	**Natural Language Processing**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Provide the student with knowledge of various levels of analysis involved in NLP. • Understand the applications of NLP. • Gain knowledge in automated Natural Language Generation and Machine Translation.

	At the end of the course, the student should be able to,	Knowledge Level
Course Outcome	**CO1:** Extract information from text automatically using concepts and methods from natural language processing (NLP) including stemming, n-grams, POS tagging, and parsing.	K2
	CO2 : Develop speech-based applications that use speech analysis (phonetics, speech recognition, and synthesis).	K3
	CO3 : Analyze the syntax, semantics, and pragmatics of a statement written in a natural language.	K2
	CO4 : Apply machine learning algorithms to natural language processing.	K3
	CO5 : Evaluate the performance of NLP tools and systems.	K4
Pre-requisites	**Fundamentals of Artificial Intelligence**	

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	2	1									2	1
CO2	1	2	2	1					2				2	2
CO3	1	2	2	1					1				2	1
CO4	1	1	2	1									2	1
CO5	1	1	2	1									2	1

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

Signature of BoS Chairman

Content of the syllabus

Unit – I	OVERVIEW AND MORPHOLOGY	Periods	9

Introduction – Models -and Algorithms - -Regular Expressions Basic Regular Expression Patterns – Finite State Automata-Morphology -Inflectional Morphology - Derivational Morphology --Finite-State Morphological Parsing --Porter Stemmer.

Unit - II	WORD LEVEL AND SYNTACTIC ANALYSIS	Periods	9

-N-grams Models of Syntax - Counting Words - Unsmoothed N-grams-Smoothing- Back off Deleted Interpolation – Entropy - English Word Classes - Tagsets for English-Part of Speech Tagging-Rule Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation-Based Tagging.

Unit - III	CONTEXT FREE GRAMMARS	Periods	9

Context Free Grammars for English Syntax- Context- Free Rules and Trees --Sentence- Level Constructions–Agreement – Sub Categorization-Parsing – Top-down – Earley Parsing -feature Structures – Probabilistic Context-Free Grammars.

Unit - IV	SEMANTIC ANALYSIS	Periods	9

Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus-Representing Linguistically Relevant Concepts -Syntax- Driven Semantic Analysis - Semantic Attachments -Syntax- Driven Analyzer-- Robust Analysis - Lexemes and Their Senses - Internal Structure - Word Sense Disambiguation -Information Retrieval.

Unit - V	LANGUAGE GENERATION AND DISCOURSE ANALYSIS	Periods	9

Discourse -Reference Resolution - Text Coherence - Discourse Structure – Coherence-Dialog and Conversational Agents - Dialog Acts – Interpretation - Conversational Agents --Language Generation – Architecture -Surface Realization- Discourse Planning .-Machine Translation -
Transfer Metaphor–Interlingua – Statistical Approaches.

	Total Periods	45

Text Books

1.	Daniel Jurafsky and James H Martin, ”Speech and Language Processing: An introduction to NaturalLanguage Processing, Computational Linguistics and Speech Recognition”, Prentice Hall, 2nd Edition, 2008.
2.	C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press. Cambridge, MA:,1999.

References

1.	James Allen, Bejamin/cummingsx, "Natural Language Understanding", 2nd edition, 1995.

E-Resources

1.	https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP.
2.	https://www.sas.com/en_us/insights/analytics/what-is-natural-language-processing-nlp.html
3.	https://towardsdatascience.com/your-guide-to-natural-language-processing-nlp-48ea2511f6e1
4.	https://github.com/oxford-cs-deepnlp-2017/lectures/blob/master/README.md
5.	https://www.analyticsvidhya.com/blog/2022/01/master-natural-language-processing-in-2022-with-best-resources/

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Programme	B.E.	Programme Code		107	Regulation		2019
Department	Computer Science & Technology				Semester		VIII

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE23	Forensic and Incident Response	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Describe the incident response methodology for all stages of an investigation. • Describe and contrast the various steps in investigating windows/MAC and Unix systems. • Investigate System compromise Indicators. • Collect Evidence from volatile and Non-Volatile.

