VIVEKANANDHA
COLLEGE OF ENGINEERING FOR WOMEN

(An Autonomous Institution Affiliated to Anna University-Chennai

Approved by AICTE – Accredited by NBA New Delhi)

Elayampalayam, Tiruchengode – 637 205, Namakkal District, Tamilnadu.

CURRICULUM

FOR

B.E. COMPUTER SCIENCE AND ENGINEERING

REGULATION 2019

(After 14th BoS)

Curriculum and Syllabus (1 to 8 Semester)

(Applicable to the students admitted from the academic year 2021 - 2022 onwards)

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B.E. COMPUTER SCIENCE AND ENGINEERING

REGULATIONS – 2019

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 empower women technocrats in the field of Computer Science and Engineering and prepare them for globalized high-tech society to orient them towards serving the dynamic needs of our nation.

DEPARTMENT MISSION

- To foster and strengthen the core competence of Computer Science by adopting innovative methods.
- To elevate the research, entrepreneurial and employability skills in women technocrats through quality education.
- To induce values of professional ethics and spirit of social commitment among the students.

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PROGRAMME EDUCTIONAL OBJECTIVES (PEOs):

PEO 1

Graduates will have successful careers with strong fundamental and technical skills in industry that meet the needs of Indian and multinational companies.

PEO 2

Graduates will become successful entrepreneurs with determination, development, self-reliance, leadership, ethic and moral values to exploit employability.

PEO 3

Graduates will pursue higher education and engage in lifelong learning to foster personal and organizational growth.

PROGRAMME OUTCOMES (POs):

Graduates of Computer Science and Engineering can able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct Investigations of Complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

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PO6: The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: : Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

PO9: Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-Long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Graduates of Computer Science and Engineering can able to

PSO1: Develop computational solution to complex real world problems with modern programming tools

PSO2: Demonstrate basic knowledge of computer applications and apply standard practices in developing feasible solutions for IT enabled services

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MAPPING OF PROGRAMME EDUCTIONAL OBJECTIVES (PEO) WITH PROGRAMME OUTCOMES (PO)

	PROGRAMME OUTCOMES											
PEO	**Po1**	**Po2**	**Po3**	**Po4**	**Po5**	**Po6**	**Po7**	**Po8**	**Po9**	**Po10**	**Po11**	**Po12**
1	√	√	√	√	√					√		√
2	√				√	√	√	√	√	√	√	√
3					√	√	√	√		√		√

Course Articulation Matrix (CO – PO & PSO Mapping)

Sub Code	Sub Name	Sem	Po1	Po2	Po3	Po4	Po 5	Po6	Po7	Po8	Po9	Po10	Po11	Po12	PSO1	PSO2
U19MA101	Calculus	1	3	3	3	3									2	1
U19EN101	English For Communication- I	1						2			3	3		3		2
U19PH105	Engineering Physics	1	3	2	1	2	1	2							1	2
U19CS101	Programming for Problem Solving	1	3	3	3	2	2							2	3	2
U19GE101	Engineering Graphics	1	3	3	2	3	3								2	2
U19PH106	Physics Laboratory	1														
U19CS102	Computer Practices Laboratory	1	3	3	3	1	3			2	2	3		2	3	2
U19MA202	Linear Algebra and Ordinary Differential	2	3	3	3	2	1								2	1
U19EN202	English For Communication-II	2						2			3	3		3	2	2
U19CH207	Engineering Chemistry	2	3	3	2	2	1	2	2				1	2	2	1

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U19EE201	Basic Electrical and Electronics Engineering	2	3	2		2								3	3	2
U19GE202	Basic Civil and Mechanical Engineering	2	3	3	2	1	2								2	1
U19CS203	Python Programming	2	3	3	1	1	2							2	3	2
U19TA201	தமிழர் மரபு / Heritage of Tamils	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U19CH208	Chemistry Laboratory	2	3	3	1	2	2	1	1					1	1	2
U19GE203	Engineering Practices Laboratory	2	3	2	3	3	2	1			2				2	1
U19MA304	Discrete Mathematics	3	3	3	2	2								2	2	2
U19CS304	Data Structures	3	3	3	3	2	2				1	2		2	2	3
U19CS305	Database Management Systems	3	3	3	3	2	2			1	1	1		1	2	2
U19CS306	Digital Logic Design	3	3	3	1	2	1					2		1	3	2
U19CS307	Object Oriented Programming	3	3	2	2	3	3				1	2			3	3
U19TA302	தமிழரும் தொழில்நுட்பமும் / *Tamils and Technology*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U19CS308	Data Structures Laboratory	3	3	3	3	2	2				2	2		2	3	3
U19CS309	Database Management Systems Laboratory	3	1	2	3	3	2			1	1	2		1	3	2
U19EN301	Communication Skills Laboratory	3						2			3	3		3		3
U19MA405	Statistics and Numerical Methods	4	3	3											2	
U19CS410	Computer Organization	4	3	2	1		1							1	3	2

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U19CS411	Design and Analysis of Algorithms	4	2	3	2	3									2	2
U19CS412	Open Source Software	4	3	3	3	2	2				2		2	2	2	3
U19CS413	Operating Systems	4	3	3	2	2								2	2	2
U19CS414	Web Technology	4	3	1	3	1	3							2	2	3
U19CS415	Operating Systems Laboratory	4	3	3	3	2								2	3	2
U19CS416	Web Technology Laboratory	4	3	3	3	2	1				2			2	3	2
U19CS519	Artificial Intelligence	5	2	2	1		1	1			1	1			2	2
U19CS520	Computer Networks	5	3	3	3	2	1					2		2	2	2
U19CS521	Microprocessor and Interfacing	5	2	2	1		1	1			1	1			2	2
U19CS522	Theory of Computation	5	3	3	3	1	1			2	1	2		3	3	2
U19CS523	Computer Networks Laboratory	5	3	2	3	2	3			2	3	3		2	2	2
U19CS524	Hardware Laboratory	5	3	3	3		1				2	2		1	2	2
U19CS625	Cloud Computing	6	2	2	3	2	2			3	2	3		2	2	3
U19CS626	Compiler Design	6	3	3	3	2	2		1		2	1		2	3	3
U19CS627	Internet of Things	6	3	2	3	1	1				1	1		2	3	3
U19IT620	Software Engineering	6	3	2	1	1									3	3
U19CS628	Compiler Design Laboratory	6	3	3	3		2					2		2	2	2

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U19CS629	Cloud and IoT Laboratory	6	3	3	3		2							2	2	2
U19CS730	Machine Learning	7	3	2	2	2	2						2	2	2	2
U19CS731	Mobile Computing	7	2	3	2	2	2							1	2	3
U19CS732	Machine Learning Laboratory	7	2	3	2	3	2						2	2	2	2
U19CS733	Internship Training and Summer Project	7	2	2	3	3	3			2	2	3	3	2	3	3
U19CSV11	Mobile Adhoc Networks		2	2	2		1								2	2
U19CSV12	Wireless Sensor Networks		3	3	3	2	1					2		2	2	2
U19CSV13	Parallel and Distributed Computing		3	3	3	2									3	2
U19CSV14	Green Computing		3	3	3										3	2
U19CSV15	Advanced Java & Framework		2	2	3	2	3				2				3	3
U19CSV21	Information Security		2	2	3		2	3							2	2
U19CSV22	Cyber Security		2	2	3		2	3							2	2
U19CSV23	Cryptography and Network Security		3	3	2	2	2							2	2	2
U19CSV24	Cyber Law and Ethical Hacking		2	2	3		2	3							2	2
U19CSV25	Social Network Analysis		2	2	2		1								2	2
U19CSV26	Semantic Web		2	3	2										2	1
U19CSV31	Data Warehousing and Data Mining		2	2	1	2	2							3	3	2
U19CSV32	Data Science and Analytics		3	3	3	2	1							2	3	2
U19CSV33	Fundamentals of Deep Learning		3	2	2	2	2						2	2	2	2

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U19CSV34	Advanced Database Systems		2	2	3	3	2							2	2	3
U19CSV35	Soft Computing		2	3	2	2	2							1	2	3
U19CSV36	Knowledge Management		2	3	2	2	2								2	2
U19CSV41	Embedded Systems		2	2	2		1								2	2
U19CSV42	Smart Sensor Technologies		2	3	2	2						3			2	2
U19CSV43	Security in Computing		2	2	2	2	2	2							2	2
U19CSV44	Industry 4.0		2	2	3	2	2	2		1	2		1	2	2	2
U19CSV51	Design Thinking		2	3	2	2	2								2	2
U19CSV52	Agile Software Development		1				2				2	1	2	2	1	2
U19CSV53	Software Project Management		3	3	3	2					2		2		2	3
U19CSV54	Software Testing and Quality Assurance		3	3	1						2				2	3
U19CSV55	Total Quality Management		3	3	3	2					2		2		2	3
U19CSV56	E-Commerce		3	3	3	2								2	3	2
U19CSV57	Professional Ethics in Engineering		2	1	2			2	1	3					1	2
U19CSOE1	Introduction to IoT		2	2	3	3		2						2	2	3
U19CSOE2	Ethical Hacking		2	3		2	2			2					2	3
U19CSOE3	Smart Sensor Technologies		2	2	3		2	2							2	2
U19CSOE4	Web Designing		2	2	2	2	3								3	2
U19CSOE5	Data Analytics		3	3	3	3	2							2	2	3

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U19CSOE6	Enterprise Java		3	3	3	2	2							1	2	3
U19CSOE7	Open Source Software		2	1	3	2	1					1		2	2	3
U19CSOE8	Python Programming		3	3	1	1	2							2	3	2
U19CS834	Project Work	8	2	3	3	2	2	2	3	3	2	3	3	3	**2**	**3**

HUMANITIES AND SOCIAL SCIENCES COURSES (HSC)

S.NO	COURSE CODE	COURSE NAME	CATEGORY	CONTACT PEROIDS	L	T	P	C
1.	U19EN101	English For Communication- I	HSC	3	3	0	0	3
2.	U19EN202	English For Communication- II	HSC	3	3	0	0	3
3.	U19TA201	***தமிழர் மரபு*** / Heritage of Tamils	HSC	2	2	0	0	1
4.	U19TA302	தமிழரும் தொழில்நுட்பமும் / TAMILS AND TECHNOLOGY	HSC	2	2	0	0	1

BASIC SCIENCE COURSES (BSC)

S.NO	COURSE CODE	COURSE NAME	CATEGORY	CONTACT PEROIDS	L	T	P	C
1.	U19MA101	Calculus	BSC	4	3	1	0	4
2.	U19PH105	Engineering Physics	BSC	3	3	0	0	3
3.	U19PH106	Physics Laboratory	BSC	4	0	0	4	2
4.	U19CH207	Engineering Chemistry	BSC	3	3	0	0	3
5.	U19MA202	Linear Algebra and Ordinary Differential Equations	BSC	4	3	1	0	4
6.	U19CH208	Chemistry Laboratory	BSC	4	0	0	4	2
7.	U19MA304	Discrete Mathematics	BSC	4	3	1	0	4
8.	U19MA405	Statistics and Numerical Methods	BSC	4	3	1	0	4

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ENGINEERING SCIENCE COURSES (ESC)

S.NO	COURSE CODE	COURSE NAME	CATEGORY	CONTACT PEROIDS	L	T	P	C
1.	U19CS101	Programming for Problem Solving	ESC	3	3	0	0	3
2.	U19GE101	Engineering Graphics	ESC	3	3	2	0	3
3.	U19CS102	Computer Practices Laboratory	ESC	4	0	0	4	2
4.	U19EE201	Basic Electrical and Electronics Engineering	ESC	3	3	0	0	3
5.	U19GE202	Basic Civil and Mechanical Engineering	ESC	3	3	0	0	3
6.	U19CS203	Python Programming	ESC	3	2	0	2	3
7.	U19GE203	Engineering Practices Laboratory	ESC	4	0	0	4	2
8.	U19CS306	Digital Logic Design	ESC	3	3	0	0	3
9.	U19CS410	Computer Organization	ESC	3	3	0	0	3
10.	U19CS521	Microprocessor and Interfacing	ESC	3	3	0	0	3
11.	U19CS524	Hardware Laboratory	ESC	4	0	0	4	2

PROFESSIONAL CORE COURSES (PCC)

S.NO	COURSE CODE	COURSE NAME	CATEGORY	CONTACT PEROIDS	L	T	P	C
1.	U19CS304	Data Structures	PCC	3	3	0	0	3
2.	U19CS305	Database Management Systems	PCC	3	3	0	0	3
3.	U19CS307	Object Oriented Programming	PCC	4	2	0	2	3
4.	U19CS308	Data Structures Laboratory	PCC	4	0	0	4	2
5.	U19CS309	Database Management Systems Laboratory	PCC	4	0	0	4	2
6.	U19CS411	Design and Analysis of Algorithms	PCC	3	3	0	0	3
7.	U19CS412	Open Source Software	PCC	3	2	0	2	3

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8.	U19CS413	Operating Systems	PCC	3	3	0	0	3
9.	U19CS414	Web Technology	PCC	3	3	0	0	3
10.	U19CS415	Operating Systems Laboratory	PCC	4	0	0	4	2
11.	U19CS416	Web Technology Laboratory	PCC	4	0	0	4	2
12.	U19CS519	Artificial Intelligence	PCC	3	3	0	0	3
13.	U19CS520	Computer Networks	PCC	3	3	0	0	3
14.	U19CS522	Theory of Computation	PCC	3	3	0	0	3
15.	U19CS523	Computer Networks Laboratory	PCC	4	0	0	4	2
16.	U19CS625	Cloud Computing	PCC	3	3	0	0	3
17.	U19CS626	Compiler Design	PCC	3	3	0	0	3
18.	U19CS627	Internet of Things	PCC	3	3	0	0	3
19.	U19IT620	Software Engineering	PCC	3	3	0	0	3
20.	U19CS628	Compiler Design Laboratory	PCC	4	0	0	4	1
21.	U19CS629	Cloud and IoT Laboratory	PCC	4	0	0	4	2
22.	U19CS730	Machine Learning	PCC	3	3	0	0	3
23.	U19CS731	Mobile Computing	PCC	3	3	0	0	3
24.	U19CS732	Machine Learning Laboratory	PCC	4	0	0	4	2

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.NO	COURSE CODE	COURSE NAME	CATEGORY	CONTACT PEROIDS	L	T	P	C
1.	U19EN301	Communication Skills Laboratory	EEC	2	0	0	2	1
2.	U19CS733	Internship Training and Summer Project	EEC	8	0	0	8	4
3.	U19CS834	Project Work	EEC	16	0	0	16	8

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Credit Distribution

(Applicable to the students admitted in the academic year 2021- 2022)

S.No	Category	Credit Per Semester								Total Credits
		1	2	3	4	5	6	7	8	
1	HSC	3	3							6
2	BSC	9	9	4	4					26
3	ESC	8	11	3	3	5				30
4	PCC			13	16	11	15	8		63
5	PEC					3	3	6	6	18
6	EEC			1				4	8	13
7	OEC					3	3	3		9
Total		20	23	21	23	22	21	21	14	165

Credit Distribution

(Applicable to the students admitted in the academic year 2022- 2023)

S.No	Category	Credit Per Semester								Total Credits
		1	2	3	4	5	6	7	8	
1	HSC	3	4	1						8
2	BSC	9	9	4	4					26
3	ESC	8	11	3	3	5				30
4	PCC			13	16	11	15	8		63
5	PEC					3	3	6	6	18
6	EEC			1				4	8	13
7	OEC					3	3	3		9
Total		20	24	22	23	22	21	21	14	167

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E. / B.Tech.**	Programme Code	101	Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**I**

CURRICULUM

(Applicable to the students admitted from the academic year 2021 - 2022 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	40	60	100
U19PH105	Engineering Physics $^{\$}$	BSC	3	0	0	3	40	60	100
U19CS101	Programming for Problem Solving*	ESC	3	0	0	3	40	60	100
U19GE101	Engineering Graphics*	ESC	2	0	3	3	40	60	100
PRACTICAL									
U19PH106	Physics Laboratory$^{\$}$	BSC	0	0	4	2	60	40	100
U19CS102	Computer Practices Laboratory*	ESC	0	0	4	2	60	40	100
MANDATORY COURSES									
	Mandatory Course - I	MC	3	0	0	0	100	-	100
					Total	**20**	**420**	**380**	**800**

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

*Common for all branches

$ Common for CSE,CST,IT,BT

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E. / B.Tech.**	Programme Code		Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**		Semester		**II**

CURRICULUM

(Applicable to the students admitted from the academic year 2021 - 2022 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 $^{\alpha}$	BSC	3	1	0	4	40	60	100
U19EN202	English For Communication-II $^{\alpha}$	HSC	3	0	0	3	40	60	100
U19CH207	Engineering Chemistry*	BSC	3	0	0	3	40	60	100
U19EE201	Basic Electrical and Electronics Engineering$^{\$}$	ESC	3	0	0	3	40	60	100
U19GE202	Basic Civil and Mechanical Engineering$^{\alpha}$	ESC	3	0	0	3	40	60	100
U19CS203	Python Programming $^{\&}$	ESC	2	0	2	3	40	60	100
U19TA201	தமிழர் மரபு / Heritage of Tamils $^{\%}$	MC	2	0	0	1	40	60	100
PRACTICAL									
U19CH208	Chemistry Laboratory*	BSC	0	0	4	2	60	40	100
U19GE203	Engineering Practices Laboratory $^{\alpha}$	ESC	0	0	4	2	60	40	100
MANDATORY COURSES									
	Mandatory course – II	MC	3	0	0	0	100	-	100
					Total	**24**	**500**	**500**	**1000**

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

% Applicable to the students admitted from the academic year 2022- 2023 onwards

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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	101	Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**III**

CURRICULUM

(Applicable to the students admitted from the academic year 2021 - 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19MA304	Discrete Mathematics[#]	BSC	3	1	0	4	40	60	100
U19CS304	Data Structures *	PCC	3	0	0	3	40	60	100
U19CS305	Database Management Systems	PCC	3	0	0	3	40	60	100
U19CS306	Digital Logic Design	ESC	3	0	0	3	40	60	100
U19CS307	Object Oriented Programming[&]	PCC	2	0	2	3	40	60	100
U19TA302	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology[%]	HSC	2	0	0	1	40	60	100
PRACTICAL									
U19CS308	Data Structures Laboratory[$]	PCC	0	0	4	2	60	40	100
U19CS309	Database Management Systems Laboratory	PCC	0	0	4	2	60	40	100
U19EN301	Communication Skills Laboratory	EEC	0	0	2	1	100	-	100
MANDATORY COURSES									
	Mandatory Course – III	MC	2	0	0	0	100	-	100
					Total	**22**	**560**	**440**	**1000**

CA - Continuous Assessment, ESE - End Semester Examination, ESC- Engineering Science Courses, PCC - Professional Core course

* Common to CSE, ECE and EEE, BME (Semester IV)

Common to CSE, IT and CST

$ Common to CSE and ECE & BME (Semester IV)

& Common for CSE and CST

% Applicable to the students admitted from the academic year 2022- 2023 onwards

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

CURRICULUM

(Applicable to the students admitted from the academic year 2021 - 2022 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	3	1	0	4	40	60	100
U19CS410	Computer Organization	ESC	3	0	0	3	40	60	100
U19CS411	Design and Analysis of Algorithms	PCC	3	0	0	3	40	60	100
U19CS412	Open Source Software	PCC	2	0	2	3	40	60	100
U19CS413	Operating Systems	PCC	3	0	0	3	40	60	100
U19CS414	Web Technology	PCC	3	0	0	3	40	60	100
PRACTICAL									
U19CS415	Operating Systems Laboratory	PCC	0	0	4	2	60	40	100
U19CS416	Web Technology Laboratory	PCC	0	0	4	2	60	40	100
MANDATORY COURSES									
	Mandatory Course – IV	MC	2	0	0	0	100	-	100
					Total	**23**	**460**	**440**	**900**

CA - Continuous Assessment, ESE - End Semester Examination, ESC- Engineering Science Courses

U19CS417 – Data Structures (EEE) & BME

U19CS418 – Data Structures Laboratory - BME

Common to CSE, IT and CST

Signature of BoS Chairman, CSE

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E.**	Programme Code	101	Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**V**

CURRICULUM

(Applicable to the students admitted from the academic year 2021 - 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CS519	Artificial Intelligence	PCC	3	0	0	3	40	60	100
U19CS520	Computer Networks	PCC	3	0	0	3	40	60	100
U19CS521	Microprocessor and Interfacing	ESC	3	0	0	3	40	60	100
U19CS522	Theory of Computation	PCC	3	0	0	3	40	60	100
	Professional Elective – I	PEC	3	0	0	3	40	60	100
	Open Elective -1	OEC	3	0	0	3	40	60	100
PRACTICAL									
U19CS523	Computer Networks Laboratory	PCC	0	0	4	2	60	40	100
U19CS524	Hardware Laboratory	ESC	0	0	4	2	60	40	100
MANDATORY COURSES									
	Mandatory Course – V	MC	2	0	0	0	100	-	100
					Total	**22**	**460**	**440**	**900**

CA - Continuous Assessment, ESE - End Semester Examination, PEC- Professional Elective courses, OEC- Open Elective courses, ESC- Engineering Science Courses

Signature of BoS Chairman, CSE

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205								
Programme	**B.E.**	Programme Code	101	Regulation	**2019**				
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**VI**				
CURRICULUM (Applicable to the students admitted from the academic year 2021 - 2022 onwards)									
Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CS625	Cloud Computing	PCC	3	0	0	3	40	60	100
U19CS626	Compiler Design*	PCC	3	0	0	3	40	60	100
U19CS627	Internet of Things	PCC	3	0	0	3	40	60	100
U19IT620	Software Engineering*	PCC	3	0	0	3	40	60	100
	Professional Elective – II	PEC	3	0	0	3	40	60	100
	Open Elective –II	OEC	3	0	0	3	40	60	100
PRACTICAL									
U19CS628	Compiler Design Laboratory	PCC	0	0	4	1	60	40	100
U19CS629	Cloud and IoT Laboratory	PCC	0	0	4	2	60	40	100
MANDATORY COURSES									
	Mandatory Course – VI	MC	2	0	0	0	100	-	100
					Total	**21**	**460**	**440**	**900**

CA- Continuous Assessment, ESE - End Semester Examination, PEC- Professional Elective courses, OEC- Open Elective courses

* Common to CSE & IT

Signature of BoS Chairman, CSE

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E.**	Programme Code	101	Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**VII**

CURRICULUM

(Applicable to the students admitted from the academic year 2021 - 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CS730	Machine Learning	PCC	3	0	0	3	40	60	100
U19CS731	Mobile Computing	PCC	3	0	0	3	40	60	100
	Professional Elective – III*	PEC	3	0	0	3	40	60	100
	Professional Elective – IV	PEC	3	0	0	3	40	60	100
	Open Elective –III	OEC	3	0	0	3	40	60	100
PRACTICAL									
U19CS732	Machine Learning Laboratory	PCC	0	0	4	2	60	40	100
U19CS733	Internship Training and Summer Project	EEC	0	0	8	4	100	-	100
					Total	**21**	**360**	**340**	**700**

CA - Continuous Assessment, ESE - End Semester Examination, EEC- Employability Enhancement Courses, PEC- Professional Elective courses, OEC- Open Elective courses

* Professional Readiness for Innovation, Employability and Entrepreneurship –Mandatory Course may offer by Anna University

Signature of BoS Chairman, CSE

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E.**	Programme Code	101	Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**VIII**

CURRICULUM

(Applicable to the students admitted from the academic year 2021 - 2022 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	40	60	100
	Professional Elective – VI	PEC	3	0	0	3	40	60	100
PRACTICAL									
U19CS834	Project Work	EEC	0	0	16	8	60	40	100
					Total	**14**	**140**	**160**	**300**

CA - Continuous Assessment, ESE - End Semester Examination, EEC- Employability Enhancement Courses, PEC- Professional Elective courses

Cumulative Credits = 165 (Applicable to the students admitted in the academic year 2021- 2022)

Cumulative Credits = 167 (Applicable to the students admitted in the academic year 2022- 2023)

Signature of BoS Chairman, CSE

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I NETWORKS	Vertical II CYBER SECURITY	Vertical III ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	Vertical IV INTERNET OF THINGS & CLOUD COMPUTING	Vertical V PROBLEM SOLVING & SOFTWARE DEVELOPMENT
Mobile Adhoc Networks	Information Security	Data Warehousing and Data Mining	Embedded Systems	Design Thinking
Wireless Sensor Networks	Cyber Security	Data Science and Analytics	Smart Sensor Technologies	Agile Software Development
Parallel and Distributed Computing	Cryptography and Network Security	Fundamentals of Deep Learning	Security in Computing	Software Project Management
Green Computing	Cyber Law and Ethical Hacking	Advanced Database Systems	Industry 4.0	Software Testing and Quality Assurance
Advanced Java & Framework	Social Network Analysis	Soft Computing	Software Defined Networks[$]	Total Quality Management
Network Programming	Semantic Web	Knowledge Management	Information Storage and Management[$]	E-Commerce
Service Oriented Architecture	Cyber Forensics	Business Intelligence & Its Applications	Fundamentals of Virtualization[#]	Professional Ethics in Engineering
Socket Programming	Biometrics Systems	Digital Image Processing	Big Data Tools and Techniques[#]	Building Enterprise Applications

Registration of Professional Elective Courses from Verticals: Professional Elective Courses are listed in groups called verticals that represent a particular area of specialisation / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V to VIII. The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E/B.Tech (Honours) or Minor degree also.