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Discuss the main technical approaches and challenges associated withIR.	K2
	CO2: Investigate the current legal frameworks and data privacy laws relevant to the field of IR.	K3
	CO3: Develop an Incident Response (IR) plan for an organisation with the aim of improving a firm's security posture.	K2
	CO4: Gather static data from a computer or storage device with the aim of preserving evidence.	K3
	CO5: Acquire volatile memory and data using advanced tools and techniques.	K4

Pre-requisites	Cyber Security

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													CO/PSO Mapping	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	2	2				2	1	2		1	2	1
CO2	1	2	2	2				1	1	2		2	2	2
CO3	1	2	2	2				2	1	2		2	2	1
CO4	1	1	2	2				1	1	2		2	2	1
CO5	1	1	2	2				1	1	2		2	2	1

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

Signature of BoS Chairman

Content of the syllabus			
Unit – I	**INCIDENT RESPONSE PROCESS AND LEGAL CONSIDERATIONS**	**Periods**	**9**
Building Incident Response Capability-Incident Readiness Planning.-Internet Laws and Statutes, Legal Concernsand Privacy.-Court Admissibility of Evidence.-Real World Incidents.
Unit - II	**EVIDENCE COLLECTION ANDPRESERVATION: VOLATILE**	**Periods**	**9**
Volatile Data Collection, Pros and Cons of System Shutdown.-Memory Data Collection-Network Data Collection.-Process, Registry Data Collection.
Unit - III	**EVIDENCE COLLECTION AND RESERVATION: NONVOLATILE**	**Periods**	**9**
Hard Drive Imaging : Physical Image-Hard Drive Imaging : Logical Image-Full/Partial Drive Encryption Scenarios- Remote Forensics-Securing the Evidence, Chain of Custody.
Unit - IV	**SYSTEM COMPROMISE INDICATORS**	**Periods**	**9**
Misconfigured Firewall, IDS, IPS Rules-Anti:Virus Logs, Critical System Log Files.-Browser Forensics, Temporary Internet Files-Hosts File ,DNS Cache, Running Services.-Network Connections, Hidden and Protected File-Windows Registry: Registry Changes, System Info,. User activities, Auto start Locations.
Unit - V	**FILE SYSTEM BASICS AND FORENSIC ANALYSIS**	**Periods**	**9**
Windows (FAT/EXFAT/NTFS) Analysis.-Linux/OSX (EXT2/3/4/MAC OS FS) Analysis.-Time line Analysis.-FileSignature Analysis, Hash Analysis.-Documentation : Evidence Report Writing.
Total Periods			**45**

Text Books

1. Kevin Mandia , "Incident Response & Computer Forensics, 3rd Edition" : 20 2. The McGraw:Hill, ISBN- 3: 978-007 798686.
2. Steve Bunting, "EnCase Computer Forensics :: The Official EnCE: EnCase Certified Examiner Study Guide "John WIley and Sons,20 2. ISBN: 978-0-470-90 06-9
3. Brian Carrier "File System Forensic Analysis" - by Addison Wesley, st edition,2005. ISBN- 3: 978-032268 74.
4. Darren R. Hayes "A Practical Guide to Computer Forensics Investigations" st Edition, 20 5. PEARSON ISBN- 3: 978-0-7897-4 5-8.
5. Bill Nelson, Amelia Philips and Christopher Steuart, "Guide to computer forensics and investigations", course technology, Cengage Learning; 4thedition, 2009. ISBN- 3: 978- -435-49883-9.
6. Dan Farmer, WietsaVenema " forensic Discovery" st Edition 2005, Addison Wesley , ISBN-13: 978-032703255.

References

1. "A practical guide to deploying digital forensic techniques in response to cyber security incidents"by Gerard Johansen 207
2. "Perform data acquisition, data recovery, network forensics, and malware analysis with Kali Linux 2019.x, 2nd Edition Paperback" by Shiva V. N. Parasram, 2020.