Signature of BoS Chairman, CSE

VERTICAL I - NETWORKS

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E. / B.Tech.**	Programme Code	101	Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**-**

CURRICULUM

(Applicable to the students admitted from the academic year 2021- 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CSV11	Mobile Adhoc Networks[#]	PEC	3	0	0	3	40	60	100
U19CSV12	Wireless Sensor Networks	PEC	3	0	0	3	40	60	100
U19CSV13	Parallel and Distributed Computing	PEC	3	0	0	3	40	60	100
U19CSV14	Green Computing[#]	PEC	3	0	0	3	40	60	100
U19CSV15	Advanced Java & Framework	PEC	3	0	0	3	40	60	100
U19ITV14	Network Programming[$]	PEC	3	0	0	3	40	60	100
U19ITV15	Service Oriented Architecture[$]	PEC	3	0	0	3	40	60	100
U19CTV12	Socket Programming[#]	PEC	3	0	0	3	40	60	100

common to CSE,IT and CST

$ common to CSE and IT

Signature of BoS Chairman, CSE

VERTICAL II - CYBER SECURITY

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E. / B.Tech.**	Programme Code	101	Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	-

CURRICULUM

(Applicable to the students admitted from the academic year 2021- 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CSV21	Information Security	PEC	3	0	0	3	40	60	100
U19CSV22	Cyber Security	PEC	3	0	0	3	40	60	100
U19CSV23	Cryptography and Network Security[$]	PEC	3	0	0	3	40	60	100
U19CSV24	Cyber Law and Ethical Hacking[#]	PEC	3	0	0	3	40	60	100
U19CSV25	Social Network Analysis[#]	PEC	3	0	0	3	40	60	100
U19CSV26	Semantic Web[#]	PEC	3	0	0	3	40	60	100
U19ITV23	Cyber Forensics [#]	PEC	3	0	0	3	40	60	100
U19CTV23	Biometrics Systems[#]	PEC	3	0	0	3	40	60	100

$ common to CSE and IT

common to CSE,IT and CST

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VERTICAL III - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E. / B.Tech.**	Programme Code	101	Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**-**

CURRICULUM

(Applicable to the students admitted from the academic year 2021- 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CSV31	Data Warehousing and Data Mining	PEC	3	0	0	3	40	60	100
U19CSV32	Data Science and Analytics	PEC	3	0	0	3	40	60	100
U19CSV33	Fundamentals of Deep Learning	PEC	3	0	0	3	40	60	100
U19CSV34	Advanced Database Systems[$]	PEC	3	0	0	3	40	60	100
U19CSV35	Soft Computing	PEC	3	0	0	3	40	60	100
U19CSV36	Knowledge Management[$]	PEC	3	0	0	3	40	60	100
U19ITV34	Business Intelligence and its Applications[$]	PEC	3	0	0	3	40	60	100
U19ITV35	Digital Image Processing[$]	PEC	3	0	0	3	40	60	100

$ common to CSE and IT

Signature of BoS Chairman, CSE

VERTICAL IV - INTERNET OF THINGS & CLOUD COMPUTING

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E. / B.Tech.**	Programme Code	101	Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	-

CURRICULUM

(Applicable to the students admitted from the academic year 2021- 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CSV41	Embedded Systems[#]	PEC	3	0	0	3	40	60	100
U19CSV42	Smart Sensor Technologies[#]	PEC	3	0	0	3	40	60	100
U19CSV43	Security in Computing[#]	PEC	3	0	0	3	40	60	100
U19CSV44	Industry 4.0	PEC	3	0	0	3	40	60	100
U19ITV41	Software Defined Networks[$]	PEC	3	0	0	3	40	60	100
U19ITV42	Information Storage and Management[$]	PEC	3	0	0	3	40	60	100
U19CTV41	Fundamentals of Virtualization[#]	PEC	3	0	0	3	40	60	100
U19CTV43	Big Data Tools and Techniques[#]	PEC	3	0	0	3	40	60	100

common to CSE,IT and CST

$ common to CSE and IT

Signature of BoS Chairman, CSE

VERTICAL V - PROBLEM SOLVING & SOFTWARE DEVELOPMENT

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E. / B.Tech.**	Programme Code	101	Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**-**

CURRICULUM

(Applicable to the students admitted from the academic year 2021- 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CSV51	Design Thinking*	PEC	3	0	0	3	40	60	100
U19CSV52	Agile Software Development*	PEC	3	0	0	3	40	60	100
U19CSV53	Software Project Management	PEC	3	0	0	3	40	60	100
U19CSV54	Software Testing and Quality Assurance	PEC	3	0	0	3	40	60	100
U19CSV55	Total Quality Management*	PEC	3	0	0	3	40	60	100
U19CSV56	E-Commerce	PEC	3	0	0	3	40	60	100
U19CSV57	Professional Ethics in Engineering	PEC	3	0	0	3	40	60	100
U19ITV56	Building Enterprise Applications	PEC	3	0	0	3	40	60	100

*Common to CSE & CST

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LIST OF MANDATORY COURSES

Course code	Course name	Category	L	T	P	C	CA	ESE	Total
U19MCFY1	Environmental Science and Engineering	MC	3	0	0	0	100	-	100
U19MCFY2	Indian Constitution and Universal Human Values	MC	3	0	0	0	100	-	100
U19MCSY4	Verbal Ability	MC	2	0	0	0	100	-	100
U19MCSY3	Numerical Ability	MC	2	0	0	0	100	-	100
U19MCTY5	Logical Reasoning	MC	2	0	0	0	100	-	100
U19MCTY6	Personality Development	MC	2	0	0	0	100	-	100

LIST OF ONE CREDIT COURSES

COURSE CODE	COURSE NAME	CONTACT PEROIDS
U19CSOC1	Data Mining Laboratory	30
U19CSOC2	Python Programming Laboratory	30
U19CSOC3	PHP Programming Laboratory	30
U19CSOC4	Entrepreneurship Development	30
U19CSOC5	Cloud Laboratory	30
U19CSOC6	Big Data Laboratory	30
U19CSOC7	AI Specific Skills on Data Science	30
U19CSOC8	AI Specific Skills on Natural Language Processing	30
U19CSOC9	AI Specific Skills on Computer Vision	30

LIST OF ADDITIONAL CREDIT COURSES

1. NPTEL, Coursera Courses
2. AICTE IDEA Lab Courses

Signature of BoS Chairman, CSE

LIST OF OPEN ELECTIVE COURSE (OEC) OFFERED TO OTHER DEPARTMENT

Course code	Course name	Category	L	T	P	C	CA	ESE	Total
U19CSOE1	Introduction to IoT	OEC	3	0	0	3	40	60	100
U19CSOE2	Ethical Hacking	OEC	3	0	0	3	40	60	100
U19CSOE3	Smart Sensor Technologies	OEC	3	0	0	3	40	60	100
U19CSOE4	Web Designing	OEC	3	0	0	3	40	60	100
U19CSOE5	Data Analytics	OEC	3	0	0	3	40	60	100
U19CSOE6	Enterprise Java	OEC	3	0	0	3	40	60	100
U19CSOE7	Open Source Software	OEC	3	0	0	3	40	60	100
U19CSOE8	Python Programming	OEC	3	0	0	3	40	60	100

LIST OF OPEN ELECTIVE COURSE – EEE

Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19EEOE1	Electron Devices	3	0	0	3	40	60	100
U19EEOE2	Electrical Safety	3	0	0	3	40	60	100
U19EEOE3	Energy Auditing	3	0	0	3	40	60	100
U19EEOE4	Energy Storage Technologies	3	0	0	3	40	60	100
U19EEOE5	Biomass Energy Systems	3	0	0	3	40	60	100
U19EEOE6	Energy Efficient Lighting System	3	0	0	3	40	60	100
U19EEOE7	Soft Computing techniques	3	0	0	3	40	60	100
U19EEOE8	Electrical Systems in Industries	3	0	0	3	40	60	100

Signature of BoS Chairman, CSE

LIST OF OPEN ELECTIVE COURSE - ECE

Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19ECOE1	Speech Processing	3	0	0	3	40	60	100
U19ECOE2	Biomedical Instrumentation	3	0	0	3	40	60	100
U19ECOE3	Automotive Electronics	3	0	0	3	40	60	100
U19ECOE4	Satellite Communication	3	0	0	3	40	60	100
U19ECOE5	VLSI Design and Its Applications	3	0	0	3	40	60	100
U19ECOE6	Digital Image Processing	3	0	0	3	40	60	100
U19ECOE7	Basics of Communication Systems	3	0	0	3	40	60	100
U19ECOE8	Wireless Sensor Networks	3	0	0	3	40	60	100
U19ECOE9	PCB Design and Fabrication	3	0	0	3	40	60	100

LIST OF OPEN ELECTIVE COURSE - IT

Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19ITOE1	Mobile application development	3	0	0	3	40	60	100
U19ITOE2	Robotics	3	0	0	3	40	60	100
U19ITOE3	Basics of Cloud Computing	3	0	0	3	40	60	100
U19ITOE4	Introduction to Data Structures	3	0	0	3	40	60	100
U19ITOE7	Business intelligence and its Applications	3	0	0	3	40	60	100
U19ITOE8	Internet of Things	3	0	0	3	40	60	100
U19ITOE9	Introduction to Java Programming	3	0	0	3	40	60	100
U19ITOE10	Introduction to R Programming	3	0	0	3	40	60	100
U19ITOE11	Ethical Hacking	3	0	0	3	40	60	100
U19ITOE12	Cyber Forensics	3	0	0	3	40	60	100
U19ITOE13	E Learning Techniques	3	0	0	3	40	60	100

Signature of BoS Chairman, CSE

LIST OF OPEN ELECTIVE COURSE – BT

Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19BTOE1	Biology for Engineers	3	0	0	3	40	60	100
U19BTOE2	Biofuels and Bioenergy	3	0	0	3	40	60	100
U19BTOE3	Bio-Business	3	0	0	3	40	60	100
U19BTOE4	Basics of Bioinformatics	3	0	0	3	40	60	100
U19BTOE5	Human Health and Nutritional Disorders	3	0	0	3	40	60	100
U19BTOE6	Waste Management	3	0	0	3	40	60	100
U19BTOE7	Food Processing and Preservation Technology	3	0	0	3	40	60	100
U19BTOE8	Forensic Technology	3	0	0	3	40	60	100
U19BTOE9	Biodiversity and Bioproprespecting	3	0	0	3	40	60	100

LIST OF OPEN ELECTIVE COURSE – BME

Course Code	Course Name	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19BMOE1	Biotelemetry	3	0	0	3	40	60	100
U19BMOE2	Virtual Instrumentation	3	0	0	3	40	60	100
U19BMOE3	Hospital Waste Management	3	0	0	3	40	60	100
U19BMOE4	Medical Robotics	3	0	0	3	40	60	100
U19BMOE5	Healthcare Management Systems	3	0	0	3	40	60	100
U19BMOE6	Biometric Systems And Their Applications	3	0	0	3	40	60	100
U19BMOE7	Basics of Biomedical Instrumentation	3	0	0	3	40	60	100
U19BMOE8	Medical Informatics	3	0	0	3	40	60	100
U19BMOE9	ICU and Operation Theatre Equipments	3	0	0	3	40	60	100

LIST OF OPEN ELECTIVE COURSE – CST

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	40	60	100
U19CTOE2	Fundamentals of Information Security	3	0	0	3	40	60	100
U19CTOE3	Fundamentals of Data Science	3	0	0	3	40	60	100
U19CTOE4	Fundamentals of Machine Learning	3	0	0	3	40	60	100
U19CTOE5	Fundamentals of Data Visualization	3	0	0	3	40	60	100
U19CTOE6	Computer Forensics	3	0	0	3	40	60	100

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MINOR DEGREE VERTICALS OFFERED TO OTHER DEPARTMENT

VERTICAL II - CYBER SECURITY

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E. / B.Tech.**	Programme Code	101	Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**-**

CURRICULUM

(Applicable to the students admitted from the academic year 2021- 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CSV21	Information Security	PEC	3	0	0	3	40	60	100
U19CSV22	Cyber Security	PEC	3	0	0	3	40	60	100
U19CSV23	Cryptography and Network Security	PEC	3	0	0	3	40	60	100
U19CSV24	Cyber Law and Ethical Hacking	PEC	3	0	0	3	40	60	100
U19CSV25	Social Network Analysis	PEC	3	0	0	3	40	60	100
U19CSV26	Semantic Web	PEC	3	0	0	3	40	60	100
U19ITV23	Cyber Forensics	PEC	3	0	0	3	40	60	100
U19CTV23	Biometrics Systems	PEC	3	0	0	3	40	60	100

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MINOR DEGREE VERTICALS – EEE

Instrumentation & Control

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E. / B.Tech.**	Programme Code	102	Regulation	**2019**
Department	**Electrical & Electronics Engineering**			Semester	**-**

CURRICULUM

(Applicable to the students admitted from the academic year 2021- 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19EEV31	Communication Engineering	PEC	3	0	0	3	40	60	100
U19EEV32	Computer Architecture	PEC	3	0	0	3	40	60	100
U19EEV33	Intelligence Techniques	PEC	3	0	0	3	40	60	100
U19EEV34	Bio Medical Instrumentation	PEC	3	0	0	3	40	60	100
U19EEV35	Robotics and Control	PEC	3	0	0	3	40	60	100
U19EEV36	Modern Control Theory	PEC	3	0	0	3	40	60	100
U19EEV37	PLC & SCADA	PEC	3	0	0	3	40	60	100
U19EEV38	Intellectual Property Rights	PEC	3	0	0	3	40	60	100

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MINOR DEGREE VERTICALS – ECE

VERTICAL VII - ELECTRONICS ENGINEERING AND ADMINISTRATION SYSTEM

	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 2021- 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19ECV71	Pattern Recognition	PEC	3	0	0	3	40	60	100
U19ECV72	Medical Electronics	PEC	3	0	0	3	40	60	100
U19ECV73	Remote Sensing	PEC	3	0	0	3	40	60	100
U19ECV74	Automotive Electronics	PEC	3	0	0	3	40	60	100
U19ECV75	Industry 4.0	PEC	3	0	0	3	40	60	100
U19ECV76	Digital Video Processing	PEC	3	0	0	3	40	60	100
U19ECV77	Principles of Public Administration	PEC	3	0	0	3	40	60	100
U19ECV78	Administrative Theories	PEC	3	0	0	3	40	60	100
U19ECV79	Indian Administrative System	PEC	3	0	0	3	40	60	100

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MINOR DEGREE VERTICALS – IT

VERTICAL IV - INTERNET OF THINGS & CLOUD COMPUTING

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E. / B.Tech.**	Programme Code	104	Regulation	**2019**
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**-**

CURRICULUM

(Applicable to the students admitted from the academic year 2021- 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CSV41	Embedded Systems	PEC	3	0	0	3	40	60	100
U19CSV42	Smart Sensor Technologies	PEC	3	0	0	3	40	60	100
U19CSV43	Security in Computing	PEC	3	0	0	3	40	60	100
U19ITV41	Software Defined Networks	PEC	3	0	0	3	40	60	100
U19CTV41	Fundamentals of Virtualization	PEC	3	0	0	3	40	60	100
U19ITV42	Information Storage and Management	PEC	3	0	0	3	40	60	100
U19CTV43	Big Data Tools and Techniques	PEC	3	0	0	3	40	60	100
U19ITV43	Cloud Computing	PEC	3	0	0	3	40	60	100

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MINOR DEGREE VERTICALS – BT

VERTICAL II - ENTREPRENEURSHIP

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.TECH.**	Programme Code	105	Regulation	**2019**
Department	**BIOTECHNOLOGY**			Semester	**-**

CURRICULUM

(Applicable to the students admitted from the academic year 2021- 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19BTV21	Principles of Management	PEC	3	0	0	3	40	60	100
U19BTV22	Bio-Entrepreneurship	PEC	3	0	0	3	40	60	100
U19BTV23	Industrial Biosafety	PEC	3	0	0	3	40	60	100
U19BTV24	Bioethics & IPR	PEC	3	0	0	3	40	60	100
U19BTV25	Bioindustries & Entrepreneurship	PEC	3	0	0	3	40	60	100
U19BTV26	Total Quality management	PEC	3	0	0	3	40	60	100
U19BTV27	Audit and Regulatory Compliance	PEC	3	0	0	3	40	60	100
U19BTV28	Biobusiness	PEC	3	0	0	3	40	60	100
U19BTV29	Resource Management & Lean Start-up Management	PEC	3	0	0	3	40	60	100

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MINOR DEGREE VERTICALS – BME

VERTICALS – VI: HEALTHCARE MANAGEMENT

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**B.E.**	Programme Code	**106**	Regulation	**2019**
Department	**BIOMEDICAL ENGINEERING**			Semester	-

CURRICULUM

(Applicable to the students admitted from the academic year 2021- 2022 onwards)

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19BMV61	Clinical Engineering	3	0	0	3	40	60	100
U19BMV62	Hospital Planning andManagement	3	0	0	3	40	60	100
U19BMV63	Medical WasteManagement	3	0	0	3	40	60	100
U19BMV64	Economics and Management forEngineers	3	0	0	3	40	60	100
U19BMV65	Bio Statistics	3	0	0	3	40	60	100
U19BMV66	Forensic Sciencein Healthcare	3	0	0	3	40	60	100
U19BMV67	AI and Its Medical Applications	3	0	0	3	40	60	100
U19BMV68	Medical Informatics	3	0	0	3	40	60	100

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MINOR DEGREE VERTICALS - CST

VERTICAL III - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

	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 SCIENEC AND TECHNOLOGY**			Semester	**-**

CURRICULUM

(Applicable to the students admitted from the academic year 2021- 2022 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U19CTV31	Pattern Recognition Techniques	PEC	3	0	0	3	40	60	100
U19CTV32	Deep Learning	PEC	3	0	0	3	40	60	100
U19CTV33	Business Intelligent and its Analytics	PEC	3	0	0	3	40	60	100
U19CTV34	Data Visualization	PEC	3	0	0	3	40	60	100
U19CTV35	Natural Language Processing	PEC	3	0	0	3	40	60	100
U19CTV36	Neuro Fuzzy and Genetic Programming	PEC	3	0	0	3	40	60	100
U19CTV37	Knowledge Based Decision Support System	PEC	3	0	0	3	40	60	100
U19ITV31	Data Science	PEC	3	0	0	3	40	60	100

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Semester – I

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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		**101**	Regulation		**2019**	
Department	**Computer Science & Engineering**				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	40	60	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**		
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	3	3	3									2	1	
CO 2	3	3	3	3									2	2	
CO 3	3	3	3	2									2	1	
CO 4	3	3	3	2									2	1	
CO 5	3	3	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	**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)

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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	**INTEGRAL CALCULUS**	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	**MUTIPLE INTEGRALS**	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/B.TECH	Programme code	101	Regulation	2019
Department	**B.E-CSE**		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	40	60	100

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

Outcomes

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-Requisities: **Nil**

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

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						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

Course Assessment Methods

Direct

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

Indirect

2. Course - end survey

Content of the syllabus

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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	45

Text Books:

1.	Sumant. s, Pereira Joyce, Shameem.M, Selvarajan.R-English Communication Skills,Vijay Nicole imprints Pvt.Ltd, 2015.
2.	Sokkaalingam, S.RM., The Art Of Speaking EnglishVersatile Publishing House,2018.