E-Resources

1. www2.deloitte.com/lu/en/pages/risk/solutions/incident-response-and-forensics.html.
2. https://www.bluevoyant.com/knowledge-center/what-is-digital-forensics-and-incident-response-dfir.
3. https://www.paloaltonetworks.com/cyberpedia/digital-forensics-and-incident-response.
4. https://fieldeffect.com/blog/digital-forensics-incident-response/

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN					
	(Autonomous Institution, Affiliated to Anna University ,Chennai)Elayampalayam, Tiruchengode – 637 205					

Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**VIII**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE24	**Geographical Information Systems**	3	0	0	3	50	50	100

Course Objective	• Understand basic concepts of GIS data structures and analysis. • Gain fundamental cartographic knowledge of map projections, scale, coordinates and mapping accuracy. • Use spatial analysis techniques to solve geographic problems. • Find sources of geographic data. • Gain the skills necessary to create GIS data through a variety of methods. • Providing an introductory understanding of the ethical questions surrounding data creation, analysis, and representation.

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Identify the fundamental concepts and practices of Geographic Information Systems (GIS) and advances in Geospatial Information Science and Technology (GIS&T).	K2
	CO2: Apply basic graphic and data visualization concepts such as color theory, symbolization, and use of white space.	K3
	CO3: Give examples of interdisciplinary applications of Geospatial Information Science and Technology.	K2
	CO4: Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis.	K3
	CO5: Gather and process original data using a Global Positioning System (GPS) or other Global Navigation Satellite Systems (GNSS).	K4

Pre-requisites	

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	2	2				1				1	2	1
CO2	2	2	2	2				2				2	2	2
CO3	2	2	2	2				1				2	2	1
CO4	2	2	2	2				2				2	2	1
CO5	2	2	2	2				1				2	2	1

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III 2.Assignment. 3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus				
Unit – I	**FUNDAMENTALS OF GIS**		**Periods**	**9**

Introduction to GIS, Defining GIS.-Components of GIS.-Introduction to Spatial data, Maps and their influence on the character of spatial data-Basic spatial entities, Thematic characteristics of spatial data-Sources of Spatial data, Field data sources – Surveying and GPS.

Unit - II	**SPATIAL DATA MODELING**		**Periods**	**9**

Spatial data modeling introduction, Spatial data models & data structures.-Modeling Surfaces and Networks, Modeling third dimension, Modeling fourth dimension.-Introduction to attribute data management, Database data models and creating database.-GIS Database applications, Database developments.

Unit - III	**DATA INPUT AND EDITING**		**Periods**	**9**

Introduction to data input and editing, Methods of Data input.-Data editing, Towards an integrated database.- Introduction to data analysis, Measurements in GIS, Queries and reclassification.-Buffering and neighborhoodfunction, Map overlay and spatial interpolation, Analysis of surfaces and networks.- Remote Sensing and GIS Integration- Principles, Classifications and Characteristics.-Extraction of Metric and Thematic Information's,
Integration of Remote Sensing and GIS.

Unit - IV	**ANALYTICAL MODELING IN GIS**		**Periods**	**9**

Introduction to analytical modeling, Process models.-Modeling physical, environmental and human processes, Modeling the decision making process and its issues.-Maps as output, Non-cartographic output.-Spatial multimedia and Mechanisms of delivery.

Unit - V	**ISSUES IN GIS**		**Periods**	**9**

Development of computer methods for handling spatial data, Handling spatial data manually, Development of GIS-Data quality issues, Describing data quality, Describing data errors sources of errors in GIS.-Real time GIS Applications.-Future of GIS, GIS Project Design and management.

			Total Periods	**45**

Text Books

1. Ian Heywood, Sarah Cornelius and Steve carver, "Introduction to geographical information systems", Pearson Education, 4th Edition, 2012.

References

1. DeMers, M.N., "Fundamentals of Geographic Information Systems", 4thEdition, Wiley Press, 2012.
2. Lo C.P. and Yeung, A.K.W.,"Concepts and Techniques of Geographic Information Systems", Prentice Hall, 2002.
3. Burrough, P.A. and R.A. McDonald, "Principles of Geographical Information Systems", Oxford University Press, 1998

E-Resources

1. https://www.usgs.gov/faqs/what-geographic-information-system-gis
2. https://gisgeography.com/what-gis-geographic-information-systems/
3. https://researchguides.library.wisc.edu/GIS
4. https://www.manage.gov.in/studymaterial/gis.pdf

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**VIII**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTE25	**Neuro Fuzzy and Genetic Programming**	3	1	0	4	50	50	100