References:

1.	Dr. Padma Ravindran, Poorvadevi, M. Y. Abdur Razack- English for life, English for work, students Book, Ebek language laboratory pvt ltd, 2011.
2.	Dutt Rajeevan, 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 Blackswan Pvt, 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	**101**	Regulation	**2019**
Department	**Computer Science and Engineering**			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	40	60	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
	• understand the elastic properties of the materials	K2
	• gain knowledge about the conduction properties of metals	K3
	• determine packing factor for various unit cells and understand different types of crystal imperfections and learn the engineering, medical applications.	K1
	• discuss the basic idea of semiconducting materials and realize the function of modern engineering materials	K1
	• learn the optical properties of materials and its uses	K3

Pre-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**	**PSO 1**	**PSO 2**	
CO 1	3	2	3	1	2	1							1	2	
CO 2	3	2	3	3	1	1							1		
CO 3	3	3		3	1	2							1	2	
CO 4	3		2	1	1	2							2	2	
CO 5	3			1	2	2								2	

Course Assessment Methods

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

Content of the syllabus

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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**
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	**45**

Text Books	
1.	R.K. Gaur and Gupta. S.L, Engineering Physics, Dhanpat Rai Publishers, 2017.
2.	S.O 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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(Autonomous Institution, Affiliated to Anna University ,Chennai)
Elayampalayam, Tiruchengode – 637 205

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
U19CS101	**Programming for Problem Solving**	3	0	0	3	40	60	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: describe the building blocks of C programming language and write simple programs using Control Flow Statements	K3
	CO3: Implement the C programs using arrays and pointers.	K3
	CO4: Develop C programs using the functions and strings.	K3
	CO5: Write the real time problems using Structures and union	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**	**PSO 1**	**PSO 2**	
CO 1	3	3	2		2							2	3	2	
CO 2	3	3	3	1	2							2	3	1	
CO 3	3	3	3	2	2							2	3	1	
CO 4	3	3	3	2	3							2	3	2	
CO 5	3	3	3	3	3							2	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	**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.

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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 of India, 2017.
2.	E. Balagurusamy, Programming in ANSI C, Seventh Edition, Mc Graw Hill, 2017.
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.	Reema Thareja,Programming in C,Oxford University Press,2018.
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	**101**		Regulation	**2019**		
Department	**Computer Science & Engineering**				Semester	**I**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19GE101	**Engineering Graphics**	2	0	3	3	40	60	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 Outcomes	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	Nil

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**	
CO 1	3	3	3	3	3	-	-	-	-	-	-	-	3	2	
CO 2	3	3	2	2	2	-	-	-	-	-	-	-	2	-	
CO 3	3	2	2	2	3	-	-	-	-	-	-	-	2	2	
CO 4	3	2	3	3	2	-	-	-	-	-	-	-	3	3	
CO 5	3	3	2	3	3	-	-	-	-	-	-	-	2	2	

Course Assessment Methods

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

Content of the Syllabus

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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 Book:	
T1.	Basant Agrawal and C.M Agrawal ,"Engineering Drawing ",Tata McGraw Hill ,Third Edition,2019
T2	Jain and Gautam ,"Engineering Graphics & Design ",Khanna Publishing House, 2018
Reference Book :	
R1.	Dr.P.Kannan and Dr.J.Bensam Raj, "Engineering Graphics", JBR Tri Sea Publishers Pvt. Ltd,2018.
R2.	K.V Natarajan, "Engineering Drawing and Graphics", M/s. N.Dhanalakshmi, Chennai,2014.
R3.	K.Venugopal and V. Prabhu Raja, "Engineering Graphics"New Age International Publishers,2011.
R4.	N.S Parthasarathy and Velamurali, " Engineering Graphics", Oxford University, New Delhi,2015
R5.	Bhatt N.D and Panchal V.M, "Engineering Drawing", Charotar Publishing House,50th Edition,2010
e-RESOURCES:	
E1.	http://nptel.ac.in/courses/105104148, "Engineering Graphics" - Dr. Nihar Ranjan Patra , IIT Kanpur
E2.	http://cfd.annauniv.edu/webcontent.htm, "Engineering Graphics" - Dr.Velamurali
E3.	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. / B.Tech**	Programme code	101	Regulation	**2019**		
Department	**Computer Science and Engineering**			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

- 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 inliquid	K3
	CO5: To understand the importance of laser beam compared to ordinary light	K2

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**	**PSO 3**
CO 1	3	1													
CO 2	3	3	1	2	2									2	
CO 3	3	2			2										
CO 4	3	3		1											
CO 5	3	1	1		1										

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Course Assessment Methods

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

Content of the syllabus

S.No.	Experiments	CO
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**

Lab Manual

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

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	60	40	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

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**	**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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LIST OF EXPERIMENTS:	**Course Outcome**
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**
7. Write a program to count the total number of vowels and consonants in a string. For	**CO4**

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example Input string: I am proud to be an Indian Output: Total vowels – 10 and Total consonants – 10 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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Elayampalayam, Tiruchengode – 637 205

Programme	B.E /B.TECH	Programme code	101	Regulation	2019
Department	**B.E-CSE**			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	-	100

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.

Outcomes	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	**Nil**	

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**
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

1. Continuous Assessment Test I, II & III
2. Assignment: Simulation using tool

Indirect

1. Course - end survey

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

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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-CO2,SO2, NO2, 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

Reference books

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-Resourses

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

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Semester – II

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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	**101**	Regulation	**2019**		
Department	**Computer Science & Engineering**			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	40	60	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,	Knowledge 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

Pre-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**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	3	3	2	1									2	1	
CO 2	3	3	2	2	1								2	2	
CO 3	3	3	3	1	1								2	1	
CO 4	3	3	3	2	2								2	2	
CO 5	3	3	3	2	2								2	1	

Course Assessment Methods

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	**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 quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms. Simple application in encoding message using 2×2 matrix.

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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
References	
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)
E-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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Programme	B.E /B.TECH	Programme code	101	Regulation	2019
Department	**B.E - CSE**			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	40	60	100

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

Outcomes

The students who complete this course successfully are expected to:	Knowledge Level
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: **Nil**

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

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						2			3	3		3	2	2
CO 2						2			3	3		3	2	2
CO 3						2			3	3		3	2	2
CO 4						2			3	3		3	2	2
CO 5						2			3	3		3	2	2

Course Assessment Methods

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

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

Reference books

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

Programme	B.E/B.TECH	Programme code		Regulation	2019
Department	**B.E-CSE**		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	40	60	100

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

Outcomes

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-Requisities: **Nil**

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**	**PSO1**	**PSO 2**	**PSO 3**
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
1. Continuous Assessment Test I, II & III
2. Assignment : simulation using tools
3. End-Semester examinations
Indirect
Course - end survey

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

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

Programme	**B.E.**	Programme Code	**102**	Regulation	**2019**
Department	**Common to CSE,IT,ECE,BT branches**			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	40	60	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, electric lamps 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

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								2	3	2	
CO 2	3	2		2								2	3	2	
CO 3	3	2		2								3	3	3	
CO 4	3	2		2								3	3	2	
CO 5	3	2		2								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	**INTRODUCTION OF ELECTRICAL CIRCUITS**	Periods	**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 reactive power. Introduction

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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, Mc Graw Hill, Third Edition, 2016.
2.	M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronics Engineering, Oxford, 2016.
References	
1.	S.B. Lal Seksena and Kaustuv Dasgupta, 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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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205								
Programme	**B.E**	Programme Code	**101**	Regulation	**2019**				
Department	**Computer Science & Engineering**			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	40	60	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 Outcomes	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	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**	**PSO 1**	**PSO 2**	
CO 1	3	3	3	2	3	-	-	-	-	-	-	-	3	2	
CO 2	3	3	3	2	3	-	-	-	-	-	-	-	3	-	
CO 3	3	2	2	-	2	-	-	-	-	-	-	-	2	2	
CO 4	3	3	2	-	2	-	-	-	-	-	-	-	2	-	
CO 5	3	2	2	-	2	-	-	-	-	-	-	-	2	2	-

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment 3. End-Semester examination
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**	**Periods**	**9**
Introduction to Electric vehicles- 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.			
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 Book:	
T1.	Dr.P.Kannan, "Basic Mechanical Engineering", JBR Tri Sea Publishers Pvt. Ltd., 2019.
T2	Pravin Kumar, "Basic Mechanical Engineering", Pearson Publishers, New Delhi, 2013.
Reference Book :	
R1.	Dr.S.Ramachandaran, " Basic Civil and Mechanical Engineering " Air Walk Publication,2016
R2.	R.Gupta, "Basic Civil Engineering", RPH Publication, 2016.
R3.	Mrs.V.Valarmathi, Mr.K.Rajasekar & Mr.T.Satheeskumar,"Basic Civil Engineering", JBR Tri Sea Publishers Pvt. Ltd., 2017.
R4.	G.Shanmugam and M.S Palanichamy, "Basic Civil and Mechanical Engineering ",Tata McGraw Hill Publishing Company Limited, New Delhi,2014
R5.	S.Seetharaman, " Basic Civil Engineering ",Anuradha Agencies,2005
e-RESOURCES:	
E1.	https://nptel.ac.in/downloads/105105104/
E2.	https://nptel.ac.in/courses/112107216/
E3.	http://link.springer.com/ "Basic Civil and Mechanical Engineering"-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		Regulation	**2019**
Department	**CSE, CST & EEE**			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	40	60	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: Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.	K3
	CO2: Perform operations on list, tuples, sets and Dictionaries using python.	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 for CSV files	K3,K4
Pre-requisites	Nil	

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**	**PSO1**	**PSO 2**
CO 1	3	2	1	-	1	-	-	-	-	-	-	2	3	2
CO 2	3	3	1	1	2	-	-	-	-	-	-	2	3	2
CO 3	3	3	1	2	2	-	-	-	-	-	-	2	3	2
CO 4	3	3	1	2	2	-	-	-	-	-	-	2	3	2
CO 5	3	3	1	2	2	-	-	-	-	-	-	2	3	2

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment: Implementation of Illustrative programs 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, 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

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

Total Periods	**60**

Text Books

1.	Anurag Gupta,G.P BISWAS ," Python Programming – Problem solving, packages and Libraries, Edition 1, Tata McGraw Hill, 2019
2.	E Balagurusamy, "Problem Solving and Python Programming", Edition1 , TataMcGraw Hill, 2018
3.	Reema Thareja, "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 for Python 3, Shroff/O‘Reilly Publishers, 2016.
2.	John V Guttag, ―Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2021
3.	Guido van Rossum (Author), The Python Development Team (Author),An Introduction to Python Tutorial and What's New ,2022,Shroff Publishers first edition

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.htm
5.	https://www.learnpython.org/
6.	https://www.udemy.com/topic/python/free

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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	101	Regulation	2019
Department	COMPUTER SCIENCE AND ENGINEERING		Semester		II

Course code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19TA201	*தமி ழர் மரபு* / Heritage of Tamils	2	0	0	1	40	60	100

Content of the syllabus

அலகு 1	மொழி மற்றும் இலக்கியம்	Periods	3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஓர செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் திருக்குறளில் மேலாண்மைக் கருத்துக்கள் தமிழ்க் காப்பியங்கள் தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு 2	மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை	Periods	3

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - கடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை. யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவல்களின் பங்கு.

அலகு 3	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:	Periods	3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு 4	தமிழர்களின் திணைக் கோட்பாடுகள்:	Periods	3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு 5	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:	Periods	3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

	Total Periods	15

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	B.E / B.Tech	Programme code		101	Regulation		2019	
Department	COMPUTER SCENCE AND ENGINEERING			Semester			II	
Course code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19TA201	தமிழர் மரபு / Heritage of Tamils	2	0	0	1	40	60	100

Content of the syllabus

UNIT I	LANGUAGE AND LITERATURE	Periods	3

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

UNIT II	HERITAGE – ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	Periods	3

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

UNIT III	FOLK AND MARTIAL ARTS	Periods	3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils.

UNIT IV	THINAI CONCEPT OF TAMILS	Periods	3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature – Aram Concept of Tamils – Education and Literacy during Sangam Age – Ancient Cities and Ports of Sangam Age –Export and Import during Sangam Age – Overseas Conquest of Cholas.

UNIT V	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	Periods	3

Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the other parts of India.- Self-Respect Movement –Role of Siddha Medicine in Indigenous Systems of Medicine–Inscriptions & Manuscripts — Print History of Tamil Books.

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Text cum-Reference Books	
1	தமிழக வரலாறு – மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4	பொருநை -ஆற்றங்கரை நாகரிகம்.(தொல்லியல் துறை வெயளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint pubhcation of TNTB & ESC and RMRL
6	Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by International Institute of Tamil Studies.
7	Historical Heritage of the Tamils (Dr.S.V.Subatamarnan,Dr.K.D.Thirunavukkarasu) Published by International Institute of Tamil Studies. .
8	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmath1) Published by International Institute of Tamil Studies.)
9	Keeladi-'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.P1llay)
11	Porunai Civilization (Jointly Published by: Department of Archaeology &Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) Published by RMRL.

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

Programme	B.E/B.TECH	Programme code		Regulation	2019
Department	**B.E-CSE**			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

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.

Outcomes

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: Nil

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

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	PSO 3
CO 1	3	3		2	2	1	1					2	1	2	
CO 2	3	3		2	1							1		2	
CO 3	3	3		2	1								1	2	
CO 4	3	3	1	2	2	2	2					2	1	2	
CO 5	2	3	1	2	2	2	2					2	1	2	

CO/PSO Mapping

Course Assessment Methods

Direct
1.Pre lab and Post lab test
2.Record mark
3.End- Semester Examinations

Indirect
1.Course –End survey

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LIST OF EXPERIMENTS	
1. Estimation of HCL using NaOH by Conductometric titration	CO1
2. Estimation of Mixture of acid using NaOH by Conductometric titration.	CO1
3. Estimation of Barium chloride using sodium sulphate by Conductometric precipitation titration	CO1
4. Estimation of ferrous iron by Potentiometric titration.	CO2
5. Determination of HCL using NaOH by pH metry	CO1
6.Estimation of Ferric ion by Spectrophotometry	CO3
7. Determination of Total, temporary and permanent hardness of water by EDTA method.	CO4
8. Estimation of Dissolved Oxygen content in water by Winkler's method	CO4
9. Estimation of alkalinity in water sample.	CO5
10. Estimation of available chlorine in bleaching powder.	CO5
Total Periods	45

Lab Manuals suggested:

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

Programme	**B.E.**	Programme Code			Regulation	**2019**		
Department	**Computer Science and Engineering**			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	60	40	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 Outcomes	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: Nil

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**	**PSO3**
CO	3	2	3	2	2	-	-	-	2	-	-	-	2	3	-
CO	3	2	3	2	2	-	-	-	2	-	-	-	2	-	-
CO	3	2	2	3	2	2	-	-	2	-	-	-	2	2	-
CO	3	2	2	3	2	2	-	-	2	-	-	-	3	-	-
CO	3	2	3	3	2	2	-	-	2	-	-	-	2	3	-

Course Assessment Methods

Direct

1.Pre lab and Post lab test
2.Record mark
3.End- Semester Examinations

Indirect

1.Course –End survey

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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) **III. ELECTRICAL ENGINEERING PRACTICE**	
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**

Reference Books :

R1.	Dr.P.Kannan, Mr.T.Satheeskumar & Mr.K.Rajasekar, "Engineering Practices Laboratory" Manual. 1st Edition, 2017.
R2.	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	**101**	Regulation	**2019**			
Department	**Computer Science and Engineering**			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	-	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.	
Outcome Course	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	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**	
CO 1						3	2	3	2		1	2			
CO 2						3	2	3	3		1	2			
CO 3						3	2	3	2		2	2			
CO 4						3	2	3	3		1	2			
CO 5						3	2	3	3		2	2			

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment: Simulation using tool
Indirect
1. Course - end survey

Content of the syllabus

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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**
Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India			
Unit – III	**STRUCTURE AND FUCTION OF STATE**	Periods	**9**
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – 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, New Delhi
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 and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2
E-Resources	
1.	https://mhrd.gov.in/
2.	https://niti.gov.in/content/niti-aayog-library
3.	www.drishtiias.com/

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Semester - III

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Programme	**B.E/B.Tech**	Programme Code				Regulation	**2019**		
Department	**CSE/IT/CST**					Semester	**III**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
U19MA304	**DISCRETE MATHEMATICS**	3	1	0	4	40	60	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	At the end of the course, the student should be able to,	Knowledge level
	CO1: Demonstrate the mathematical reasoning and logics	K1,K2
	CO2: Reformulate statements from common language to formal language	K2,K5
	CO3: Relate logic with sets	K2,K3
	CO4: Analyze the connection between functions and relations.	K3,K5
	CO5: Demonstrate Algebraic facility with Semigroups ,Groups and Normal subgroups	K1,K3
Pre-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**	**PSO 1**	**PSO 2**	
CO 1	**3**	**3**	**2**	**2**								**1**	**2**	**1**	
CO 2	3	3	2	2								2	2	2	
CO 3	3	3	2	2								2	2	2	
CO 4	3	3	2	2								2	2	2	
CO 5	3	3	2	2								2	2	2	

Course Assessment Methods

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

Content of the syllabus

Unit – I	**PROPOSITIONAL CALCULUS**	Periods	**12**

Propositions – Logical connectives – Compound propositions – Conditional and biconditional propositions – Truth tables – Tautologies and contradictions – Contra positive – 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.

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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	**60**

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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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**B.E.**	Programme Code			Regulation	**2019**		
Department	**CSE, EEE, ECE, BME**				Semester	**III**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS304	**Data Structures**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Impart the basic concept of list ADT.
- Learn the linear data structures such as stack and queue.
- Describe the non linear data structures such as Tree and Graphs.
- Examine various algorithms for finding shortest path and minimum spanning tree.
- Analyze various searching, sorting algorithms and hashing techniques.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Implement abstract data type for list and operations.	K3
	CO2: Apply the stack and queue data structure for problem solution.	K3, K4
	CO3: Analyze Binary tree, BST and AVL tree data structures to implement computer based solutions	K4
	CO4: Analyze and solve the problems in finding shortest path and minimum spanning using graph	K5
	CO5: Demonstrate the various searching, sorting algorithms and hashing techniques	K3,K4

Pre-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**	**PSO 1**	**PSO 2**	
CO 1	3	3	3	2	2					1		2	2	2	
CO 2	3	3	3	2	2					2		2	2	2	
CO 3	3	3	3	3	2				1	2		2	2	3	
CO 4	3	3	3	2	2				2	2		2	2	3	
CO 5	3	3	3	3	2				1	2		2	2	3	

Course Assessment Methods

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

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Content of the syllabus			
Unit – I	**LINEAR DATA STRUCTURE – LIST**	Periods	**9**
Abstract Data Types (ADTs) – List ADT – Array Implementation – Linked List Implementation — Singly Linked Lists – Circular Linked Lists – Doubly Linked Lists – Applications of Lists – Polynomial operations (Insertion, Deletion, Merge, Traversal).			
Unit - II	**LINEAR DATA STRUCTURE – STACKS, QUEUES**	Periods	**9**
Stack ADT – Operations – Application: Evaluating Arithmetic Expressions – Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Priority Queue – DeQueue – Applications of queues.			
Unit – III	**NON LINEAR DATA STRUCTURE – TREES**	Periods	**9**
Terminologies – Tree ADT – Binary Tree – Tree Traversals – Expression Trees – Applications of Trees – Binary Search Tree ADT - AVL Trees – B- Trees – Heap – Applications of Heap.			
Unit - IV	**NON LINEAR DATA STRUCTURES – GRAPHS**	Periods	**9**
Definition – Representation of Graph – Types of graph – Breadth-First Traversal – Depth-First Traversal – Topological Sort – Shortest Path Algorithms - Minimum Spanning Tree - Applications of graphs.			
Unit – V	**SEARCHING, SORTING & HASHING TECHNIQUES**	Periods	**9**
Searching: Linear Search – Binary Search, Sorting: Bubble sort – Selection sort – Insertion sort – Shell sort – Quick Sort, Hashing: Hash Functions – Collision Resolution Techniques – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.			
		Total Periods	**45**

Text Books	
1.	Mark Allen Weiss — Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 2011
2.	Reema Thareja — Data Structures Using C, Second Edition , Oxford University Press, 2011
3.	Gilberg and Forouzan: "Data Structure- A Pseudo code approach with C" by Thomson publication
References	
1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein — "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2010.
2.	Harry, Hariom Chaudhary, — "Data Structures: An Advanced Approach Using C", Second Edition, Programmers Mind Inc, (7 December 2014)
3.	Stephen G. Kochan, — "Programming in C", Third edition, Pearson Education.
4.	Birkhäuser— "An Introduction to Data Structures and Algorithms", Second Edition, Pearson Education, 2012.
5.	Steven S. Skiena — "The Algorithm Design Manual", Second Edition, Springer, 2010.
E-Resources	
1.	https://www.edx.org/course/algorithms-and-data-structures
2.	https://hackr.io/tutorials/learn-data-structures-algorithms
3.	https://www.learneroo.com/subjects/8

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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	**101**	Regulation	**2019**		
Department	**Computer Science and Engineering**			Semester	**III**		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS305	**Database Management Systems**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Understand the basics of Database and ER model concepts.
- Understand the construction of Relational Database and querying the database.
- Understand the database design and remove the redundancy from database.
- Understand the storage and structuring concepts.
- Understand the Transaction processing and Concurrency Control.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Design database for the simple applications and model them using ER diagram	K2
	CO2: Build a relational database using SQL Queries.	K3
	CO3: Analyze and fine tune the designed database using normalization procedures.	K3
	CO4: Choose best storage structure and efficient data access methods for database storage.	K3,K4
	CO5: Provide best transaction control mechanisms and recovering techniques	K3,K4

Pre-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**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	2	3	3	1									1	2	
CO 2	3	3	3	2	2				1	1		2	3	2	
CO 3	3	3	3		2			1	2	2		2	3	2	
CO 4	3	3	3		2			1	2	2		1	2	2	
CO 5	3	3	3	2	2			1	2	2		2	3	2	

Course Assessment Methods

Direct

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

Indirect

1. Course - end survey

Content of the syllabus

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Unit – I	INTRODUCTION TO DATABASES AND CONCEPTUAL DATA MODELING AND DATABASE DESIGN	Periods	9
Database system concepts and architecture -A Brief History of Database Applications, View of Data, Databases and Database Users. **Database System Concepts and Architecture** - Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence. **Data Modeling Using the Entity–Relationship (ER) Model** - Entity Sets, attributes and Keys, Relationship Sets, ER Diagrams. **The Enhanced Entity–Relationship (EER) Model** - Subclasses, Superclasses, and Inheritance, Specialization and Generalization, Constraints.			
Unit - II	**THE RELATIONAL DATA MODEL AND SQL**	Periods	**9**
Relational Model Concepts - Relational Database Schemas, Dealing with Constraint Violations. **Basic SQL** - Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL. **Complex Queries, Triggers, Views, and Schema Modification. The Relational Algebra and Relational Calculus** - Unary Relational Operations, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, The Tuple Relational Calculus, The Domain Relational Calculus.			
Unit – III	**RELATIONAL DATABASE DESIGN, DATA STORAGE AND QUERYING**	Periods	**9**
Database Design and the E-R Model- First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Decomposition Using Multivalued Dependencies, More Normal Forms, Database-Design Process. **Storage and File Structure** - Overview of Physical Storage Media, Magnetic Disk and Flash Storage, RAID, Tertiary Storage, File Organization, Organization of Records in Files.			
Unit - IV	**INDEXING, HASHING AND TRANSACTIONS**	Periods	**9**
Ordered indices - B+ Tree index files - Multiple key access - Static and dynamic hashing – Bit map indices – Transactions concept – model - storage structure - Transaction atomicity and durability – Isolation – Serializability			
Unit – V	**CONCURRENCY CONTROL AND RECOVERY SYSTEM**	Periods	**9**
Concurrency control: Lock Based Protocols - Multiple Granularity - Deadlock Handling - Timestamp and Validation Based Protocols. **Recovery System**: Failure classification – Storage - Recovery and atomicity - Algorithm - Buffer management - Failure with loss of nonvolatile storage - Early lock release and logical undo operations			
		Total Periods	**45**

Text Books	
1.	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts" Sixth Edition, McGraw Hill, 2011.
2.	RamezElmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2016.
References	
1.	C. J. Date, A. Kannan and S. Swamynathan. "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2.	Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom. " Database Systems – The Complete Book " Pearson Education, 2009.
3.	Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", Third Edition, McGraw Hill, 2010.http://pages.cs.wisc.edu/~dbbook/
4.	Rob Cornell, "Database Systems Design and Implementation", Cengage Learning, 2011.
5.	G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
E-Resources	
1.	https://www.c-sharpcorner.com/topics/database-management-system
2.	https://www.bmc.com/blogs/dbms-database-management-systems/
3.	https://www.studytonight.com/dbms/components-of-dbms.php
4.	https://www.devmedia.com.br/database-management-system-overview-of-dbms/30332

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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	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**III**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS306	**Digital Logic Design**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Understand the concept of digital and binary number systems • Design simple combinational logics using basic gates. Able to optimize simple logic using Karnaugh maps, understand "don't care". • Understand the concept combinational logics circuits and Programmable Devices, PLA, PAL, ROM. • Understand concepts of sequential circuits and to analyze sequential systems • Understand the analysis and design of Synchronous and Asynchronous Sequential circuits	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Perform arithmetic operations in any number system	K2
	CO2: Simplify the Boolean expression using K-Map and Tabulation techniques	K2
	CO3: Apply Boolean simplification techniques to design a combinational hardware circuit.	K3
	CO4: Analyze the given sequential circuit.	K3
	CO5: Compare Synchronous and Asynchronous Sequential circuits.	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	2	2	2	-					1		1	3	2
CO 2	2	3	1	2	-					2		1	3	2
CO 3	3	2	1	1	2					2		2	3	2
CO 4	2	2	2	2	2					2		2	3	2
CO 5	3	2	1	2	-					2		1	3	2

Course Assessment Methods

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

Content of the syllabus

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Unit – I	BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS	Periods	9
The nature of logic- Boolean Algebra and switching functions- Number Systems- binary, hexadecimal and other systems. Representation and properties of switching functions and their logic realizations using GATES and Switches.			
Unit – II	**OPTIMAL DESIGN**	Periods	**9**
Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) -Implicants and prime implicants- Minimization using K-map- Quine- McCluskey algorithm for finding prime implicants.			
Unit – III	**COMBINATIONAL CIRCUITS**	Periods	**9**
Combinational circuits–Analysis and design procedures-Circuits for arithmetic operations-Code conversion –-Decoders and encoders-Multiplexers and demultiplexers-Implementation of combinational logic circuits using ROM, PLA, PAL-Introduction to Hardware Description Language (HDL) -HDL for combinational circuits.			
Unit – IV	**SEQUENTIAL CIRCUITS**	Periods	**9**
Sequential logic elements -Flip-Flops, Registers, Shift Registers and Counters- Examples of applications. State reduction and state assignment - HDL for Sequential Circuits			
Unit – V	**SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS**	Periods	**9**
Synchronous Sequential Circuits: General Model – Classification – Design – Analysis of Synchronous Sequential Circuits. Asynchronous Sequential Circuits: Analysis and design of asynchronous sequential circuits - Reduction of state and flow tables – Race free state assignment – Hazards - Design of Hazard Free Switching circuits -ASM Chart.			
		Total Periods	**45**

Text Books	
1.	M. Morris Mano, "Digital Design", 6th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2018.
2.	Leach & Malvino, Digital Principles & Application, 8thEdition, Mc Graw Hill Company,2014
References	
1.	John F.Wakerly, "Digital Design", 4th Edition, Pearson/PHI, 2008
2.	John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
3.	Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
4.	Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011
5.	Modern Digital Electronics, 2nd Edition, R.P. Jain. Tata Mc Graw Hill Company Limited.
E-Resources	
1.	https://circuitglobe.com/number-system-in-digital-electronics.html
2.	https://www.iitg.ac.in/asahu/cs221-2018/Lects/Lec08.pdf http://pami.uwaterloo.ca/~basir/ECE124/QL.pdf
3.	http://ocw.nctu.edu.tw/course/digitaldesign/LogicDesignCh04.pdf https://www.elprocus.com/what-are-pal-and-pla-design-and-differences/
4.	http://web.ee.nchu.edu.tw/~cpfan/FY92b-digital/Chapter-5.ppt
5.	http://pami.uwaterloo.ca/~basir/ECE124/Sync_Circuit_Analysis_Design.pdf https://www.brainkart.com/article/Analysis-Procedure-of-Asynchronous-Sequential-Circuits_13574/

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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		Regulation	**2019**
Department	**CSE,CST**			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	40	60	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: Write Java programs using OOP principles	K2
CO2: Develop Java programs with the concepts inheritance, packages and interfaces	K3
CO3: Build Java applications using exceptions and I/O streams	K3
CO4: Develop Java applications with threads	K3,K4
CO5: Implement interactive Java programs using swings	K3,K4

Pre-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**	**PSO 1**	**PSO 2**	
CO 1	3	3	3	3	3					2			3	2	
CO 2	3	2	2	2	2					2			3	2	
CO 3	2	3	2	3	3				2	2			3	3	
CO 4	3	2	2	3	3				2	2			3	3	
CO 5	3	2	2	2	3				1	2			3	3	

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III
2. Assignment / Seminar
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	**12**
Object Oriented Programming - objects and classes - Abstraction - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File - Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members - Data Types, Control Flow, Arrays-Strings.			
Unit - II	**INHERITANCE AND PACKAGES**	Periods	**12**
Inheritance Basics – Multilevel Hierarchy – Constructors – Method Overriding -Using super – Dynamic Method Dispatch –Using final – Abstract Classes – Packages – Access Protection – Importing Packages – Interfaces.			
Unit – III	**EXCEPTION HANDLING AND I/O**	Periods	**12**
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	**MULTITHREADING PROGRAMMING**	Periods	**12**
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	**12**
Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse event. 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	**60**
Text Books			
1.	Herbert Schildt, “Java The complete reference”, 11th Edition, McGraw Hill Education, 2018.		
References			
1.	Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.		
2.	Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015		
3.	Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.		
4.	Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 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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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	B.E	Programme code		101	Regulation		2019	
Department	COMPUTER SCIENCE AND ENGINEERING			Semester			III	
Course code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19TA302	தமிழரும் தொழில்நுட்பமும் / TAMILS AND TECHNOLOGY	2	0	0	1	40	60	100

Content of the syllabus

அலகு 1	நெசவு மற்றும் பானை தொழில்நுட்பம்	Periods	3

சங்ககாலத்தில் நெசவுத்தொழில் – பானை தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்

அலகு 2	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	Periods	3

சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடைஅமைப்பு பற்றிய விவரங்கள் - மாமல்லபுர சிற்பங்களும், கோவில்களும் – சோழர் காலத்து பெருங்கோவில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் கால கோவில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள்– பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக்கலை.

அலகு 3	உற்பத்தித் தொழில் நுட்பம்	Periods	3

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல்– மணி உருவாக்கும் தொழிற்சாலைகள்– கல்மணிகள், கண்ணாடி மணிகள்– சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்

அலகு 4	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்	Periods	3

அணை, ஏரி, குளங்கள் , மதகு – சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத் துக்குளித் தல் – பெருங்கடல் மற்றும் பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு 5	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்	Periods	3

அறிவியல் தமிழின் வளர்ச்சி – கணினித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

	Total Periods	15

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VIVEKANANDHA
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Elayampalayam, Tiruchengode – 637 205

Programme	B.E.	Programme code	104	Regulation	2019
Department	COMPUTER SCIENCE AND ENGINEERING		Semester		III

Course code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19TA302	தமிழரும் தொழில்நுட்பமும் / TAMILS AND TECHNOLOGY	2	0	0	1	40	60	100

Content of the syllabus

UNIT I	WEAVING AND CERAMIC TECHNOLOGY	Periods	3

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

UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	Periods	3

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

UNIT III	MANUFACTURING TECHNOLOGY	Periods	3

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

UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	Periods	3

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

UNIT V	SCIENTIFIC TAMIL & TAMIL COMPUTING	Periods	3

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

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Text cum-Reference Books	
1	தமிழக வரலாறு – மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4	பொருநை -ஆற்றங்கரை நாகரிகம்.(தொல்லியல் துறை வெயளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint pubhcation of TNTB & ESC and RMRL
6	Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by International Institute of Tamil Studies.
7	Historical Heritage of the Tamils (Dr.S.V.Subatamarnan,Dr.K.D.Thirunavukkarasu) Published by International Institute of Tamil Studies. .
8	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmath1) Published by International Institute of Tamil Studies.)
9	Keeladi-'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.P1llay)
11	Porunai Civilization (Jointly Published by: Department of Archaeology &Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) Published by RMRL.

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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			Regulation			**2019**
Department	**CSE,ECE,BME**				Semester			**III**
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS308	**Data Structures Laboratory**	0	0	4	2	60	40	100

Course Objective	The student should be made to, • Design and develop simple programs using data structures • Apply linear data structures for various real time applications. • Develop programs to implement non linear data structures. • Design shortest path algorithm for various real life applications • Write programs to implement for sorting and hashing.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Design and implement program for Linked List.	K3
	CO2: Implement the program for manipulating Stack.	K3
	CO3: Design and Implement programs for Binary Search tree and AVL tree.	K3,K4
	CO4: Implement the shortest path algorithms available in graph.	K4
	CO5: Apply appropriate sorting algorithm and hash functions that result in a collision free scenario for data storage and retrieval.	K3,K4
Pre-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**	**PSO 1**	**PSO 2**	
CO 1	3	3	3	2	1				1	2		2	3	2	
CO 2	3	3	3	2	1				1	2		2	3	2	
CO 3	3	3	3	2	2				2	2		2	3	3	
CO 4	3	3	3	2	2				2	2		2	3	3	
CO 5	3	3	3	2	2				2	2		2	3	3	

Course Assessment Methods

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

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LIST OF EXPERIMENTS	**Course Outcome**
1. Represent a polynomial as a linked list and write functions for polynomial addition.	CO1
2. Implementation of stack and use it to convert infix to postfix expression.	CO2
3. Implementation of Binary Tree and Traversal Techniques	CO2
4. Implementation of binary search tree	CO3
5. Implementation of insertion in AVL trees.	CO3
6. Implementation of graphs using BFS and DFS.	CO4
7. Implementation of Djikstra's algorithm.	CO4
8. Implementation of Prim's algorithm using priority queue to find MST of an undirected graph.	CO4
9. Implementation of Merge sort using Divide and Conquer method.	CO5
10. Implementation of Hashing with open addressing	CO5
Total Periods	**45**

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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	**101**	Regulation	**2019**		
Department	**Computer Science Engineering**			Semester	**III**		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS309	**Database Management Systems Laboratory**	0	0	4	2	60	40	100

Course Objective	**The student should be made to,** • Understand data definitions and data manipulation commands • Learn the use of nested and join queries • Understand functions, procedures and procedural extensions of data bases • Familiar with the use of a front end tool • Understand design and implementation of typical database 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	K3
	CO3: Analyze the stored programming concepts using Cursors and triggers	K3,K4
	CO4: Analyze the use of Tables, Views, Functions and Procedures in database	K3,K4
	CO5: Develop simple application using Front end DBMS	K3,K4
Pre-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**	**PSO 1**	**PSO 2**	
CO 1	1	2	3	3	2			1		2			3	2	
CO 2	1	2	3	3	2			1		2			3	2	
CO 3	1	2	3	3	2			1		2		2	3	2	
CO 4	1	2	3	3	2			1		2		2	3	2	
CO 5	1	2	3	3	2			1	3	2		2	3	2	

Course Assessment Methods

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

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LIST OF EXPERIMENTS	Course Outcome
1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements	CO1
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins	CO2
3. Views, Sequences, Synonyms	CO4
4. Database Programming: Implicit and Explicit Cursors	CO3
5. Procedures and Functions	CO4
6. Triggers	CO3
7. Exception Handling	CO5
8. Database Design using ER modeling, normalization and Implementation for any application	CO5
9. Database Connectivity with Front End Tools	CO5
10. Case Study using real life database applications	CO5
Total Periods	**45**

E-Resources	
1.	https://www.codecademy.com/articles/sql-commands
2.	https://www.w3schools.com/sql/
3.	https://www.dataquest.io/blog/sql-basics/

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

Programme	B.E/B.TECH	Programme code	101	Regulation	2019
Department	**B.E-CSE**			Semester	III

Course code	Course Name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19EN301	**Communication Skills laboratory**	**0**	**0**	**2**	**1**	**100**	**-**	**100**

Objective

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

Outcomes	The students who complete this course successfully are expected to:	Knowledge Level
	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: To attain professional correspondence and execute the same in professional manner.	K4
	CO5: To employ the professional needs and accomplishments at global standards.	K4
Pre-requisites	Nil	

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**	**PSO1**	**PSO 2**
CO 1	-	-	-	-	-	2	-	-	3	3	-	3	-	2
CO 2	-	-	-	-	-	2	-	-	2	3	-	3	-	2
CO 3	-	-	-	-	-	2	-	-	2	2	-	3	-	1
CO 4	-	-	-	-	-	2	-	-	3	3	-	3	-	2
CO 5	-	-	-	-	-	2	-	-	3	3	-	3	-	3

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 - Body language – 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 Career Advancement-Personality and Soft Skills for career growth- Time management.

	Total Periods	45

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, New Delhi, 2004.

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Programme	**B. Tech.**	Programme Code		Regulation	**2019**			
Department	**CSE,EEE, ECE,IT,B, BME, CST**			Semester	-			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MCSY3	**NUMERICALABILITY**	2	0	0	0	100	-	100
Course Objective	The main objective of the course is to: • Develop skill to meet the competitive examinations for better job opportunity • Accommodate fundamental, mathematical aspects to instill confidence among students • Expand their knowledge and to develop their logical reasoning thinking ability							
Course Outcome	At the end of the course, the student will be able to:							KL
	CO1: Develop a proper understanding of the number system							K3
	CO2: Explain the meaning of ratio, proportion and percentage							K2
	CO3: Solve complex problems involving speed, distance and time.							K3
	CO4: Understand the relationship between compound interest and its influencing factors							K2
	CO5: Solve surface area and volume of rectangular-prism problems with real objects							K3
Pre-requisites	-							

CO/PO Mapping (3/2/1indicatesstrength of correlation)3-Strong,2– Medium,1-Weak												**CO/PSO Mapping**	
COs	Programme Outcomes(POs)											PSOs	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
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	

Content of the syllabus

Unit–I	**NUMBERSYSTEMS**	Periods	**6**
Number Properties–HCF–LCM-Square root–Cube root –Simplification –Averages.			
Unit-II	**DIRECTPROPORTIONALPROBLEMS**	Periods	**8**
Percentage-Profit & Loss–.Ratio &Proportions–Mixture & Allegations-Problem on Ages			

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Unit–III	**INDIRECTPROPORTIONALPROBLEMS**	Periods	**8**
Time&Work–Pipes&Cisterns-Time,Speed&Distance–Boats&Streams–Races&Gamesof Skills.			
Unit-IV	**BANKER'SPROBLEMS**	Periods	**4**
Simple Interest –Compound Interest – Logarithms–Partnership-Discounts.			
Unit–V	**MISCELLANEOUSPROBLEMS**	Periods	**4**
Mensuration: Area & perimeter –Volume & Surface Area–Geometry-Trigonometry.			
		Total Periods	**30**
Text Books			
1.	DineshKhattar-ThePearsonguidetoQuantitativeAptitudeforCompetitiveExaminations 3rd edition.		
References			
1.	R.S.Aggarwal –Quantitative Aptitude for Competitive Examinations		

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Semester - IV

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Programme	**B.E/B.TECH**	Programme Code		Regulation	**2019**		
Department	**CSE/IT/CST**			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	40	60	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 in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of 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 and technology 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 and technology disciplines.

Course Outcome	At 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 real life problems.	K1,K3
	CO2: Apply the basic concepts of classifications of design of experiments in the field of agriculture.	K2,K3
	CO3: Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.	K3,K5
	CO4: Understand the knowledge of various techniques and methods for solving first and 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
(3/2/1 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	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

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Content of the syllabus			
Unit – I	**TESTING OF HYPOTHESIS**	Periods	**12**
Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.			
Unit - 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 - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values 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 derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal 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 corrector methods 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.
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, 8th Edition, 2014.
3.	Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi,2006.
4.	S.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
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	**101**	Regulation	**2019**		
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**IV**		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS410	**Computer Organization**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Understand the basic structure and operations of digital computer.
- Impart the knowledge on Hardwired control; Micro programmed control and nano programming.
- Familiarize the concept of pipelining and hazards.
- Analyze the various memory system including Cache memories and virtual memory.
- Expose 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: Identify the basic structure and functional units of a computer and analyze the effect of addressing modes on the execution time of a program	K2
CO2: Apply the hardwired and micro programmed control units for solving the problems	K3
CO3: Illustrate the process of pipelining and analyze pipelined control units.	K3
CO4: Summarize the memory organization techniques	K3,K4
CO5: Illustrate data transfer between central computer and I/O devices	K3,K4

Pre-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**	**PSO 1**	**PSO 2**	
CO 1	3	2	2		-					1		1	3	2	
CO 2	2	3	1	2	-					1			2	2	
CO 3	3	2	1	2	2			2		1			2	2	
CO 4	2	2	2		2					1		2	3	2	
CO 5	3	2	1		-			1		1		1	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

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Unit – I	BASIC STRUCTURE OF COMPUTERS	Periods	9
Functional units – Basic operational concepts – Bus structures – Performance and metrics – Instructions and instruction sequencing – Hardware – Software Interface –Instruction set architecture – Addressing modes – RISC – CISC.			
Unit - II	**BASIC PROCESSING UNIT**	Periods	**9**
Fundamental concepts – Execution of a complete instruction – Multiple bus organization– Hardwired control – Micro programmed control – Nano programming.			
Unit – III	**PIPELINING**	Periods	**9**
Basic concepts – Data hazards – Instruction hazards – Influence on instruction sets –Data path and control considerations – Performance considerations – Exception handling.			
Unit - IV	**MEMORY SYSTEM**	Periods	**9**
Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache memories – Improving cache performance – Virtual memory – Memory management requirements – Associative memories – Secondary storage devices.			
Unit – V	**I/O ORGANIZATION**	Periods	**9**
Accessing I/O devices – Programmed Input/output -Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB)			
		Total Periods	**45**

Text Books	
1.	Carl Hamacher, ZvonkoVranesic and SafwatZaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill, 2014.
References	
1.	David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software interface”, Fifth Edition, Elsevier, 2013.
2.	William Stallings, “Computer Organization and Architecture – Designing for Performance”, Eighth Edition, Pearson Education, 2006.
3.	V.P. Heuring, H.F. Jordan, “Computer Systems Design and Architecture”, Second Edition, Pearson Education, 2004.
E-Resources	
1.	https://nptel.ac.in/courses/106/105/106105163/
2.	https://www.learncomputerscienceonline.com/computer-organization-and-architecture/
3.	https://www.javatpoint.com/computer-organization-and-architecture-tutorial
4.	https://unacademy.com/content/nta-ugc/study-material/computer-science/computer-organisation-and-architecture/

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Programme	**B.E.**	Programme Code	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			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	40	60	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 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 asymptotic runtime complexity of algorithms.	K2
	CO2: Apply the algorithms and design techniques to solve problems using divide and conquer and Greedy algorithm.	K3
	CO3: Understand and design algorithms using dynamic programming	K3
	CO4: Apply concepts of Back tracking	K4
	CO5: Synthesize efficient algorithms for NP problems	K3,K4
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**	**PSO 3**
CO 1	1	3	3	2									1	2	
CO 2	2	2	2	3									2	2	
CO 3	2	2	3	2									3	2	
CO 4	2	3	2	3									2	3	
CO 5	2	3	2	3									3	3	

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

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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: The Floyd-Warshall algorithm. 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.
2.	Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2012
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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Programme	**B.E.**	Programme Code	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**IV**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS412	**Open Source Software**	2	0	2	3	40	60	100

Course Objective	The student should be made to, • Promoting the use of OSS in learning, teaching and administrative IT infrastructure. • Understand the PHP concepts and building blocks • Make the student to develop websites using PHP and Mysql • Understand the open source scripting languages Perl • Exploring the use of the Common Gateway Interface (CGI) scripting language to serve dynamic content.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Outline the benefits of OSS and essential of Linux	K2
	CO2: Implement simple PHP programs for various applications	K3
	CO3: Design & implement a small to medium size web enabled information storage & retrieval system using PHP & MYSQL	K3
	CO4: Enumerate the syntax and style of PERL scripting.	K3,K4
	CO5: Implement Perl programs with Database Connectivity	K3,K4
Pre-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**	**PSO 1**	**PSO 2**	
CO 1	3	3	3	2	2						2	2	2	2	
CO 2	3	3	3	2	2				2		2	2	2	2	
CO 3	3	3	3	3	2				2		2	2	2	3	
CO 4	3	3	3	2	2				2		2	2	2	3	
CO 5	3	3	3	3	2				2		2	2	2	3	

Course Assessment Methods

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

Content of the syllabus

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Unit – I	INTRODUCTION TO OPEN SOURCES	Periods	12
Introduction to Open sources –Need of Open Sources –Advantages of Open Sources–Application of Open Sources -FOSS Licenses –FOSS Examples. **Linux Overview:** Linux system structure -Kernel and User mode Operations -Process–User Management in Linux. **Case Study**: Ubuntu -Cent OS – Redhat. **Illustrative Programs:** Practicing basic Linux commands.			
Unit - II	**INTRODUCTION TO PHP**	**Periods**	**12**
Introduction to PHP - The Building blocks of PHP: Variables, Data Types, Operators. Flow Control Functions in PHP: Conditional statements, Switching Flow, Loops-Strings and Arrays-random numbers-functions-Reading data from web pages - PHP Browser Handling Power. **Illustrative Programs:** 1. Write a PHP Script to display the prime members from count 1 to 1000 2. Write a factorial program with function and without function using for loop in PHP. 3. Write a program to calculate Electricity bill in PHP 4. Write a simple calculator program in PHP using switch case			
Unit – III	**PHP WITH MYSQL**	**Periods**	**12**
Session Handling in PHP –Cookies. Introduction to MYSQL – Working with Databases and Tables–PHP with MYSQL Connectivity: Insert Data from HTML Form to Tables, extracting data from database – Updating the table data. **Illustrative Programs:** 1. File Uploading and Downloading with PHP 2. Session handling in PHP 3. Basic My SQL queries **PHP with Database connectivity** (Retrieving and uploading data, dynamic internet applications): 1. Result Display System.			
Unit - IV	**INTRODUCTION TO PERL**	**Periods**	**12**
PERL overview-Variables and Data types–Arrays-Control Structures–Subroutines, Packages and Modules-Error Handling –Regular Expressions. **Illustrative Programs:** 1. Write a Perl Program to swap two numbers without using the third variable.			
Unit – V	**PERL AND CGI**	**Periods**	**12**
Working with Files–Sending Emails -Database Access –Perl CGI Programming –GET and POST Methods – Cookies in CGI. **Illustrative Programs:** **Perl Database Connectivity: 1.** Create a record into Student table with the attributes of Student Roll no, Name, DOB, Age, Blood Group, Contact Number and Year of Studying. 2. Write a perl program to read and write a file.			
		Total Periods	**60**

Text Books

1.	Remy Card, Eric Dumas and Frank Mevel, "The Linux KernelBook", WileyPublications, 2003

References

1.	Steven Holzner, "PHP: The Complete Reference", McGraw Hill Education,2017
2.	Steve Suchring, "MySQL Bible", John Wiley, 2002
3.	Martin C. Brown, "Perl: The Complete Reference", 2nd Edition, Tata McGraw - Hill Publishing Company Limited, Indian Reprint 2009.