Course Objective	The Main Objective of the course is to • Understand the fundamentals of Neural Networks. • Learn the various topologies and learning algorithms of ANN. • Understand the principles and fundamentals of Fuzzy Logic. • Understand the Fuzzy Rule based systems. • Understand the concepts and techniques of Genetic Algorithms.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Acquire the knowledge on constructing a neural network.	K2
	CO2: Identify the basic Neural net and learning algorithm to apply for a real time problem.	K3
	CO3: Acquire the ability to use Fuzzy operators, membership functions, Fuzzification and Defuzzification Techniques.	K2
	CO4: Gain Knowledge on applying the Fuzzy rules to different applications.	K3
	CO5: Apply the Genetic Algorithm to real-time applications.	K4
Pre-requisites	**Neuro Networks**	

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	1										-	1
CO2	1	1	2							2			1	2
CO3	2	1	2								3		2	-
CO4	1	1	1							2			3	2
CO5	2	2	1										1	3

Course Assessment Methods Direct

Direct
1.Continuous Assessment Test I, II & III   2.Assignment.   3.End-Semester examinations
Indirect
1.Course - end survey

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Content of the syllabus

Unit – I	INTRODUCTION TO ANN	Periods	9

Biological and Artificial Neuron, History of ANN-ANN architectures and Learning Algorithms-Activation Functions, Bias Threshold and other parameters-McCullosh Pitts model, Simulation of Logic Functions-Perceptron Network, Hebbian network-Linear Separability problem and solutions-ADALINE and MADALINE networks-Practice of Neural Network tool : Simple Logic functions, XOR problem.

Unit - II	FEEDFORWARD NETWORK, PATTERN ASSOCIATION,UNSUPERVISED LEARNING	Periods	9

Delta Rule, Derivation of GDR-Backpropagation Algorithm, Local Minima Problem-Radial Basis Function-Pattern Association, Auto Associative net-Hetero Associative nets-Bidirectional Associative Memory-Hopfield network-Competitive networks: Maxnet, SOM-Learning Vector Quantization, Adaptive Resonance Theory- Practice of Neural Network tool : Delta rule, Associative memory, LVQ.

Unit – III	FUNDAMENTALS OF FUZZY LOGIC	Periods	9

Crisp sets, Fuzzy sets, Fuzzy membership functions-Operations of Fuzzy sets, Fuzzy Relations, Operations-Fuzzy Extension Principle-Crisp Relations, Fuzzy relations, Properties, operations,-Crisp Logic, Propositional Logic, Predicate Logic Rules of Inference-Fuzzy Truth, Fuzzy Rules,-Fuzzy Reasoning-Practice of Fuzzy Logic tool: Fuzzy functions, operations.

Unit - IV	FUZZY RULE BASED AND INFERENCE SYSTEMS	Periods	9

Fuzzification of Input Variables, Application of Fuzzy operation-Evaluation of Fuzzy rules, Aggregation of output Fuzzy set-Rule based systems, Conventional programs vs Rule based systems-Fuzzy Propositions-Fuzzification and Defuzzification-Fuzzy Controller : Air conditioner control, Cruise Controller-Fuzzy Decision making-Practice of Fuzzy Logic tool : Fuzzy controller design and applications.

Unit – V	CONCEPTS AND TECHNIQUES OF GENETICALGORITHMS	Periods	9

History of Evolutionary Computing, Genetic Algorithms, basic concepts-GA Cycle , Fitness Function, Introduction to GA Operators-Selection Operators, Crossover, Mutation Operations-Schema Theorem, Example- Classification of Genetic Algorithm-Holland Classifier Systems-Genetic Programming, Data Representation- Application of Genetic Algorithm, Genetic Operators.

	Total Periods	**45**

Text Books

1.	Samir Roy, Udit Chakraborty, "Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms", Pearson Education, 2013.
2.	B.K.Tripathy, J.Anuradha," Soft Computing", Cengage Learning, 2015.
3.	S.N.Sivanadam, S.N.Deepa,"Principles of Soft Computing, Wiley India Edition, 2007.
4.	Laurene Fausett, "Fundamentals of Neural Networks, Architectures, Algorithms and Applications", Pearson Education, 2008.