E-Resources

1.	https://tavaana.org/sites/default/files/introduction_to_opensource.pdf
2.	https://www.w3schools.com/php/php_intro.asp
3.	https://www.tutorialspoint.com/perl/perl_introduction.htm

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Programme	**B.E.**	Programme Code	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**IV**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS413	**Operating Systems**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Build an understanding of the fundamental concept of operating system • Familiarize with the basic process scheduling and CPU scheduling • Familiarize with the storage management • Familiarize the file system interface and implementation • Understand the disk management and disk storage	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Outline various operating system structure and process scheduling.	K2
	CO2:. Compare the performance of various CPU scheduling algorithms and synchronization.	K3
	CO3: Analyze the performance of various storage management schemes.	K3
	CO4: Evaluate the performance of various disc scheduling algorithm.	K3,K4
	CO5: Interpret the mechanism adopted for file system implementation.	K3,K4
Pre-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**	**PSO 1**	**PSO 2**	
CO 1	3	3	2	2								2	2	2	
CO 2	3	3	2	2								2	2	2	
CO 3	3	3	2	3								2	2	3	
CO 4	3	3	2	2								2	2	3	
CO 5	3	3	2	3								2	2	3	

Course Assessment Methods

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

Content of the syllabus

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Unit – I	INTRODUCTION	Periods	9
Introduction to operating systems – Operating-System Operations - Resource Management. **Operating system structures**: System calls – System Services - Linkers and Loader. **Processes**: Process concept – Process scheduling – Operations on processes – Interprocess communication.			
Unit - II	**CPU SCHEDULING AND PROCESS SYNCHRONIZATION**	Periods	**9**
CPU Scheduling: Scheduling criteria – Scheduling algorithms – Real time scheduling. **Process Synchronization**: The critical-section problem – Hardware Support for Synchronization – Semaphores – Classic problems of synchronization – Monitors.			
Unit – III	**DEADLOCK AND STORAGE MANAGEMENT**	Periods	**9**
Deadlock: System model – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance –Deadlock detection – Recovery from deadlock. **Memory Management**: Background – Contiguous memory allocation– Paging – Segmentation – Swapping.			
Unit - IV	**MEMORY AND I/O SYSTEMS**	Periods	**9**
Virtual Memory: Background –Demand paging – Copy on write – Page replacement – Allocation of frames –Thrashing. **Mass-Storage Structure**: Disk scheduling – Disk management –Swap-space management – RAID – Storage attachment. **I/O Systems**: I/O Hardware – Application I/O interface – kernel I/O subsystem – streams – performance.			
Unit – V	**FILE SYSTEMS**	Periods	**9**
File-System Interface: File concept – Access methods – Directory structure – Protection. **File-System Implementation:** File-System Structure – File System Operations - Directory implementation –Allocation methods – Free-space management – efficiency and performance – recovery.			
		Total Periods	**45**

Text Books	
1.	Silberschatz, Galvin, and Gagne, "Operating System Concepts", Tenth Edition, Wiley India Pvt Ltd, 2018
References	
1.	Andrew S. Tanenbaum, "Modern Operating Systems", 4th Edition, Pearson Education / PHI 2015
2.	Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004
3.	Harvey M. Deital, "Operating Systems", Third Edition, Pearson Education, 2004
E-Resources	
1.	http://www.os-book.com
2.	https://www.academia.edu/42880365/Operating_System_Concepts_10th_Edition
3.	http://index-of.es/Varios-2/Modern%20Operating%20Systems%204th%20Edition.pdf

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Programme	**B.E.**	Programme Code	**101**		Regulation	**2019**		
Department	**COMPUTER SCIENCE AND ENGINEERING**				Semester	**IV**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS414	**Web Technology**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Describe the various steps in designing a creative and dynamic website.
- Create web pages using html, JavaScript, CSS and applet codes.
- Design dynamic and interactive web pages by embedding Java Script code in HTML.
- Understand the concepts of HTML and XML, DOM

Course Outcome

At the end of the course, the student should be able to,	Knowledge Level
CO1: Develop a dynamic webpage by the use of HTML & XHTML.	K2
CO2: Design a well formed web page using CSS and JavaScript.	K3
CO3: Implement a server side application using Servlets.	K3
CO4: Develop JSP application for implementing session management and database connectivity.	K3
CO5: Design rich client presentation using AJAX and validate the security challenges	K3,K4

Pre-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**	**PSO 1**	**PSO 2**	
CO 1	3	2	3		3							2	3	2	
CO 2	3		3	2	3							2	3	2	
CO 3	3		3		3							2	2	3	
CO 4	3		3	2	3							2	2	3	
CO 5	3		3		2							2	3	3	

Course Assessment Methods

Direct

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

Indirect

1. Course - end survey

Content of the syllabus

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Unit – I	HTML & XHTML	Periods	9
The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message-Web Clients Web Servers. Markup Languages: XHTML- An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics- Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-Creating HTML Documents.			
Unit - II	**CSS & JAVA SCRIPT**	Periods	**9**
Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML Style Rules Cascading and Inheritance-Text Properties-Box Model. Client-Side Programming: The JavaScript Language-History and Versions -Syntax-Variables and Data Types-Statements-Operators- Literals-Functions-Objects-Arrays-Built-in Objects.			
Unit – III	**DOM &JAVA SERVLET**	Periods	**9**
Host Objects : Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling. Server-Side Programming: Java Servlets- Architecture -Overview-A Servelet-Generating Dynamic Content-Life Cycle-Parameter Data-Sessions-Cookies- URL Rewriting.			
Unit - IV	**XML & JSP**	Periods	**9**
Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration - Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH- Template based Transformations: XSLT-Displaying -XML Documents in Browsers. JSP: JSP Technology Introduction-JSP and Servlets-Running JSP Applications – JDBC in JSP			
Unit – V	**HTML 5 .0 & AJAX**	Periods	**9**
HTML 5: Introduction - Web Forms 2.0 - Web Storage – Canvas – Audio & Video Player -Geolocation- QR Code. AJAX: Introduction- Ajax Client Server Architecture-Introduction to XML- AJAX Request & Response- JS JSON –JSON Objects – JSON Array – jQuery Selector –JQuery CSS – JQuery DOM.			
		Total Periods	**45**

Text Books

1.	Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2011.

References

1.	Deitel and Deitel and Nieto, “Internet and World Wide Web - How to Program”, Prentice Hall, 5th Edition, 2011.
2.	Herbert Schildt, “Java-The Complete Reference”, 8th Edition, McGraw Hill Professional, 2011.
3.	Gopalan N.P. and Akilandeswari J., “Web Technology”, Prentice Hall of India, 2011.
4.	Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.

E-Resources

1.	https://www.seu1.org/files/level6/IT230/Book/(web.tech%201st%20book)%20Web%20Technologies%20-%20A%20Computer%20Science%20Perspective.pdf
2.	https://www.tutorialspoint.com/ajax/ajax_security.htm
3.	https://www.pearson.com/us/higher-education/product/Deitel-Associates-Power-Points-for-Internet-and-World-Wide-Web-How-To-Program-5th-Edition/9780132151016.html?tab=downloadable-resources

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Programme	**B.E.**	Programme Code			**101**	Regulation		**2019**	
Department	**COMPUTER SCIENCE AND ENGINEERING**					Semester		**IV**	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
U19CS415	**Operating Systems Laboratory**	0	0	4	2	60	40	100	

Course Objective

The student should be made to,

- Learn the basic commands of UNIX and shell programming commands.
- Generate the programs for system calls.
- Show the programs using scheduling and semaphores.
- Work on memory management algorithms.

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Implement Unix commands and shell programming.	K3
	CO2: Implement C program for process and file system management using system calls.	K3
	CO3: Implement various CPU scheduling algorithms using C-programming.	K3,K4
	CO4: Develop an algorithm for deadlock detection, avoidance and file allocation strategies.	K4
	CO5: Develop the memory management schemes and performance of various page replacement algorithms.	K3,K4

Pre-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	PSO 1	PSO 2	
CO 1	3	3	3	2								2	3	2	
CO 2	3	3	3	2								2	3	2	
CO 3	3	3	3	2								2	3	3	
CO 4	3	3	3	2								2	3	2	
CO 5	3	3	3	2								2	3	2	

Course Assessment Methods

Direct

1. Prelab and post lab test
2. End-Semester examinations

Indirect

1. Course - end survey

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Content of the syllabus LIST OF EXPERIMENTS	Course Outcome
1. Shell programming (Using looping, control constructs etc.,)	CO1
2. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir	CO1
3. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)	CO2
4. Write C programs to simulate UNIX commands like ls, grep, etc.	CO2
5. Implementation of CPU scheduling algorithms: FCFS, SJF, Round Robin & Priority Scheduling.	CO3
6. Implement the Producer – Consumer problem using semaphores.	CO4
7. Implementation of Banker's algorithm.	CO4
8. Implement some memory management schemes (First fit, Best fit & Worst fit)	CO5
9. Implement some page replacement algorithms (FIFO & LRU)	CO5
Total Periods	**45**

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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	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**IV**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS416	**Web Technology Laboratory**	0	0	4	2	60	40	100

Course Objective	The student should be made to, • Understand the web technologies to create adaptive web pages for web application. • Use CSS to implement a variety of presentation effects to the web application. • Gain the skills and project-based experience needed for entry into web application and development careers. • Explore different web extensions and web services standards. • Acquire knowledge and skills for creation of web site considering both client and server side programming.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Create web pages using XHTML and Cascading Style Sheets	K3
	CO2: Develop a dynamic webpage by the use of java script and DHTML.	K3
	CO3: Write a server side java application called Servlet to catch form data sent from client, process it and store it on database	K3
	CO4: Write a server side java application called JSP to catch form data sent from client and store it on database	K4
	CO5: Develop a dynamic webpage using java bean and store it on database	K3,K4
Pre-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**	**PSO 1**	**PSO 2**	
CO 1	3	3	3	2					1			2	3	2	
CO 2	3	3	3	2					2			2	3	2	
CO 3	3	3	3	2	1				2			2	3	3	
CO 4	3	3	3	2	2				2			2	3	2	
CO 5	3	3	3	2	2				2			2	3	2	

Course Assessment Methods

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

LIST OF EXPERIMENTS	**Course Outcome**
1. The catalogue page should contain the details of all the books available in the web. The details should contain the following: 1. Snap shot of Cover Page. 2. Author Name. 3. Publisher. 4. Price. 5. Add to cart button. 2. Create a "registration form "with the following fields 1) Name (Text field) 2) Password	CO1

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(password field) 3) E-mail id (text field) 4) Phone number (text field) 5) Sex (radio button) 6) Date of birth (3 select boxes) 7) Languages known (check boxes – English, Telugu, Hindi, Tamil) 8) Address (text area)	CO1
3. **HTML5 and JavaScript :** a) position in the string of the left-most vowel b) number with its digits in the reverse order c) Write an HTML page including any required JavaScript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.	CO2
HTML and CSS:	
4. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).	CO2
5. Design a web page using CSS (Cascading Style Sheets) which includes the following: A. Use different font, styles: In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.	CO2
6. To convert the static web pages online library into dynamic web pages using servlets and cookies.	CO3
7. a) Assume four users user1, user2, user3 and user4 having the passwords pwd1,pwd2,pwd3 and pwd4 respectively. Write a PHP for doing the following. 1. Create a Cookie and add these four user ID‟s and passwords to this Cookie. 2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies. If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user‟	CO5
8. Write an XML file which will display the Book information which includes the following: 1) Title of the book 2) Author Name 3) ISBN number 4) Publisher name 5) Edition 6) Price Write a Document Type Definition (DTD) to validate the above XML file.	CO5
9. Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Experiment with various SQL queries. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.	CO3
10. Write a JSP which does the following job Insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database. CO4	CO4
11. A user validation web application, where the user submits the login name and password to the server. The name and password are checked against the data already available in Database and if the data matches, a successful login page is returned. Otherwise a failure message is shown to the user. Modify the above program using AJAX to show the result on the same page below the submit button.	CO5
12. To write a program using AJAX for displaying cricket players profile	CO5
Total Periods	**45**

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	VIVEKANANDHACOLLEGEOFENGINEERINGFORWOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam,Tiruchengode–637 205								
Programme	**B.E./B.Tech.**	Programme Code				Regulation		**2019**	
Department	**CSE,EEE, ECE,IT,BT,BME,CST**					Semester		-	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
U19MCSY4	**VERBALABILITY**	2	0	0	-	100	-	100	
Course Objective	**The main objective of the course is to:** • To help the student understand the importance of having his language skills kept ready for effective use • To provide a host of varied opportunities for the student to hone his acquired language skills basic components, namely, Grammar, Vocabulary, Spelling and Comprehension.								
Course Outcome	**At the end of the course, the student will be able to,**							KL	
	CO1:Identify the verb and tense in a sentence by circling and labeling							K1	
	CO2: State the definition of an article							K1	
	CO3: Develop their awareness of correct usage of English grammar in writing and speaking ·							K3	
	CO4: Tests a vocabulary power and skill to follow the logic of sentences							K4	
	CO5: Discuss how word root based extends vocabulary							K2	
Pre-requisites									

CO/PO Mapping (3/2/1indicatesstrength of correlation)3-Strong,2– Medium,1-Weak												**CO/PSO Mapping**	
COs	Programme Outcomes(POs)											PSOs	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**
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

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**

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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 Eye dbeggar, 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 using a before words that start with consonants and an before words that begin with vowels. The first letter of the word honor, 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, Before the 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 sort of 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,UpAndDown,Ago

c. Prepositions Of Directions/MovementsAcross,Through,To,Into,OutOf,Onto,Towards,From

d. Other Prepositions-Of, By, About, For, With

e. Prepositions Usage with Its Context

Unit – III	SENTENCECORRECTION	Periods	6

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SENTENCECORRECTION

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.

SENTENCEIMPROVEMENT

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 compared from the rest of class of things by using the

f. Confusing words
   i) Fewand Less
   ii) FewandA few
   iii) Little and A Little
   A little tact would have saved the situation(sometact).Layand Lie Lay, laid

Unit-IV	**SENTENCECOMPLETION**	Periods	**6**

SENTENCE COMPLETION: Purpose and usage of proper words. **SPOTTINGERRORS:**

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 SPBakshi–Arihant Publication

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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Semester – V

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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	**101**		Regulation	**2019**		
Department	**COMPUTER SCIENCE AND ENGINEERING**				Semester	**V**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS519	**Artificial Intelligence**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Study the concepts of Artificial Intelligence. • Learn the methods of solving problems using Artificial Intelligence. • Introduce the concepts of Expert Systems and machine learning.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Apply the various methods for problem solving using AI.	K2,K3
	CO2: Analyze the knowledge representation using prediction logic.	K3
	CO3: Infer the knowledge based systems using various algorithms and theories	K3
	CO4: Identify the knowledge systems by applying appropriate learning techniques.	K3
	CO5: Analyze the different types of expert systems.	K4
Pre-requisites	basic mathematics concepts, Programming language	

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

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	1	2	3			1	2	2		2	1	1	
CO 2	2	1	2	3	2			2	3	2		3	2	2	
CO 3	3	2	3	2	2			3	2	2		2	3	3	
CO 4	2	1	1	3	3			2	1	3		2	1	2	
CO 5	3	3	2	2	3			3	2	3		3	3	3	

Course Assessment Methods

Direct

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

Indirect

1. Course - end survey

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Content of the syllabus

Unit – I	**INTRODUCTION TO Al AND PRODUCTION SYSTEMS**	Periods	**9**
Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized production system-Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breadth first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.			
Unit – II	**REPRESENTATION OF KNOWLEDGE**	Periods	**9**
Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.			
Unit - III	**KNOWLEDGE INFERENCE**	Periods	**9**
Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.			
Unit – IV	**PLANNING AND LEARNING**	Periods	**9**
Basic plan generation systems - Strips -Advanced plan generation systems – K strips -Strategic explanations -Why, Why not and how explanations. Learning- Statistical learning - Reinforcement learning.			
Unit - V	**EXPERT SYSTEMS**	Periods	**9**
Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition –Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XCON, Expert systems shells			
		Total Periods	**45**

Text Books

1.	Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013
2.	Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE) ", McGraw Hill – 2010. (Units-I,II,VI & V)

References

1.	Stuart Russel and Peter Norvig "AI – A Modern Approach", 3rd Edition, Pearson Education 2015.
2.	Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007.(Unit-III)
3.	Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.

E-Resources

1.	http://www.sciencedirect.com/bookseries/foundations-of-artificial-intelligence
2.	https://www.javatpoint.com/knowledge-representation-in-ai
3.	https://thegradient.pub/when-ai-plans-ahead/
4.	https://en.wikipedia.org/wiki/Expert_system
5.	http://www-formal.stanford.edu/jmc/whatisai/

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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	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**V**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS520	**Computer Networks**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Describe the basics and functions of OSI layers • Recognize the different internetworking devices and their functions. • Understand the concepts of Routing and Addressing • 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: Identify the different components, categories of Computer Networks and Demonstrate the Layered Architecture.	K2
	CO2: Describe the design issues of data link layer, media access control protocols & internetworking protocols.	K3
	CO3: Apply appropriate routing algorithms and multicast routing techniques.	K3
	CO4: Illustrate the functions and protocols of the transport layer , congestion control techniques and Quality of Service requirements for a network	K3
	CO5: Analyze the features and operations of various application layer protocols such as HTTP, DNS, and SMTP	K3
Pre-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**	**PSO 1**	**PSO 2**	
CO 1	3	2	3	2	2					2		3	1	2	
CO 2	3	3	2	2	3	2				2		2	2	2	
CO 3	3	3	3	3	2					2		2	3	2	
CO 4	3	2	3	2	3					2		1	2	3	
CO 5	2	3	2	2	1					3		2	2	3	

Course Assessment Methods

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

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Content of the syllabus			
Unit – I	**FUNDAMENTALS & LINK LAYER**	Periods	**9**
Building a network – Requirements - Layering and protocols - Internet Architecture – Network software – Performance ; Link layer Services - Framing - Error Detection - Flow control.			
Unit - II	**MEDIA ACCESS & INTERNETWORKING**	Periods	**9**
Media access control - Ethernet (802.3) - Wireless LANs – 802.11 – Bluetooth - Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP,ICMP)			
Unit – III	**ROUTING**	Periods	**9**
Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast –addresses – multicast routing (DVMRP, PIM)			
Unit - IV	**TRANSPORT LAYER**	Periods	**9**
Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management – Flow control - Retransmission – TCP Congestion control - Congestion avoidance (DECbit, RED) – QoS –Application requirements			
Unit – V	**APPLICATION LAYER**	Periods	**9**
Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS - SNMP			
		Total Periods	**45**

Text Books	
1.	Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Sixth Edition, Morgan Kaufmann Publishers, 2021.
References	
1.	James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Eight Edition, Pearson Education, 2021.
2.	Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.
3.	Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", Mc Graw Hill Publisher, 2011.
4.	Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, TMH, 2011.
5.	Andrew S. Tanenbaum, David Wetherall, Computer Networks,Pearson, 2011
E-Resources	
1.	https://book.systemsapproach.org/
2.	https://cseweb.ucsd.edu/classes/wi19/cse124-a/courseoverview/compnetworks.pdf
3.	https://booksite.elsevier.com/9780123850591/lec.php
4.	https://slideplayer.com/slide/3550313/

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Programme	**B.E.**	Programme Code	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**V**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS521	**Microprocessor and Interfacing**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Study the Architecture of 8085 microprocessor.
- Learn the design aspects of I/O and Memory Interfacing circuits.
- Study the addressing modes and instruction set of 8085 and 8086.
- Study the Architecture of 8086 microprocessor.
- Develop skill in simple program writing for 8085 and 8086 applications.

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Explain the architecture of Microprocessor, addressing modes & instruction set of 8085.	K2
	CO2: Use of Interrupt structure 8085 and programming.	K2
	CO3: Interpret 8086 signals and bus operations.	K3
	CO4: Interpret and execute programs based on 8086 microprocessor.	K3
	CO5: Interface I/O units with 8086 processor	K2

Pre-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**	**PSO 1**	**PSO 2**
CO 1	3	2	1	1									2	2
CO 2	3	2	1	1									2	2
CO 3	3	2	1	1									2	2
CO 4	3	2	1	1									2	2
CO 5	3	2	1	1									2	2

Course Assessment Methods

Direct

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

Indirect

1. Course - end survey

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Content of the syllabus			
Unit – I	**INTRODUCTION TO 8-BIT MICROPROCESSOR**	Periods	**9**
General 8-bit microprocessor and its architecture - 8085 functional block diagram - Pin configurations – Memory organization - I/O ports -Timing Diagram.			
Unit – II	**INSTRUCTION SETS AND ASSEMBLY LANGUAGE PROGRAMMING OF 8085 PROCESSOR**	Periods	**9**
Interrupts - Instruction Set: Format and addressing modes – Data transfer, Arithmetic, Logical, Branch, Stack and Machine control group of instruction set - Assembly Language Programming.			
Unit - III	**THE 8086 INTRODUCTION**	Periods	**9**
Register Organization 8086, Architecture, Pin Configuration, Maximum Mode and Minimum Mode Systems and Timings, Addressing Modes.			
Unit – IV	**8086 PROGRAMMING**	Periods	**9**
Instruction Set, Assembly Language Programming, Simple Assembly Language Programs, Stack, Interrupts and Interrupt Service Routines			
Unit - V	**Peripheral Interfacing with 8086**	Periods	**9**
Interfacing with 8255, Programmable Interval Timer 8254, The keyboard Display Controller 8279, Programmable Communication Interface 8251			
		Total Periods	**45**

Text Books	
1.	R.S. Gaonkar, Microprocessor Architecture Programming and Application‟, with 8085, Wiley Eastern Ltd., New Delhi, 2013.
2.	K. M. Bhurchandi, A. K. RAY, "Advanced Microprocessor And Peripherals" McGraw Hill, 3rd Edition, 2013.
References	
1.	Yu-Cheng Liu, Glenn A. Gibson, - Microcomputer Systems: The 8086 / 8088 Family – Architecture, Programming and Design‖, 2nd Edition, Prentice Hall of India, 2014.
2.	Krishna Kant, - Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096‘‘, PHI, 2007, 7th Reprint, 2015.
3.	Barry B. Brey, "Intel Microprocessors", Architecture, Programming, and Interfacing, 8th Edition, Pearson Education, 2009.
4.	Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, ―The 8051 Microcontroller and Embedded Systems: Using Assembly and C‖, 2nd Edition, Pearson Education, 2011.
E-Resources	
1.	https://dlscrib.com/download/advanced-microprocessors-and-periperals-by-a-k-ray-and-k-m-bhurchandi_586a24736454a7214a35c120_pdf
2.	https://www.researchgate.net/publication/344729598_Microprocessors_and_Microcontrollers_Architecture_Programming_Interfacing_using_8085_8086_and_8051_by_SK_Mandal_z-liborg
3.	https://www.worldcat.org/title/microprocessors-and-interfacing-programming-and-hardware/oclc/611374608
4.	https://pdfcoffee.com/ak-ray-and-km-bhurchandi-advanced-microprocessors-and-peripherals-3e-tata-mcgraw-hill-2012pdf-pdf-free.html

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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	**101**	Regulation	**2019**		
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**V**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
U19CS522	**Theory of Computation**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Construct finite state machines and the equivalent regular expressions. • Prove the equivalence of languages described by finite state machines and regular expressions • Construct CNF and GNF and the equivalent context free grammars. • Prove the equivalence of languages described by pushdown automata and context free grammars. • Construct Turing machines to prove the equivalence of languages described by Turing machines	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Analyze and design finite automata	K3
	CO2: Design finite state automata, regular grammar, regular expression and Myhill-Nerode relation representations for regular languages	K2
	CO3: Classify formal languages into regular, context-free and Simplification of CFG	K3
	CO4: Describe the Pushdown Automata and pumping lemma for CFL	K3
	CO5: Understand the notions of decidability and un-decidability of problems, Halting problem and Design of Turing machine	K3
Pre-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**	**PSO 1**	**PSO 2**	
CO 1	3	3	2	2	1	0	0	1	1	3	0	2	2	3	
CO 2	2	3	3	1	1	0	0	3	1	1	0	3	2	3	
CO 3	3	2	3	2	2	0	0	1	2	2	0	2	3	2	
CO 4	2	3	3	1	1	0	0	2	1	1	0	3	3	2	
CO 5	3	3	2	1	2	0	0	1	2	2	0	3	3	2	

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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	**FINITE AUTOMATA**	Periods	**9**
Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions – Finite Automaton – DFA & NDFA – Finite Automaton with €- moves.			
Unit - II	**REGULAR LANGUAGES**	Periods	**9**
Regular Languages- Regular Expression – Equivalence of NFA and DFA – Equivalence of NDFA's with and without €-moves – Equivalence of finite Automaton and regular expressions –Minimization of DFA- Pumping Lemma for Regular sets – Problems based on Pumping Lemma.			
Unit – III	**GRAMMARS**	Periods	**9**
Grammar Introduction– Types of Grammar - Context Free Grammars and Languages– Derivations and Languages – Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG – Elimination of Useless symbols - Unit productions - Null productions – Greibach Normal form –Chomsky normal form – Problems related to CNF and GNF.			
Unit - IV	**PUSHDOWN AUTOMATA**	Periods	**9**
Pushdown Automata- Definitions –Moves–Instantaneous descriptions–Deterministic pushdown automata– Equivalence of Pushdown automata and CFL-pumping lemma for CFL– problems based on pumping Lemma.			
Unit – V	**TURING MACHINES**	Periods	**9**
Definitions of Turing machines – Models – Computable languages and functions –Techniques for Turing machine construction – Multi head and Multi tape Turing Machines - The Halting problem – Partial Solvability – Problems about Turing machine.			
		Total Periods	**45**

Text Books

1.	Hopcroft J.E., Motwani R. and Ullman J.D, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2008.

References

1.	John C Martin, "Introduction to Languages and the Theory of Computation", Third Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007.
2.	"Introduction to Theory of Computation", Michael Sipser, Third Edition, Published by Course Technology, 2006.
3.	Mishra K L P and Chandrasekaran N, "Theory of Computer Science - Automata, Languages and Computation", Third Edition, Prentice Hall of India, 2016.
4.	RajendraKumar,Theory of Automata Language &Computation,Tata McGraw Hill,New Delhi,2010.
5.	Kamala Krithivasan and R. Rama, Introduction to Formal Languages, Automata Theory and Computation, Pearson Education, Delhi, 2009.

E-Resources

1.	https://www.gatevidyalay.com/theory-of-automata-computation/
2.	https://www.tutorialspoint.com/automata_theory/index.htm
3.	https://academyera.com/theory-of-computation-gate-questions
4.	https://www.geeksforgeeks.org/lmn-toc/

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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	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**V**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS523	**Computer Networks Laboratory**	0	0	4	2	60	40	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 TCP, UDP, FTP, DNS and SNMP. • Work on Network simulator to implement congestion control algorithm • Compare the performance of various routing protocols. • Show the router configuration using packet tracer	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Implement the transmission control protocols such as stop &wait and sliding window protocols	K3
	CO2:.Configure Network related commands (PING and TRACEROUTE)	K3
	CO3: Develop simple applications using TCP and UDP.	K3,K4
	CO4:. Demonstrate the routing and Congestion Control algorithm using NS2 simulator for real time applications.	K4
	CO5: Implement router configuration using CISCO packet tracer	K3,K4
Pre-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**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	3	2	3	2	2			2	2	3		2	2	2	
CO 2	3	2	3	2	3			2	2	3		2	2	2	
CO 3	3	2	3	3	3			3	3	3		2	2	3	
CO 4	3	3	3	3	3			3	3	3		2	3	2	
CO 5	3	3	3	2	3			2	3	3		2	3	3	

Course Assessment Methods

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

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LIST OF EXPERIMENTS	Course Outcome
1. Implementation of Stop and Wait Protocol and Sliding Window Protocol.	CO1
2. Write a code simulating PING and TRACEROUTE commands	CO2
3. Applications using TCP Sockets like a. Echo client and echo server b. Chat **c.** File Transfer	CO3
4. Applications using TCP and UDP Sockets like a. DNS b. SNMP	CO3
5. Simulation of Congestion Control Algorithms using Network Simulator (NS)	CO4
6. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer using NS2 Simulator. a. Link State routing b. Flooding **c.** Distance vector	CO4
7. Introduction to packet tracer	CO5
8. Router Configuration (Creating Passwords, Configuring Interfaces)	CO5
Total Periods	**45**

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Programme	**B.E.**	Programme Code	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**V**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS524	**Hardware Laboratory**	0	0	4	2	60	40	100

Course Objective	The student should be made to, • Introduce ALP concepts, features and Coding methods • Write ALP for arithmetic and logical operations in 8086 and 8051. • Differentiate the Serial and Parallel Interface. • Interface different I/Os with Microprocessors. • Determine the operation of Microprocessors, Arduino and PIC.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Implement a program for Simple arithmetic operations	K2
	CO2: Implement a program for Code conversions.	K3
	CO3: Implement a program for Sorting and searching.	K4
	CO4: Evaluate the data transfer information through serial & parallel ports with Microprocessors.	K3
	CO5: Implement the program for 8279, 8259, and 8253 using Interfaces.	K4
Pre-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	3						2	2			2	2
CO 2	3	3	3						2	2			2	2
CO 3	3	3	3						2	2			2	3
CO 4	3	3	3		3				2	2		2	2	2
CO 5	3	3	3		3				2	2		2	2	2

Course Assessment Methods

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

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LIST OF EXPERIMENTS	Course Outcome
8085 programs	
1. Simple arithmetic operations using 8085: a. addition b. subtraction c. multiplication d. division.	CO1
2. Programming with control instructions: a. Sorting and searching of numbers. b. Counting of odd and even numbers in a block of data. c. Counting of positive and negative numbers in a block of data	CO2
3. Programs for Code conversions.	CO2
8086 programs	
1. Programs for 16 bit Arithmetic operations	CO1
2. Programs for Sorting and Searching	CO3
3. Serial communication interfacing with 8086	CO4
4. Parallel Communication between two MP Kits using Mode 1 and Mode 2 of 8255	CO4
5. Interfacing and Programming 8279	CO5
6. Interfacing and Programming 8259	CO5
7. Interfacing and Programming 8253	CO5
Total Periods	**45**

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Programme	**B.E./B.Tech.**	Programme Code				Regulation		**2019**
Department	**CSE,EEE,ECE,BT,BME,CST**					Semester		**-**
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 the odd 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], Nu**mber, 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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Semester - VI

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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	**101**	Regulation	**2019**		
Department	**Computer Science and Engineering**			Semester	**VI**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
U19CS625	**Cloud Computing**	3	0	0	3	40	60	100

Course Objective	The Student should be made to, • Insight into the basics of cloud computing and traditional network infrastructure to a Cloud • Understand the concept of Virtualization • Emphasizes on how to build cloud Architecture • Interpret the Scheduling , Storage systems and Amazons AWS instances • Understand the need for security and cloud applications	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Summarize the fundamental principles of Cloud computing	K2
	CO2: Examine the importance of virtualization and how this has enabled the development of Cloud Computing.	K3
	CO3: Describes the knowledge about cloud Architecture	K3
	CO4: Design and develop deployable Amazons AWS instances	K4
	CO5: Recognize the concept of Cloud Security and cloud applications	K2
Pre-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**	**PSO 1**	**PSO 2**
CO 1	2	2	3	2	2	0	0	3	2	2	0	2	2	2
CO 2	2	3	3	2	2	0	0	3	2	3	0	3	2	3
CO 3	3	2	3	3	3	0	0	2	2	3	0	2	3	3
CO 4	3	3	3	2	2	0	0	3	2	2	0	3	3	2
CO 5	2	2	3	3	3	0	0	2	2	3	0	2	2	3

Course Assessment Methods

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

Content of the syllabus

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Unit – I	CLOUD COMPUTING BASICS	Periods	9
System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:-Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS)–Public vs Private Cloud– Cloud Solutions-Cloud ecosystem–Service management– Computing on demand.			
Unit - II	**VIRTUALIZATION**	Periods	**9**
Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Virtualization of CPU, Memory, I/O Devices - Virtual Private Cloud(VPC)-Virtual Clusters and Resource management – Virtualization for Data-center Automation			
Unit – III	**CLOUD ARCHITECTURE**	Periods	**8**
Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.			
Unit - IV	**SCHEDULING AND STORAGE SYSTEMS**	Periods	**10**
Scheduling Algorithms for Computing Clouds- Borrowed Virtual Time- Cloud Scheduling Subject to Deadlines-Scheduling MapReduce Applications Subject to Deadlines. Storage Systems: Google file system-Apache Hadoop- Big Table, Megastore, Amazon Simple Storage Service (S3)-,HDFS, Hive, Java AWS DK, S3 API, Microsoft Azure - SimpleDB Service, NoSQL Databases - Create and manipulate Amazon instances in Amazons AWS.			
Unit – V	**SECURITY AND APPLICATIONS OF CLOUD**	Periods	**9**
Security Overview–Cloud Security Challenges and Risks–Security Governance– Risk Management–Security Monitoring–Virtual Machine Security-Identity Management and Access Control .Applications: Scientific Applications – Healthcare –Biology – Geo science – Business and Consumer Applications.			
		Total Periods	**45**

Text Books	
1.	RajkumarBuyya, Christian Vecchiola and ThamaraiSelvi S, "Mastering Cloud Computing", Tata McGraw Hill Education Private Limited, New Delhi, 2013.
2.	Distributed and Cloud Computing, Kaittwang Geoffrey C.Fox and Jack J Dongrra, Elsevier India 2012.
3.	Distributed and Cloud Computing, Kai Hwang, Jack Dongarra, Geoffrey C. Fox,O'Reilly, 2013
References	
1.	Cloud Computing: Implementation, Management and Security, John W.Rittinghouse, James F.Ransome, CRC Press, RP 2012.
2.	Dan C. MarinescuCloud Computing: Theory and Practice, Morgan kaufmann publishers, Second edition 2017,Elsevier
3.	Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH,2017
E-Resources	
1.	https://onlinecourses.nptel.ac.in/noc20_cs20/preview
2.	https://www.elsevier.com/books/cloud-computing/marinescu/978-0-12-812810-7
3.	https://www.jigsawacademy.com/blogs/cloud-computing/implementation-levels-of-virtualization-in-cloud-computing/
4.	https://electricalfundablog.com/cloud-storage-architecture-types/
5.	https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/EC2_GetStarted.html

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205						
Programme	**B.E. / B.Tech.**	Programme Code		Regulation	**2019**		
Department	**CSE & IT**			Semester	**VI**		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS626	**Compiler Design**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Enrich the knowledge in various phases of compiler
- Define the role of lexical analyzer, use of regular expression and transition diagrams
- Extend the knowledge of parser by parsing LL parser and LR parser.
- Construct dynamic run-time stack
- Enrich the knowledge in code optimization techniques, machine code generation, and use of symbol table.

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Demonstrate the role of compilers and describe the phases of compiler	K2
	CO2: Apply automata theory and knowledge on formal languages and improve the Minimization of DFA	K3
	CO3: Categorize and illustrate the different top- down parsing and bottom-up parsing techniques.	K3
	CO4: Design syntax directed translation schemes and intermediate code generation process and interpret the use of runtime environment	K4
	CO5: Apply the code optimization techniques to improve the performance of a program.	K4

Pre-requisites	programming language

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	2	3	3	2					2	1		2	2	2
CO 2	3	3	3	3	2				2	1		2	3	3
CO 3	3	3	3	3	3		2		3	1	1	3	3	3
CO 4	3	3	3	2	2		1		2	2	1	2	2	2
CO 5	3	3	3	2	2		2		2	3		3	3	3

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment/Quiz/Seminar/Case Study **3.** End-Semester examinations
Indirect
1. Course - end survey

Content of the syllabus

Unit – I	**INTRODUCTION TO COMPILERS**	Periods	**8**

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Translators-Compilation and Interpretation-Language processors -The Phases of Compiler-Errors Encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools - Programming Language basics			
Unit - II	**LEXICAL ANALYSIS**	Periods	**9**
Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX.			
Unit – III	**SYNTAX ANALYSIS**	Periods	**10**
Need and Role of the Parser-Context Free Grammars -Top Down Parsing -General Strategies-Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item-Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC.			
Unit - IV	**SYNTAX DIRECTED TRANSLATION & RUN TIME ENVIRONMENT**	Periods	**9**
Intermediate Languages -Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions. RUN-TIME ENVIRONMENT: Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing-Symbol Tables-Dynamic Storage Allocation.			
Unit – V	**CODE OPTIMIZATION AND CODE GENERATION**	Periods	**9**
Principle Sources of Optimization-DAG- Optimization of Basic Blocks-Global Data Flow Analysis-Efficient Data Flow Algorithms-Issues in Design of a Code Generator - A Simple Code Generator Algorithm.			
		Total Periods	**45**

Text Books	
1.	Alfred V Aho, Monica S Lam, Ravi Sethi &Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", 2nd Edition, Pearson Education, India, 2014.
References	
1.	O.G. Kakde, "Compiler Design", 5th Edition, An Imprint of Laxmi Publications Pvt. Ltd., 2015.
2.	V Raghavan , "Principles Of Compiler Design", Tata Mcgraw Hill Publishing Co Ltd, 2016.
3.	Randy Allen, Ken Kennedy,―Optimizing Compilers for Modern Architectures: A Dependence-based Approach‖, Morgan Kaufmann Publishers, 2009
4.	Steven S. Muchnick, ―Advanced Compiler Design and Implementation, ―Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2007
5.	Charles N. Fischer, Richard. J. LeBlanc ―Crafting a Compiler with C‖, Pearson Education, 2008
E-Resources	
1.	https://nptel.ac.in/courses/106/105/106105190/
2.	https://www.geeksforgeeks.org/compiler-design-tutorials/
3.	https://nptel.ac.in/courses/106/108/106108113/
4.	gatecse.in/category/compiler-design/
5.	www.tutorialspoint.com/compiler_design

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Programme	**B.E.**	Programme Code	**101**	Regulation	**2019**		
Department	**Computer Science and Engineering**			Semester	**VI**		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS627	**Internet of Things**	3	0	0	3	40	60	100

Course Objective

The Main Objective of the course is to

- Learn about the components of Internet of Things and characteristics
- Learn about IOT Architecture.
- Know the various protocols in IOT
- Know how to build an IOT Applications using Raspberry pi.
- Understand the real world design constraints of IOT.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Explain the building blocks of Internet of Things	K2
	CO2: Discuss the various models of IOT reference Architecture.	K2
	CO3: Identify the protocols for IOT	K2
	CO4: Construct the IOT components using Raspberry Pi.	K3
	CO5: Examine the various constraints with IOT working environment	K4

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**	**PSO1**	**PSO 2**
CO 1	3	2	3										3	2
CO 2	3	2	2									2	3	3
CO 3	3	2	3									2	2	3
CO 4	3	3	3	3	3				2	2		2	3	3
CO 5	3	3	3	3					2	2		2	3	3

Course Assessment Methods

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

Content of the syllabus

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Unit – I	INTRODUCTION TO INTERNET OF THINGS	Periods	9
Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG.			
Unit - II	**IOT ARCHITECTURE**	Periods	**9**
M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture			
Unit – III	**IOT PROTOCOLS**	Periods	**9**
Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– **Zigbee Architecture**: Network layer – Security. **Adaptation layer**: 6Lowpan- COAP.			
Unit - IV	**BUILDING IoT WITH RASPBERRY PI**	Periods	**9**
Python Packages of Interest for IoT, IoT Physical Devices & Endpoints: Building blocks – Raspberry Pi Board – Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python – Case study: Parcel Delivery Detector, Curtain Automation			
Unit – V	**REAL WORLD DESIGN CONSTRAINTS**	Periods	**9**
Introduction – Technical Design constraints – Data representation and visualization – Interaction and remote Control. Internet of Things Privacy, Security and Governance – Case Studies: Smart Grid – Electrical Vehicle Charging.			
		Total Periods	**45**

Text books:

1.	Honbo Zhou ,"The Internet of Things in the Cloud: A Middleware Perspective",CRC Press, 2012
2.	Jan Ho¨ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle," From Machine-to-Machine to the Internet of Things Introduction to a New Age of Intelligence", Academic print of Elsevier, 2014.
3.	Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1st Edition, Orient Blackswan Private Limited, 2015

References:

1.	Sudip Misra,Anandarup Mukherjee,Arijit Roy, "Introduction to IoT", Cambridge University Press, 2021.
2.	Olivier Hersent, Omar Elloumi and David Boswarthick ," The Internet of Things: Key applications and Protocols", Wiley, 2012.
3.	Andrew K. Dennis, "Raspberry Pi Home Automation with Arduino", Packt Publishing, 2015.
4.	David Hanes,Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", Ciscopress, 2017.
5.	Olivier Hersent, Omar Elloumi and David Boswarthick ,"The Internet of Things: Applications to the Smart Grid and Building Automation", Wiley, 2012
6.	Ovidiu Vermesan ,Peter Friess ,"Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers, 2013.