References

1.	Timothy J. Ross , "Fuzzy Logic with Engineering Applications", McGraw-Hill InternationalEditions,1995.
2.	David E. Goldberg, "Genetic Algorithms-In Search, optimization and Machine Learning", Pearson Education.

E-Resources

1.	https://www.sciencedirect.com/science/article/pii/S0898122102002742
2.	http://www.soukalfi.edu.sk/01_NeuroFuzzyApproach.pdf
3.	https://www.ece.nus.edu.sg/stfpage/elepv/soft_comp.html

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**OE**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTOE1	**Fundamentals of Artificial Intelligence**	3	0	0	3	50	50	100

Course Objective	The main objective of this course is to: • Analyze the various characteristics of Intelligent agents • Organizing different search strategies in AI • Incorporating Knowledge in solving AI problems • Understand the Knowledge Representation using various methods • Constructing AI concepts in different ways of designing softwareagents	

Course Outcome	The students who complete this course successfully are expected to:	Knowledge level
	CO1: Know the basics of AI and learn the difference between optimal reasoning vs human likereasoning.	K1
	CO2: Understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities	K2
	CO3: Understand the logic systems in AI..	K2
	CO4: Analyze different knowledge representation techniques	K3
	CO5: Understand the basics of Experts systems and its applications	K3

Pre-requisites	-

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

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2. Assignment: Simulation using tool 3. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE**	Periods	**09**

Introduction, History, Intelligent Systems, Foundations of AI, Sub areas of AI, Applications.
Problem Solving - State-Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem.

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Unit – II	SEARCHING TECHNIQUES	Periods	09

Exhaustive Searches, DFS, Heuristic Search Techniques, A* algorithm, Constraint Satisfaction. Game Playing, Bounded Look-ahead Strategy, Alpha-Beta Pruning

Unit – III	LOGIC PROGRAMMING	Periods	09

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Semantic Tableau System in Propositional Logic, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Unit – IV	KNOWLEDGE REPRESENTATION	Periods	09

Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames. Probability Theory: Introduction, Probability Theory, Bayes Theorem, Certainty Factor Theory.

Unit – V	EXPERT SYSTEM AND APPLICATIONS	Periods	09

Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and Tools. Uncertainty Measure

	Total Periods	45

Text Books

1.	Saroj Kaushik. Artificial Intelligence. Cengage Learning. 2011
2	S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition,2015

References

1.	Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition 2009.
2.	Introduction to Artificial Intelligence by Eugene Charniak, Pearson
3.	Introduction to Artificial Intelligence and expert systems Dan W.Patterson. PHI.
4.	Artificial Intelligence by George Fluger rearson fifth edition
5.	NPTEL Course Notes

E-Resources

1.	https://www.youtube.com/watch?v=9IgscYw7BnY
2.	https://towardsdatascience.com/foundations-of-ai-b11d6ad7ce6f
3.	https://artint.info/2e/html/ArtInt2e.html

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Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**OE**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTOE2	**Fundamentals of Information Security**	3	0	0	3	50	50	100

Course Objective	The main objective of the course is to • Able to understand basics of information security • Acquire and knowledge of Communication security • Able to understand basics of Network security • Able to know about Scanning & Enumeration technology • Able to understand the Ethics in information security

Course Outcome	At the end of the course, the student should be able to	Knowledge level
	CO1: Understand about the basics of information security	K1,K3
	CO2: Apply the concepts of Cryptographic techniques to ensure the security	K2,K3
	CO3: Understand about the basics of Network security by knowing different protocols	K2,K3
	CO4: Identify the security threats and providing optimal solutions	K2,K3
	CO5: Understand about the Ethics in Security and learning different case studies	K1,K3

Pre-requisites	-

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

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III   2. Assignment: Simulation using tool   3. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**INTRODUCTION TO INFORMATION SECURITY**	Periods	**09**

Introduction to Information Security, Need for Security - Threats to security & Attacks, Computer System Security and AccessControls - System access and data access.