E-Resources

1.	https://www.edureka.co/blog/iot-tutorial/
2.	https://www.geeksforgeeks.org/architecture-of-internet-of-things-iot/
3.	https://www.techtarget.com/iotagenda/
4.	https://docs.arduino.cc/cloud/iot-cloud/tutorials/iot-cloud-getting-started
5.	https://www.tutorialspoint.com/raspberry_pi/index.htm

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**B.E/B.Tech.**	Programme Code			Regulation			**2019**
Department	**CSE & IT**				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	40	60	100

Course Objective	The student should be made to, • Defined as a simplified representation of a software process. Each model represents 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: Apply the requirement engineering tasks to identify the requirements for a given scenario.	K3
	CO3: Implement the designed 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	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 1K3	3	3	2	1									3	3
CO 2K3	3	2	1	1									3	3
CO 3K3	3	2	1	1									3	3
CO 4K3	3	2	1	1									3	3
CO 5K3	3	2	1	1									3	3

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	**PROCESS MODELS**	Periods	9

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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.			
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 – SCM repository – SCM process.			
		Total Periods	**45**

CASE STUDY:

Only for Assignment not for end sem 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.tutorialspoint.com/software_testing/index.htm

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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			**101**	Regulation		**2019**	
Department	**COMPUTER SCIENCE AND ENGINEERING**					Semester		**VI**	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
U19CS628	**Compiler Design Laboratory**	0	0	4	1	60	40	100	

Course Objective	The student should be made to, • Implement Lexical Analyzer using Lex tool • Implement Syntax Analyzer or parser using YACC Tool • Implement of a type checker. • Implement front end of the compiler by means of generating Intermediate codes. • Implement code optimization techniques.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: implement the program for symbol table creation	K3
	CO2: Apply the knowledge of Lex and Yacc tools to develop programs	K3
	CO3: implement the dataflow and control flow analysis and storage allocation strategies	K4
	CO4: implement the program for DAG and generate the assembly instruction and addressing modes	K3
	CO5: Identify the code optimization techniques and applied to improve the performance of a program in terms of speed and space.	K4
Pre-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	3		2					2		2	3	2
CO 2	3	3	2		2					2		2	2	2
CO 3	3	3	3		2					2		2	2	3
CO 4	3	3	3		2					2		2	2	2
CO 5	3	3	2		2					2		2	3	2

Course Assessment Methods

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

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LIST OF EXPERIMENTS	Course Outcome
1. Implementation of Symbol Table	CO1
2. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.)	CO2
3. Implementation of Lexical Analyzer using Lex Tool	CO2
4. Implementation of Calculator using LEX and YACC	CO2
5. Implement control flow analysis and Data flow Analysis	CO3
6. Implement any one storage allocation strategies(Heap ,Stack, Static)	CO3
7. Construction of DAG	CO4
8. Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler. The target assembly instructions can be simple move, add, sub, jump. Also simple addressing modes are used.	CO4
9. Implementation of Simple Code Optimization Techniques (Constant Folding. etc.)	CO5
Total Periods	**45**

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Programme	**B.E.**	Programme Code	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**VI**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS629	**Cloud and IoT Laboratory**	0	0	4	2	60	40	100

Course Objective	The student should be made to, • Learn to use of tools in Arduino • Understand to use of tools in Raspberry PI • Design application using NODEMCU for interfacing and control • Design and deploy a web application in AWS Cloud. • Upload data on cloud for further analysis and visualization	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Use of tools in Arduino and Raspberry PI in IoT	K4
	CO2: Utilization of microcontroller based embedded platforms in IoT	K4
	CO3: Applications of Devices, Gateways and Data Management in IoT	K3
	CO4: Use wireless peripherals for exchange of data	K3
	CO5: Make use of Cloud platform to upload and analyze any sensor data	K3
Pre-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**	**PSO 1**	**PSO 2**	
CO 1	3	3	3		2							2	2	2	
CO 2	3	3	3		2							2	2	2	
CO 3	3	3	3		2							2	2	3	
CO 4	3	3	3		2							2	2	2	
CO 5	3	3	3		2							2	2	2	

Course Assessment Methods

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

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LIST OF EXPERIMENTS	Course Outcome
1. Introduction to Arduino platform and programming	CO1
2. Design a system to find the obstacle distance using Arduino	CO1
3. Design a project to count the number of visitors using Arduino	CO1
4. Interfacing Arduino to GSM Module	CO2
5. Interface a gas sensor and find the gas level using NODEMCU	CO4
6. Control an LED via a webpage with the help of NODEMCU	CO4
7. Introduction to Raspberry PI platform and python programming	CO1
8. Interfacing sensors to Raspberry PI	CO4
9. Create an application using Amazon AWS.	CO5
10. Create Log Data using Raspberry PI and upload to the cloud platform	CO3
Total Periods	**45**

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Programme	**B.E.**	Programme Code	**101**		Regulation	**2019**		
Department	**COMPUTER SCIENCE AND ENGINEERING**				Semester	**-**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19MCTY6	**PERSONALITY EVELOPMENT**	2	0	0	-	100	-	100

Content of the syllabus

Unit – I	**NUMERICAL ABILITY**	Periods	**6**
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	**6**
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	**6**
Resume Preparation – Mock GD – Interview Etiquette – Mock Interview – Reading Comprehension – Essay Writing			
Unit - IV	**TECHNICAL SKILLS I**	Periods	**6**
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	**6**
Pointers – String Handling – Structures & Unions – File Handling – Pre Processor Directives – Command Line Arguments & Variables – Searching & Sorting – Stack – Queue – Linked List – Trees			
		Total Periods	**30**

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Semester -VII

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Programme	**B.E.**	Programme code	**101**	Regulation	**2019**			
Department	**Computer Science and Engineering**			Semester	**VII**			
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS730	**Machine Learning**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Acquire theoretical knowledge on setting hypothesis for pattern recognition • Analyze the importance of supervised and unsupervised machine learning algorithms • Apply suitable machine learning techniques for data handling and to gain knowledge from it • Evaluate the performance of algorithms and to provide solution for various real-world applications.	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Identify the perspectives of machine learning and formulating hypothesis	K2
	CO2: Apply regression and classification algorithms for real world problems	K2
	CO3: Design a clustering and association algorithms for solving a given problem	K3
	CO4: Create Reinforcement & Instance Based Learning models for decision making	K2
	CO5: Solve optimization problem using the Genetic Algorithms & Learning Sets of Rule	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	3	2	1	2	2								3	2
CO 2	3	2	1	1	3								3	2
CO 3	3	2	1	1	3								3	2
CO 4	3	2	1	2	3								3	2
CO 5	3	2	1	2	2								3	2

Course Assessment Methods

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

Content of the syllabus

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Unit – I	Introduction	Periods	9
Learning Problems – Designing a Learning System – Perspectives and Issues in Machine Learning – Concept Learning – task – search – finding maximally specific Hypotheses – version spaces and candidate elimination algorithm – inductive bias.			
Unit – II	**Supervised Learning**	Periods	**9**
Linear Regression – Non Linear Regression – Decision Tree Learning: Decision Tree Representation – Problems – basic decision tree learning algorithms –hypotheses search – Issues – Bayesian Learning: Bayes Theorem – Maximum Likelihood and Least-Squared Error Hypothesis – Bayes Optimal Classifier - Naïve Bayes Classifier –. Random forest.			
Unit – III	**Unsupervised Learning**	Periods	**9**
k-Nearest Neighbour Learning – KMeans – K Medoids – Principle Component Analysis-Artificial Neural Networks: Introduction – Representations – Problems – Perceptrons – Multilayer networks and Back Propagation Algorithm – example.			
Unit – IV	**Reinforcement & Instance Based Learning**	Periods	**9**
Reinforcement Learning: Introduction – Markov Decision Processes - Values- SARSA vs Q-Learning Instance Based Learning: Introduction –Locally Weighted Regression – Radial Basis Functions – Case-Based Reasoning.			
Unit – V	**Genetic Algorithms & Learning Sets of Rules**	Periods	**9**
Genetic Algorithms: Introduction – Example – Hypothesis Space Search – Genetic Programming- Models of Evolution and Learning – Parallelizing Genetic Algorithms.-Learning sets of rules: Introduction – sequential covering algorithms – First order rules – FOIL – Induction as Inverted deduction – inverting resolution.			
		Total Periods	**45**

Textbooks	
1.	Tom M. Mitchell, "Machine Learning", 1st Edition, McGraw-Hill Education, India, 2017.
2.	Stephen Marsland, "Machine Learning – An Algorithmic Perspective", 2nd Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
References	
1.	Jiawei Han &Micheline Kamber, "Data Mining Concepts and Techniques", 3rd Edition, Elsevier, 2012.
2.	Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012
E-Resources	
1.	https://en.wikipedia.org/wiki/Unsupervised_learning
2.	https://blog.statsbot.co/probabilistic-graphical-models-tutorial-and-solutions-e4f1d72af189
3.	https://www.geeksforgeeks.org/what-is-reinforcement-learning/
4.	https://ml2.inf.ethz.ch/courses/aml/
5.	https://www.javatpoint.com/machine-learning

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Programme	**B.E.**	Programme code	**101**		Regulation		**2019**	
Department	**Computer Science and Engineering**				Semester		**VII**	
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS731	**Mobile Computing**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Understand the basic concepts of mobile computing. • Learn the basics of mobile telecommunication system. • Learn the basics of network and transport layer protocols in mobile communication. • Be exposed to Ad-Hoc networks. • Gain knowledge about different mobile platforms and application development.	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Outline the diaries of Mobile computing.	K2
	CO2: Illustrate the functionalities of mobile IP & transports layer.	K2
	CO3: Utilize the concepts and features of GSM, GPRS and UMTS.	K3
	CO4: Demonstrate the Adhoc network concepts and its routing protocols	K2
	CO5: Make use of mobile OS in developing mobile applications.	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	3	2	1										3	2
CO 2	3	2	1	1	1								3	2
CO 3	3	2	1	1	1								3	2
CO 4	3	2	1										3	2
CO 5	3	2	1										3	3

Course Assessment Methods

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

Content of the syllabus

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Unit – I	INTRODUCTION	Periods	9
Mobile Computing–Mobile Computing Vs Wireless Networking–Mobile Computing Applications–Characteristics of Mobile computing–Structure of Mobile Computing Application. MAC Protocols–Wireless MAC Issues–Fixed Assignment Schemes–Random Assignment Schemes – Reservation Based Schemes.			
Unit – II	**MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER**	Periods	**9**
Overview of Mobile IP–Features of Mobile IP–Key Mechanism in Mobile IP–route Optimization. Overview of TCP/IP–Architecture of TCP/IP-Adaptation of TCP Window–Improvement in TCP Performance.			
Unit – III	**MOBILE TELECOMMUNICATION SYSTEM**	Periods	**9**
Global System for Mobile Communication (GSM)–General Packet Radio Service (GPRS)–Universal Mobile Telecommunication System (UMTS).			
Unit – IV	**MOBILE AD-HOC NETWORKS**	Periods	**9**
Ad-Hoc Basic Concepts–Characteristics–Applications–Design Issues–Routing–Essential of Traditional Routing Protocols–Popular Routing Protocols–Vehicular Ad Hoc networks (VANET)–MANET Vs VANET – Security.			
Unit – V	**MOBILE PLATFORMS AND APPLICATIONS**	Periods	**9**
Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android.			
		Total Periods	**45**

Textbooks	
1.	Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt. Ltd, New Delhi – 2018.
2.	Jochen H. Schller, "Mobile Communications", Second Edition, Pearson Education, New Delhi, 2008.
References	
1.	Dharma PrakashAgarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
2.	UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
3.	William.C.Y.Lee,"Mobile Cellular Telecommunications-Analog and Digital Systems", Second Edition,TataMcGraw Hill Edition ,2006.
4.	C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.
E-Resources	
1.	https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxpdDY2MDFtb2JpbGVjb21wdXRpbmd8Z3g6N2ZhN2M4ZmMyZDk4ODdmNg
2.	https://www.javatpoint.com/mobile-computing
3.	Android Developers:http://developer.android.com/index.html
4.	Windows PhoneDevCenter:http://developer.windowsphone.com
5.	BlackberryDevelopers:http://developer.blackberry.com
6.	Apple Developer:https://developer.apple.com/

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Programme	**B.E.**	Programme Code		**101**	Regulation		**2019**	
Department	**COMPUTER SCIENCE AND ENGINEERING**				Semester		**VII**	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS732	**Machine Learning Laboratory**	0	0	4	2	60	40	100

Course Objective	The student should be made to, • Make use of Data sets in implementing the machine learning algorithms • Understand the implementation procedures for the machine learning algorithms. • Differentiate supervised, unsupervised and reinforcement learning • Apply neural networks, Bayes classifier and k nearest neighbor, for problems appear in machine learning. • Perform statistical analysis of machine learning techniques.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Implement the machine learning concepts and algorithms in any suitable language of choice.	K3
	CO2: Design Python programs for various Learning algorithms.	K3
	CO3: Apply appropriate data sets to the Machine Learning algorithms.	K4
	CO4: build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.	K4
	CO5: Investigate ANN, Bayes classifier, k nearest neighbor.	K4
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**	**PSO1**	**PSO 2**
CO 1	3	3	3	2	3							2	2	2
CO 2	3	3	3	2	3							2	2	2
CO 3	3	3	3	2	3							2	2	3
CO 4	3	3	3	2	3							2	2	2
CO 5	3	3	3	2	3							2	2	2

Course Assessment Methods

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

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LIST OF EXPERIMENTS	Course Outcome
1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.	CO1
2. Implement and demonstrate the Candidate-Elimination algorithm for a given set of training data stored in a .csv file.	CO1
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	CO2
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.	CO4
5. Write a program to implement the Naïve Bayes classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.	CO5
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.	CO3
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Python ML library classes/API.	CO5
8. Cluster a set of data stored in a .CSV file using the same data set for clustering using k-Means algorithm and EM algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Python ML library classes/API in the program.	CO5
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Python ML library classes can be used for this problem.	CO3
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.	CO2
Total Periods	**45**

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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	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**VII**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS733	**Internship Training and Summer Project**	0	0	8	4	100	-	100

Course Objective	The student should be made to, • Advance from an intellectual student to a creator and an industry professional. • Apply communication skills to explain technical problem solving techniques and solutions. • Collaborate within and across disciplinary boundaries to solve problems. • Exercise computational thinking over the entire software life cycle.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Gain industrial experience and to apply them in practical form	K2
	CO2: Understand the modern tools used in the field of computer science and engineering for product development	K2
	CO3: Deliver an effective presentation and inculcate team work ethics	K3
	CO4: Apply engineering and management values to accomplish project ambitions	K3
	CO5: : Write an effective internship report and to do mini project	K3
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**	**PSO1**	**PSO 2**
CO 1	3	2	3	3	2	2	2			3	3	3	3	3
CO 2	3	3	3	2	3	2					2	2	3	3
CO 3	2	2	2	2	1			1	3	2	2	1	3	3
CO 4	3	1	2	2	2	2	1	1	3				3	2
CO 5	3	3	2	2	1	3	1	2	2	1	3	2	3	3

Course Assessment Methods

Direct
1. Internship Training & Certification 2. Summer Project Development & Viva
Indirect
1. Course - end survey

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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	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**VIII**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CS834	**Project Work**	0	0	16	8	60	40	100

Course Objective	The student should be made to, • Explore their field of knowledge, which includes a critical awareness of current problems and/or new insights at the forefront of that field. • Understand of techniques applicable to their own area of professional practice. • Demonstrate originality in the application of knowledge, together with a practical understanding. • Demonstrate self-direction and originality in tackling and solving problems.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Review the literature and develop solutions for framed problem statement.	K2
	CO2: Implement hardware and/or software techniques for identified problems.	K3
	CO3: Analyze and test the modules of planned project.	K4
	CO4: Write technical report by applying different visualization tools and Evaluation metrics.	K3
	CO5: Apply engineering and management principles to achieve project goal.	K3
Pre-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	2	3	2	2	3			2	2	2	3	3	3	3
CO 2	1	3	3	3	3	2	2	2	2	2	2	3	3	3
CO 3	1	3	3	2	3			2	2	2	2	3	2	2
CO 4				3	3			2	2	2	3	3	2	2
CO 5				1	3	3	3	2	2		2	3	2	3

Course Assessment Methods

Direct
1. Project Reviews 2. End Semester Examinations
Indirect
1. Course - end survey

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Vertical Syllabus

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**B.E. / B.Tech.**	Programme code		Regulation	**2019**			
Department	**CSE, IT & CST**		Semester		**-**			
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV11	**Mobile Adhoc Networks**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Study the basic and emerging technologies in the context of ad-hoc networks • Understand the functioning of different Medium Access Protocols and routing protocols that can be used for ad-hoc networks. • Learn the concepts of Security issues for designing a routing protocol • understand the role of cross layer design in enhancing the network performance	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Remember and understand the principles on how mobility is dealt with in today's Internet and Mobile ad-hoc Networks	K2
	CO2: Discuss various MAC routing protocols function	K2
	CO3: Apply different routing technologies for designing a routing protocol.	K3
	CO4: Illustrate the security issues in adhoc networks	K2
	CO5: exposed to the advances in adhoc network design concepts	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	3	3	3	2	3			2			2	3	3	3
CO 2	3	2	3	3	3			1			2	3	3	3
CO 3	3	3	2	3	3						3	3	3	3
CO 4	3	3	3	2	2	2	2				2	3	3	3
CO 5	3	1	2	1	2						3	3	3	3

Course Assessment Methods

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

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Content of the syllabus			
Unit – I	**INTRODUCTION**	Periods	**9**
Introduction to ad-hoc networks – definition, characteristics features, applications. Characteristics of wireless channel, ad-hoc mobility models: indoor and outdoor models.			
Unit - II	**MEDIUM ACCESS PROTOCOLS**	Periods	**9**
MAC Protocols: Design issues, goals and classification. Contention based protocols – with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN			
Unit – III	**NETWORK PROTOCOLS**	Periods	**9**
Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing.			
Unit – IV	**END – END DELIVERY AND SECURITY**	Periods	**9**
Transport Layer: Issues in designing – Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.			
Unit – V	**CROSS LAYER DESIGN**	Periods	**9**
Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of adhoc with Mobile IP networks.			
		Total Periods	**45**

Textbooks	
1.	C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocollsll, 2nd edition, Pearson Education. 2011 (For units1,2 and 3)
2.	Charles E. Perkins, Ad hoc Networking!, Addison – Wesley, 2000 (For units 4 and 5)
References	
1.	Mohammad Ilyas, The handbook of adhoc wireless networks 1st Edition, CRC press, 2002.
2.	Erdal Qayirci and Chunming Rong c, Security in Wireless Ad Hoc and Sensor Networks 2009, John Wiley and Sons, Ltd.
3.	Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile ad-hoc networking, Wiley-IEEE press, 2004
4.	Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du: Ad-hoc Wireless Networking, Kluwer Academic Publishers, 2004.
E-Resources	
1.	Research, "Wireless Commun, and Mobile Comp.Special Issue on Mobile Ad-hoc Networking Research, Trends and Applications, Vol. 2, no. 5, 2002, pp. 483 – 502.
2.	A survey of integrating IP mobility protocols and Mobile Ad-hoc networks, Fekri M. bduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, no: 12007

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Programme	**B.E.**	Programme code	**101**	Regulation	**2019**			
Department	**Computer Science and Engineering**		Semester		**-**			
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV12	**Wireless Sensor Networks**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • learn basic concepts of Wireless sensor networks • Familiar with architecture and protocols used in Wireless sensor networks. • Provide knowledge of deployment and security issued of Wireless sensor networks. • Study the basic concepts Energy management • Provide knowledge of operating system for Wireless sensor networks	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1:explain the fundamentals of wireless sensor networks.	K2
	CO2:demonstrate various routing protocols for gathering information in Wireless sensor networks.	K2
	CO3:illustrate different schemes for energy management in wireless sensor networks.	K3
	CO4:summarize various challenges, attacks and countermeasures for attacks in wireless sensor networks.	K2
	CO5:describe and install various operating systems used in wireless sensor networks	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	2	1											2	3
CO 2	3	2		1	1								2	2
CO 3	3	2		1	1								2	3
CO 4	2	1											2	2
CO 5	2	1											2	2

Course Assessment Methods

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

Content of the syllabus

Unit – I	**Wireless Sensor Networks Architecture**	Periods	**9**

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Sensors – Sensor Node Architecture – Sensor Network Architecture – Mote Technology – Comparison of MANET and WSN –Requirements of a WSN – Challenges for a WSN – WSN Applications – Wireless Sensor Networks Architecture: Introduction – Network Protocol Stack – Communication Standards – IEEE 802.11 – IEEE 802.15.4 – ZigBee – 6LoWPAN.			
Unit - II	**Information Gathering**	Periods	**9**
Introduction – Routing – Flat-based Routing Algorithms – Sensor Protocols for Information Negotiation (SPIN) – Hierarchical Routing Algorithms – LEACH Routing Protocol – Information Gathering Based on Geographic Locations – Geographical Routing – Greedy Perimeter Stateless Routing – Landmark-based Routing – Data Aggregation – Content-based Naming.			
Unit – III	**Energy Management in WSN**	Periods	**9**
Introduction – Duty Cycling – Independent Strategies – Dependent Strategies – Independent Sleep/Wakeup Schemes – Asynchronous Schemes – TDMA-based MAC Protocols – Contention-based MAC Protocols – Hybrid MAC Protocols – Data-driven Approaches –Energy-aware Routing Protocols – Hierarchical Energy-aware Routing – Location-based Routing – Data Aggregation-based Routing.			
Unit – IV	**Security in WSN**	Periods	**9**
Introduction – Challenges in WSN – Attacks in WSN – Protection against Attacks – Key Management – Secure Routing in WSNs –Attacks on Routing Protocols – Countermeasures for Attacks – Intrusion Detection in WSN.			
Unit – V	**Operating Systems for WSNs**	Periods	**9**
Introduction – Architecture – Execution Model – Scheduling – Power Management – Communication – Case Study on Popular Operating Systems. Programming WSNs – Introduction – TinyOS – Contiki- Castalia – NS-3.			
		Total Periods	**45**

Textbooks	
1.	Nandini Mukherjee, Sarmistha Neogy & Sarbani Roy, "Building Wireless Sensor Networks Theoretical & Practical Perspectives",3rd Edition, CRC Press, Taylor & Francis Group, 2016.
2.	HolgerKarl& Andreas Willig, "Protocol and Architecture for Wireless Sensor Networks", John Wiley & Sons, 2006.
References	
1.	KazemSohraby, Daniel Minoli & TaiebZnati, "Wireless Sensor Networks Technology, Protocols and Applications", John Wiley &Sons, 2007
2.	Edgar H. Callaway, Jr. and Edgar H. Callaway, "Wireless Sensor Networks: Architectures and Protocols," CRC Press, August 2003,
E-Resources	
1.	https://www.coursera.org/lecture/internet-of-things-history/sensor-networks-n-to-1-iOmzK
2.	https://www.geeksforgeeks.org/wireless-sensor-network-wsn/
3.	https://www.tutorialspoint.com/what-are-wireless-sensor-networks
4.	https://www.electronicshub.org/wireless-sensor-networks-wsn/
5.	https://www.elprocus.com/architecture-of-wireless-sensor-network-and-applications/

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Programme	**B.E.**	Programme Code	**101**	Regulation	**2019**		
Department	**Computer Science and Engineering**			Semester	**-**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
U19CSV13	**Parallel and Distributed Computing**	3	0	0	3	40	60	100

Course Objective	The Main Objective of the course is to • understand the need and fundamentals of parallel computing paradigms • learn the nuances of parallel algorithm design • understand the programming principles in parallel and distributed architectures • learn few problems that is solved using parallel algorithms • develop application that includes fault tolerance	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Apply parallel and distributed computing architectures for any given problem	K2
	CO2: Apply problem solving (analysis, design, and development) skills to distributed applications	K2
	CO3:. Implement applications by applying principles of parallel and distributed architectures	K3
	CO4: Develop applications by incorporating parallel and distributed computing architectures	K2
	CO5: Use applications by incorporating fault tolerance	K3
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**	**PSO1**	**PSO 2**
CO 1	3	3	3	1									3	2
CO 2	3	3	3	1									2	3
CO 3	3	3	2	3									3	3
CO 4	3	3	3	2									3	2
CO 5	3	3	3	2									3	2

Course Assessment Methods

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

Content of the syllabus

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Unit – I	**INTRODUCTION TO PARALLEL COMPUTING**	Periods	**9**
Scope of Parallel Computing – Parallel Programming Platforms – Implicit Parallelism – Limitations of Memory System Performance – Control Structure of Parallel Platforms – Communication Model of Parallel Platforms – Physical Organization of Parallel Platforms – Communication Costs in Parallel Machines.			
Unit - II	**PARALLEL ALGORITHM DESIGN**	Periods	**9**
Preliminaries – Decomposition Techniques – Characteristics of Tasks and Interactions – Mapping Techniques for Load Balancing – Methods for Containing Interaction Overheads – Parallel Algorithm Models – Basic Communication Operations – One-to-All Broadcast and All-to-One Reduction – All-to-All Broadcast and Reduction – All-Reduce and Prefix Sum Operations – Scatter and Gather – All-to-All Personalized Communication- Circular Shift.			
Unit – III	**PROGRAMMING USING MESSAGE PASSING AND SHARED ADDRESS SPACE**	Periods	**9**
Principles of Message Passing Programming – Building Blocks – Send and Receive Operations – MPI – Message Passing Interface – Topologies and Embedding – Overlapping Communication with Computation – Collective Communication and Computation Operations – Groups and Communicators – POSIX thread API			
Unit - IV	**DISTRIBUTED COMPUTING PARADIGM**	Periods	**9**
Paradigms for Distributed applications – Leader Election in Rings – Mutual Exclusion in Shared Memory.			
Unit – V	**FAULT TOLERANT DESIGN**	Periods	**9**
Synchronous Systems with Crash Failures – Byzantine Failures – Impossibility in Asynchronous Systems - Formal Model for Simulation – Broadcast and Multicast – Specification of a Broadcast Service – Implementing a Broadcast Service – Multicast in Groups – Distributed Shared Memory – Linearizable – Sequentially Consistent Shared Memory – Algorithms.			
		Total Periods	**45**

Text Books:

1.	Ananth Grama, Anshul Gupta, George Karypis and Vipin Kumar, ―Introduction to Parallel Computing, Second Edition, Pearson Education, 2009
2.	Haggit Attiya and Jennifer Welch, ―Distributed Computing – Fundamentals, Simulations and Advanced Topics, Second Edition, Wiley, 2012.
3.	Michael Quinn, ―Parallel Computing - Theory and Practice, Second Edition, Tata McGraw Hill, 2002.