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Unit – II	COMMUNICATION SECURITY	Periods	09
Introduction to cryptography, cryptosystems, Encryption & Decryption Techniques - classical encryption techniques, communication channel used in cryptographic system, various types of ciphers, Cryptanalysis, Hash function and Data integrity, Security of Hashing function			
Unit – III	NETWORK SECURITY	Periods	09
Introduction to Network Security, Email Security, IP Security, Web Security, Kerberos, X.509 techniques			
Unit – IV	SCANNING & ENUMERATION TECHNOLOGY	Periods	09
Malicious softwares, Firewalls, Honey pots, Intrusion Detection system, Intrusion Prevention system			
Unit – V	ETHICS IN INFORMATION SECURITY	Periods	09
Implementing Information Security, Legal Ethical & Professional issues in Information Security –Case studies			
		Total Periods	45

Text Books	
1.	Matt Bishop, ―Computer Security: Art and Science‖, Addison WesleyProfessional, First Edition, 2003. ISBN: 0201440997
2	William Stallings, ‐Cryptography and Network Security‖, Pearson Education, Fourth Edition, 2006. ISBN: 8177587749

References	
1.	Michael E. Whitman, Herbert J. Mattord ,―Principles of Information Security‖ Cengage Learning, Fourth Edition, 2010, ISBN: 1111138214
2.	Charlie Kaufman, Radia Perlman, Mike Speciner, ―Network security: private communication in a public world‖, Second Edition, ISBN: 0130460192.
3.	Dieter Gollmann ,‖Computer Security ―, Third Edition, ISBN: 0470741155.

E-Resources	
1.	https://www.cybersecurityeducation.org/resources/
2.	https://securityscorecard.com/
3.	www.nptel.ac.in

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Programme	B.E.	Programme Code		107	Regulation	2019	
Department	Computer Science & Technology				Semester	OE	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTOE3	Fundamentals of Data Science	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to
	• Understand the key concepts of data science and applications • Learn the data collection and data science pre-processing • Recall the mathematical concepts for descriptive and statistical analysis of givendataset and to know R-programming basics • Apply model development and evaluation • Analyze the results on model evaluation and validation

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: .Implement and apply data science and applications	K3
	CO2: Apply the results on data collection and datapreprocessing	K3
	CO3: Implement graph concepts in statistical concepts	K2
	CO4: Analyze model development and evaluation.	K4
	CO5: Implement the model evaluation metrics in data science and be able to deliver the results in effective manner	K3

Pre-requisites	-

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	2	2	2	2	1						3	2	2
CO 2	3	3	3	3	3	1			1			2	3	3
CO 3	3	3	3	3	3	1			1			1	3	3
CO 4	3	3	3	3	3	1			1	1		1	3	3
CO 5	3	3	3	3	3	1			1	3		1	3	3

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2. Assignment. 3. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	INTRODUCTION	Periods	09

Introduction to Data Science -Bigdata– Evolution of Data Science –Datafication- Data Science Roles – Stagesin a Data Science Project – Applications of Data Science in various fields – Data Security Issues

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Unit – II	DATA COLLECTION AND DATA PRE-PROCESSING	Periods	09

Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

Unit – III	EXPLORATORY DATA ANALYTICS	Periods	09

Exploratory Data analytics-Statistical Inference-Descriptive Statistics – Mean, Standard Deviation, Skewnessand Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA..

Unit – IV	MODEL DEVELOPMENT	Periods	09

Choosing and evaluating models – Sampling for modeling and validation-mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-means algorithm – Linear andlogistic regression.

Unit – V	DELIVERING RESULTS	Periods	09

Documentation and deployment – producing effective presentations– Introduction to graphical analysis – plot() function – matrix plots – multiple plots in one window -- exporting graph- using graphics parameters.

		Total Periods	45

Text Books	
1.	Cathy O'Neil and Rachel Schutt , ―Doing Data Science‖, O'Reilly, 2015

References	
1.	Jojo Moolayil, ―Smarter Decisions : The Intersection of IoT and Data Science
2.	David Dietrich, Barry Heller, Beibei Yang, ―Data Science and Big data Analytics‖, EMC 2013
3.	Raj, Pethuru, ―Handbook of Research on Cloud Infrastructures for Big Data Analytics‖, IGI Global

E-Resources	
1.	https://www.leadquizzes.com/blog/data-collection-methods/
2.	https://www.lotame.com/what-are-the-methods-of-data-collection/
3.	https://www.sciencedirect.com/topics/social-sciences/data-collection-technique
4.	https://www.ibm.com/in-en/cloud/learn/exploratory-data-analysis
5.	https://www.nap.edu/read/11972/chapter/5

Signature of BoS Chairman

<table>
<tr><td colspan="2" rowspan="3">

</td><td colspan="4" align="center">VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous Institution, Affiliated to Anna University ,Chennai)
Elayampalayam, Tiruchengode – 637 205</td><td></td></tr>
</table>

Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**OE**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTOE4	**Fundamentals of Machine Learning**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Understand the basic concepts of machine learning. • Learn the concepts and implementation of the various supervised learning algorithms. • Learn the concepts and implementation of unsupervised learning and reinforcementlearning algorithms • Learn to evaluate machine learning algorithms using performance assessment techniques. • Gain an overall understanding of the fundamentals of machine learning and its applications in real world	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand the concepts of machine learning	K2
	CO2: Apply and implement the supervised learning algorithms in real time example	K2
	CO3: Apply and implement the unsupervised learning algorithms in real time example	K1
	CO4: Apply and implement the Reinforcement learning algorithms in real time example	K2
	CO5: Understand the applications of machine learning and implement the concepts in various domains	K3
Pre-requisites	-	

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

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III 2. Assignment. 3. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**INTRODUCTION**	Periods	**09**

Machine learning: Features of Machine Learning, Machine Learning Life Cycle, Applications of Machine Learning, Classifications of Machine Learning - Supervised Learning - Unsupervised Learning – reinforcement, Data Preprocessing in Machine learning Curve, Classification, Error and noise, Parametric vs. non-parametric models-Linear models

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Unit – II	**SUPERVISED LEARNING**	Periods	**09**
Regression Model - Linear Regression, Regression Trees, Non-Linear Regression, Bayesian Linear Regression, Polynomial Regression, Multiple Linear Regression **Classification -** Random Forest, Decision Trees, Logistic Regression, k-nearest neighbors, Support vector Machines, Naïve Bayes Classifier Algorithm.			
Unit – III	**UNSUPERVISED LEARNING**	Periods	**09**
Working of Unsupervised Learning, Types of Unsupervised Learning Algorithm: **C**lustering and Association, K-means clustering, Hierarchal clustering, Anomaly detection, Association Rule Learning, Confusion Matrix in Machine Learning.			
Unit – IV	**REINFORCEMENT LEARNING**	Periods	**09**
Introduction to Reinforcement Learning, Terms used in Reinforcement Learning, Key features of Reinforcement Learning, Elements of Reinforcement Learning – Policy, Reward Signal, Value Function, Model of the environment , Approaches to implementing Reinforcement Learning, Reinforcement Learning process, The Bellman Equation, Positive Reinforcement, Negative Reinforcement.			
Unit – V	**APPLICATIONS OF MACHINE LEARNING**	Periods	**09**
Applications of Machine Learning in : Medical diagnosis, Agriculture, Business prediction, Traffic Alerts, Recommendations Engines.			
		Total Periods	**45**

Text Books

1.	Andriy Burkov, ―Machine Learning Engineeringǁ, 2020, Amazon.
2	Kevin P. Murphy, ―Machine Learning: A Probabilistic Perspectiveǁ, MIT Press, 2012.
3.	Ethem Alpaydin, ―Introduction to Machine Learningǁ, Prentice Hall of India, 2005.

References

1.	Hastie, Tibshirani, Friedman, ‒The Elements of Statistical Learningǁ (2nd ed)., Springer, 2008
2.	Stephen Marsland, ―Machine Learning –An Algorithmic Perspectiveǁ, CRC Press, 2009
3.	Christopher Bishop, ―Pattern Recognition and Machine Learningǁ Springer, 2006

E-Resources

1.	https://nptel.ac.in/courses/106106139
2.	https://www.techtarget.com/searchenterpriseai/definition/machine-learning-ML
3.	https://www.geeksforgeeks.org/machine-learning

Signature of BoS Chairman

Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**OE**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTOE5	**Fundamentals of Data Visualization**	3	0	0	3	50	50	100

Course Objective	The Main Objective of the course is to • Understanding Information and Scientific visualization techniques. • Learn gives a clear picture of various abstraction mechanisms. • Understand the multidimensional visualization • Understand the textual method of abstraction • Understand the interactive system visualizations	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand the different Visualization Techniques	K1
	CO2: Able to apply the Interaction techniques in information visualizationfields	K2
	CO3: Understand and apply the various abstraction mechanisms	K2
	CO4: Create and apply the various interactive visual interfaces.	K4
	CO5: Apply the various concepts abstraction in time and interactive systems in visualization	K3
Pre-requisites	-	

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1	1							1	2	2
CO2	3	3	3	1	3							1	3	3
CO3	3	3	3	1	3							1	3	3
CO4	3	3	3	1	3							1	3	3
CO5	3	3	3	1	3							1	3	3

Course Assessment Methods Direct

Direct
1. Continuous Assessment Test I, II & III   2. Assignment.   3. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I	**FOUNDATIONS FOR DATA VISUALIZATION**	Periods	**09**

Introduction to Visualization, visualization stages, experimental Semiotics based on Perception , Gibson'sAffordance theory, Model of Perceptual Processing, Costs and Benefits of Visualization ,types of Data

Signature of BoS Chairman

Unit – II	**COMPUTER VISUALIZATION**	Periods	
Unit – III		Periods	
Unit – IV		Periods	
Unit – V		Periods	
		Total Periods	

Text Books	
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Signature of BoS Chairman

Programme	**B.E.**	Programme Code				**107**	Regulation	**2019**

Department	**Computer Science & Technology**		Semester	**OE**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total

Course Objective	•

Course Outcome		Knowledge level

Pre-requisites	-

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

Programme Outcomes (POs) — PSOs

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

Course Assessment Methods Direct

Direct
4. Continuous Assessment Test I, II & III
5. Assignment.
6. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I		Periods	

Signature of BoS Chairman

Unit – II		Periods	
Unit – III		Periods	
Unit – IV		Periods	
Unit – V		Periods	
		Total Periods	

Text Books

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Programme	B.E.	Programme Code		107	Regulation	2019
Department	Computer Science & Technology				Semester	OE

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total

Course Objective	•

Course Outcome		Knowledge level

Pre-requisites	-

CO / PO Mapping													CO/PSO Mapping	
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak														
Programme Outcomes (POs)													PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3											2	
CO2	3	3											2	
CO3	3	3											2	
CO4	3	3											2	
CO5	3	3											2	

Course Assessment Methods Direct

Direct
7. Continuous Assessment Test I, II & III
8. Assignment.
9. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I		Periods	

Signature of BoS Chairman

Unit – II		Periods	
Unit – III		Periods	
Unit – IV		Periods	
Unit – V		Periods	
		Total Periods	

Text Books

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Signature of BoS Chairman

Programme	B.E.	Programme Code		107	Regulation	2019
Department	Computer Science & Technology				Semester	OE

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total

Course Objective	•

Course Outcome		Knowledge level

Pre-requisites	-

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

	Programme Outcomes (POs)												CO/PSO Mapping PSOs	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3											2	
CO2	3	3											2	
CO3	3	3											2	
CO4	3	3											2	
CO5	3	3											2	

Course Assessment Methods Direct

Direct
10. Continuous Assessment Test I, II & III
11. Assignment.
12. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I		Periods	

Signature of BoS Chairman

Unit – II		Periods	
Unit – III		Periods	
Unit – IV		Periods	
Unit – V		Periods	
		Total Periods	

Text Books

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Signature of BoS Chairman

Programme	**B.E.**	Programme Code		**107**	Regulation	**2019**
Department	**Computer Science & Technology**				Semester	**OE**

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total

Course Objective	•

		Knowledge level
Course Outcome		

Pre-requisites	-

CO / PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak

CO/PSO Mapping

Programme Outcomes (POs)

PSOs

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

Course Assessment Methods Direct

Direct
13. Continuous Assessment Test I, II & III
14. Assignment.
15. End-Semester examinations
Indirect
1.Course - end survey

Content of the syllabus

Unit – I		Periods	

Signature of BoS Chairman

Unit – II		Periods	
Unit – III		Periods	
Unit – IV		Periods	
Unit – V		Periods	
		Total Periods	

Text Books

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