References:

1.	Norman Matloff, ―Parallel Computing for Data Science – With Examples in R, C++ and CUDA, Chapman and Hall/CRC, 2015.
2.	Wan Fokkink, ―Distributed Algorithms: An Intuitive Approach, MIT Press, 2013.
3.	M.L. Liu, ―Distributed Computing – Principles and Applications, First Edition, Pearson Education, 2011.
4.	Basu S. K"Parallel and Distributed Computing: Architectures and Algorithms",2016.

E-Resources

1.	http://www.math.nsysu.edu.tw/~lam/MPI/lecture/
2.	https://www.cs.purdue.edu/homes/ayg/TALKS/NANO_WSHOP/
3.	https://www.clear.rice.edu/comp422/lecture-notes/index.html
4.	https://www.geeksforgeeks.org/distributed-application-paradigms/

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Programme	**B.E. / B.Tech.**	Programme Code		Regulation	**2019**		
Department	**CSE, IT & CST**			Semester	-		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
U19CSV14	**Green Computing**	3	0	0	3	40	60	100

Course Objective

The Main Objective of the course is to

- acquire knowledge to adopt green computing practices
- minimize negative impacts on the environment
- learn about energy saving practices
- understand the impact of e-waste and carbon waste.
- describe green IT in relation to technology

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Explain the necessity of green IT.	K2
	CO2: Outline methodologies for creating green assets & their management.	K2
	CO3: Associate the use of grid in green IT.	K3
	CO4: Outline the protocols, standards & audits available for green IT.	K2
	CO5: Apply the Environmentally responsible business strategies	K3

Pre-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	3										3	2
CO 2	3	3	3										2	3
CO 3	3	3	2										3	3
CO 4	3	3	3										3	2
CO 5	3	3	3										3	2

Course Assessment Methods

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

Content of the syllabus

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Unit – I	FUNDAMENTALS	Periods	9
Green IT Fundamentals: Business, IT, and the Environment – Benefits of a Green Data Centre - Green Computing: Carbon Foot Print, Scoop on Power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.			
Unit - II	**GREEN ASSETS AND MODELING**	Periods	**9**
Green Assets: Buildings, Data Centers, Networks, Devices, Computer and Earth Friendly peripherals, Greening Mobile devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains .			
Unit – III	**GRID FRAMEWORK**	Periods	**9**
Virtualizing of IT Systems – Role of Electric Utilities, Telecommuting, Teleconferencing and Teleporting – Materials Recycling – Best Ways for Green PC – Green Data Center – Green Grid Framework. Optimizing Computer Power Management, Seamless Sharing Across Systems. Collaborating and Cloud Computing, Virtual Presence.			
Unit - IV	**GREEN COMPLIANCE**	Periods	**9**
Socio-Cultural Aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, And Audits – Emergent Carbon Issues: Technologies and Future. Best Ways to Make Computer Greener.			
Unit – V	**GREEN INITIATIVES**	Periods	**9**
Green Initiative Drivers and Benefits with IT - Resources and Offerings to Assist Green Initiatives. - Green Initiative Strategy with IT - Green Initiative Planning with IT - Green Initiative Implementation with IT - Green Initiative Assessment with IT. The Environmentally Responsible Business Strategies (ERBS)			
		Total Periods	**45**

Text Books:

1.	Bhuvan Unhelkar, Green IT Strategies and Applications-Using Environmental Intelligence, CRC Press, June 2011.
2.	Carl Speshocky, Empowering Green Initiatives with IT, John Wiley and Sons, 2010.
3.	Alin Gales, Michael Schaefer, Mike Ebbers, Green Data Center: Steps for the Journey, Shoff/IBM rebook, 2011.

References:

1.	John Lamb, The Greening of IT, Pearson Education, 2009.
2.	Jason Harris green Computing and Green IT- Best Practices on Regulations and Industry, Lulu.com, 2008.
3.	Woody Leonhard, Katherrine Murray, Green Home computing for dummies, August 2009.

E-Resources

1.	http://dte.karnataka.gov.in/Institutes/gptbellary/FileHandler/4-db424c3c-c2e7-4a3f-9337-ba1618da73e8
2.	https://shareok.org/bitstream/handle/11244/11105/Letcher_okstate_0664M_12544.pdf?sequence=1

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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	**101**	Regulation	**2019**		
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**-**		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV15	**Advanced Java & Framework**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Understand the basics of core Java EE
- Know Struts Framework architecture and libraries
- Understand Hibernate Environment and HQL
- Be familiar with client and server side framework

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Outline the importance of core java platform	K2
	CO2: Create simple enterprise application using struts framework	K3
	CO3: Create and deploy web applications using eclipse IDE and create Database connectivity using Hibernate.	K3
	CO4: Implement NoSQL Database CURD operations	K4
	CO5: Explore Angular features, create component based web pages	K3

Pre-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	2	2	3	2	3				2				3	3
CO 2	2	2	3	2	3				2				3	3
CO 3	2	2	3	2	3				2				3	3
CO 4	3	3	3	2	3				3				3	3
CO 5	2	3	3	2	3				3				3	3

Course Assessment Methods

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

Content of the syllabus

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Unit – I	CORE JAVA EE	Periods	9
Java EE 5 Platform Overview - Java EE Platform – Distributed Multi-tiered Applications - Web and Business Components - Java EE Containers – services & types - Application Assembly and Deployment– Packaging Applications -Getting Started with Web Applications – Application Deployment –Web application development and deployment Steps - Configuring Web application – Web application deployment descriptor (web.xml file) - Building & Deploying Applications- Web &Business Components Development.			
Unit – II	**STRUTS**	Periods	**9**
Struts Framework: Basics & Architecture – Request Handling Life Cycle - Building a simple struts– Configuration, Actions, Interceptors, Results, Value Stack/OGNL Struts2 Tag LibrariesStruts2 XML Based Validations - Database Access.			
Unit - III	**HIBERNATE**	Periods	**9**
Introduction to Hibernate, ORM Overview, Hibernate Environment - Hibernate Architecture &API, Hibernate Configuration, Hibernate Sessions, Persistent Class & Mapping Files - Building Hibernate application, Hibernate Query Language (HQL) - Hibernate O/R Mappings – Collection &Association Mappings-Hibernate Annotations Eclipse - overview.			
Unit – IV	**INTRODUCTION TO SERVER-SIDE JS FRAMEWORK – NODE.JS**	Periods	**9**
Introduction - What is Node JS – Architecture – Feature of Node JS - Installation and setup - Creating web servers with HTTP (Request & Response) – Event Handling - GET & POST implementation - Connect to NoSQL Database using Node JS – Implementation of CRUD operations.			
Unit - V	**INTRODUCTION TO CLIENT-SIDE JS FRAMEWORK – BASICS OF ANGULAR 4.0**	Periods	**9**
Introduction to Angular 4.0 - Needs & Evolution – Features – Setup and Configuration – Components and Modules – Templates – Change Detection – Directives – Data Binding - Pipes – Nested Components - Template Driven Forms - Model Driven Forms or Reactive Forms.			
		Total Periods	**45**

Text Books

1.	Jim Keogh, “The Complete Reference J2EE”, Tata McGraw –Hill Edition 2011

References

1.	James Holmes, “The Complete References Struts”, 2ndEdition, Tata McGraw, 2007
2.	Jusin Couch, Daniel H. Steinberg, “J2EE Bible” Wily India (P) Ltd, New Delhi 2002.
3.	Nathan Rozentals, “Mastering Type Script”, April 2015
4.	Nate Murray, Felipe Coury, Ari Lerner and Carlos Taborda, “ng-book, The Complete Book on Angular 4” September 2016

E-Resources

1.	https://docs.oracle.com/javaee/5/tutorial/doc/docinfo.html
2.	http://www.tutorialspoint.com/eclipse/index.htm
3.	www.allitebooks.in/mastering-typescript

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205						
Programme	**B.E. / B.TECH**	Programme Code		Regulation	2019		
Department	CSE, IT			Semester	-		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
U19ITV14	**Network Programming**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Study the basics of TCP/IP protocols and sockets. • Develop the applications of TCP echo client and server, I/O model. Enhance the socket methods options and elementary UDP socket options. • To know about the difference between IPV4 and IPV6 protocols, functions of raw socket.Study the basic simple network management system.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Demonstrate advanced knowledge of networking, understand the keyprotocols which support the Internet	K3
	CO2: Be familiar with several common programming interfaces for network communication.	K2
	CO3: Demonstrate advanced knowledge of programming for network communications.	K3
	CO4: Make use of different types of I/O such as non-blocking I/O and event driven I/O, have a detailed knowledge of the TCP/UDP Sockets.	K2
	CO5: Be familiar with the simple network management information system.	K2
Pre-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	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	2	1	3		3							2	2	
CO 2					2								2	
CO 3			2											1
CO 4		2				2							2	1
CO 5													2	

Course Assessment Methods

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	**ELEMENTARY TCP SOCKETS**	**Periods**	**9**
Introduction to socket programming – Overview of TCP / IP protocols – Introduction to sockets – Socket address structures – Byte ordering functions – Address conversion functions – Elementary TCP sockets – Socket – Connect – Bind – Listen – Accept – Read – Write – Close functions – Iterative server – Concurrent server.			
Unit – II	**APPLICATION DEVELOPMENT**	**Periods**	**9**
TCP echo server – TCP echo client – POSIX signal handling – Server with multiple clients – Boundary conditions– Server process crashes– Server host crashes – Server crashes and reboots – Server shutdown – I/O multiplexing – I/O models – Select function – Shutdown function – TCP echo server (with multiplexing) – Poll function – TCP echo client (with multiplexing)			
Unit – III	**SOCKET OPTIONS, ELEMENTARY UDP SOCSOCKETS**	**Periods**	**9**
Socket options – Getsocket and set socket functions – Generic socket options – IP socket options – ICMP socket options – TCP socket options – Elementary UDP sockets – UDP echo server – UDP echo client – Multiplexing TCP and UDP sockets – Domain Name System – Get host by name function – IPV6 support in DNS – Gethostbyadr function – Getservbyname and get servbyport functions.			
Unit – IV	**ADVANCED SOCKETS**	**Periods**	**9**
IPV4 and IPV6 interoperability – Threaded servers – Thread creation and termination– TCP echo server using threads – Mutexes – Condition variables – Raw sockets – Raw socket creation – Raw socket output – Rawsocket input – Ping program – Trace route program.			
Unit – V	**SIMPLE NETWORK MANAGEMENT**	**Periods**	**9**
SNMP network management concepts – SNMP management information – Standard MIB„s – SNMP V1protocol and practical issues – Introduction to RMON, SNMP V2 and SNMP V3.			
		Total Periods	**45**

Text Books

1.	W. Richard Stevens, ―Unix Network Programming Vol – I, 3rd Edition, Prentice Hall of India / Pearson Education, 2003.
2.	William Stallings, ―SNMP, SNMPV2, SNMPV3 and RMON 1 and 2‖, 3rd Edition, Addison Wesley, 1999.
3.	D. E. Comer, ―Internetworking with TCP/IP Vol – III‖, (BSD Sockets Version), 2nd Edition, Prentice Hall of India, 2003.

References

1.	D. E. Comer, ―Internetworking with TCP/IP Vol - III‖, (BSD Sockets Version), 2nd Edition, Prentice Hall of India, 2003

E-Resources

1,	https://notes.shichao.io/unp/ch4/
2.	https://www.masterraghu.com/subjects/np/introduction/unix_network_programming_v1.3/ch08.html
3.	https://docs.oracle.com/cd/E26502_01/html/E35299/sockets-22932.html
4.	https://www.geeksforgeeks.org/simple-network-management-protocol-snmp/

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

(Autonomous Institution, Affiliated to Anna University ,Chennai)

Elayampalayam, Tiruchengode – 637 205

Programme	**B.E. / B.TECH**	Programme Code		Regulation	**2019**
Department	**CSE, IT**			Semester	-

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19ITV15	**SERVICE ORIENTED ARCHITECTURE**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Study the importance of Service Oriented Architecture. • Learn to implement SOA in the J2EE and .Net environment • Study the advanced features of SOA and web services for SOA	
Course Outcome	At the end of the course, the student should be able to,	KL
	CO1: Relate how the components are interrelated in SOA.	K1
	CO2: Classify simple web services using SOA principles.	K2
	CO3: Apply various activity management and a series of composition techniques for SOA	K3
	CO4: Experiment the various services using Metadata.	K3
	CO5: Select the advanced features of web services security.	K3
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**
CO 1	1												1	1
CO 2	2	1											2	2
CO 3	3	2	1	1									3	3
CO 4	3	2	1	1									3	3
CO 5	3	2	1	1									3	3

Course Assessment Methods

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 SOA WITH WEB SERVICES**	Periods	**9**
Service Oriented Enterprise – Service Oriented Architecture (SOA) – SOA and Web Services – Multi-Channel Access – Business Process management – Extended Web Services Specifications.			
Unit - II	**SOA AND WEB SERVICES**	Periods	**9**
Web Services Platform – Service Contracts – Service-Level Data Model – Service Discovery – Service-Level Security – Service-Level Interaction patterns – Atomic Services and Composite Services – Proxies and Skeletons-Introduction to REST –Designing a REST Service –Introduction to Micro services.			
Unit – III	**SOA AND MULTICHANNEL ACCESS**	Periods	**9**
Multi-Channel Access – Business Benefits – SOA for Multi Channel Access – Tiers – Business Process Management – Concepts – BPM - SOA and Web Services – WS- BPEL – Web Services Composition			
Unit - IV	**EXTENDED WEB SERVICES SPECIFICATION**	Periods	**9**
Metadata Management - Metadata Specification – XML-WSDL 2.0-UDDI-Addressing-Policy-WS policy-WSPL-WSDL 2.0 features and properties-comparing the policy specifications-WS Metadata Exchange.			
Unit – V	**WEB SERVICES SECURITY**	Periods	**9**
Overarching concern, Core Concepts, Summary of Challenges, Threats and Remedies, Securing the Communications Layer, Message Level Security-Data Level Security.			
		Total Periods	**45**

Text Books	
1.	Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", First Edition, Pearson Education,2005

References	
1.	James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, "Java Web Services Architecture", Elsevier, 2003
2.	Thomas Erl, "Service Oriented Architecture", Pearson Education, 2005.
3.	Eric Pulier, Hugh Taylor, "Understanding Enterprise SOA", Dreamtech Press, 2007.

E Resourses	
1.	https://www.tutorialspoint.com/soa/soa_business_processes.htm
2.	https://www.informit.com/articles/article.aspx?p=357691&seqNum=6
3.	https://docs.oracle.com/cd/E13209_01/wlcp/wlng22/devext/wespa_using.html
4.	https://www.coursera.org/learn/service-oriented-architecture

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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN

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Programme	**B.E. / B.Tech.**	Programme Code		Regulation	**2019**		
Department	**CSE, IT & CST**			Semester	-		

Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTV12	**Socket Programming**	3	0	0	0	40	60	100

Course Objective

The main objective of this course is to:

- To learn different socket function and implement client server applications 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

(3/2/1 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				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 flow control 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 from Scratch, 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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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**B.E.**	Programme code	**101**	Regulation	**2019**			
Department	**Computer Science and Engineering**			Semester	**-**			
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV21	**Information Security**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • know the legal, ethical and professional issues in Information Security • know the aspects of risk management • become aware of various standards in this area • know the technological aspects of Information Security	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Outline the basic models of information system.	K2
	CO2: Identify the legal, ethical & professional issues in information security.	K2
	CO3: Analyses the risk management in providing security.	K3
	CO4: Interpret the various polices, standards and practices for designing security architecture.	K2
	CO5: Use analysis tools, technologies and control devices for security implementation	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	2					2	2						2	2
CO 2	2					2	2					2	2	2
CO 3	2					2	3					2		2
CO 4	2					2	3							2
CO 5	2				3	2	3					2		2

Course Assessment Methods

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

Content of the syllabus

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Unit – I	**INTRODUCTION**	Periods	**9**
History, definition- Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC.			
Unit - II	**SECURITY INVESTIGATION**	Periods	**9**
Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues			
Unit – III	**SECURITY ANALYSIS**	Periods	**9**
Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk.			
Unit – IV	**SECURITY POLICIES**	Periods	**9**
Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity.			
Unit – V	**SECURITY TECHNOLOGY**	Periods	**9**
IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel.			
		Total Periods	**45**

Textbooks	
1.	Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2017
2.	Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", 6th edition,2019.
References	
1.	Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw Hill, 2013
2.	Matt Bishop, " Computer Security Art and Science", Pearson/PHI, 2015
3.	SanilNadkarni"Fundamentals of Information Security"1st edition, 2020
E-Resources	
1.	https://www.utc.edu/sites/default/files/2021-06/3600
2.	https://www.geeksforgeeks.org/principle-of-information-system-security/
3.	https://www.coursehero.com/file/33632699/
4.	https://lecturenotes.in/subject/453/information-security

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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	**101**	Regulation	**2019**		
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**-**		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV22	**Cyber Security**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Understand the basic concepts of cyber security
- Learn about security attacks, models and risk management
- Understand the key terms and concepts of security plans and procedures
- Describe about security tools and encryption methods
- Learn about testing and forensics methods

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Outline the security principles and security architecture	K2
	CO2: Explore the security attacks and management roles.	K3
	CO3: Apply the cyber security policies and procedures for an organizations	K3
	CO4: Practice the security tools and hardening techniques	K4
	CO5: Employ the Penetration Testing and explore the Next Generation Security	K3

Pre-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	1	2	3		2	3							2	2
CO 2	2	2	3		2	3							2	2
CO 3	2	3	3		2	3							2	2
CO 4	2	3	3		2	3							2	2
CO 5	2	2	3		2	3							2	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

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Unit – I	INTRODUCTION TO CYBER SECURITY	Periods	9
Introduction to Cyber Security, Need for security, Concept of Cyber Space, Cyber Crimes and Cyber-attack. Fundamental security principles – threats, attacks and vulnerability. Key Security triad – Confidentiality, Integrity and Availability. Key components of cyber security network architecture. Authentication, Authorization, Access control, Identification and Accounting.			
Unit – II	**SECURITY ATTACKS, PRINCIPLESAND MANAGEMENT**	Periods	**9**
Introduction to different classes of security attacks - active and passive. Impact of attacks on an organization and individuals. Principles of Cyber security - Apply cyber security architecture principles. Cyber security models (the CIA triad, the star model, the Parkerianhexad). Techniques used by Hackers - The Reconnaissance Phase: Active and Passive Scanning Techniques. Risk Management – Principles, Types and Strategies - The Risk Management Framework (RMF). Cyber security Management concepts – Security Governance and Management roles, models and functions.			
Unit - III	**SECURITY PLANS, POLICIES AND PROCEDURES**	Periods	**9**
Defining a Cyber Security policy, General security expectations, roles and responsibilities in the organization – Stakeholders. Cyber security standards and controls - Certification and accreditation (C&A) process. Audit goals - Updating and auditing cyber security procedures - Compare the organization's cyber security policy to actual practices.			
Unit – IV	**OVERVIEW OF SECURITY COUNTERMEASURE TOOLS**	Periods	**9**
Introduction to key security tools including firewalls, anti-virus and cryptography – Identify security tools and hardening techniques – Prevention of cyber-attacks. Security Countermeasure tools and techniques - Encryption standards - Modern Methods - Legitimate versus Fraudulent Encryption Methods. Security threats – Threat and Risk exposure - Determine the organization's exposure to internal threats - Evaluate the risk of external security threats.			
Unit - V	**CYBER SECURITY TESTING, DIGITAL FORENSICS AND NEXT GENERATION SECURITY**	Periods	**9**
Cyber security testing – Penetration testing. System Level Solutions - Intrusion Detection System (IDS) and Intrusion Protection System (IPS). Basic Concept of Ethical Hacking. Protecting against Cyber Crime – Identity Theft, Cyber Stalking and Investment fraud. Introduction to digital forensics - Digital Forensics Tools and Forensics Investigative Process. Introduction to Next-Generation Firewall – Preventing Infection and Finding Infected Hosts. Smart Policies for ensuring security.			
		Total Periods	**45**

Text Books	
1.	Lawrence C. Miller, "Cyber security for Dummies" -Palo Alto Networks, by John Wiley & Sons, Inc., 7th Edition, 2022.
References	
1.	William Stallings, "Effective Cyber security: A Guide to Using Best Practices and Standards", Addison - Wesley Professional Publishers, 1st Edition, 2018
2.	RaefMeeuwisse, "Cyber security for Beginners", Cyber Simplicity Publications, 2nd Edition, 2017.
3.	Mehdi Khosrow-Pour, DBA, Information Resources Management Association, USA, "Cyber security and threats: concepts, methodologies, tools, and applications", IGI Global, Vol. 1, 2018.
E-Resources	
1.	http://www.uou.ac.in/sites/default/files/slm/Introduction-cyber-security.pdf
2.	https://www.simplilearn.com/tutorials/cyber-security-tutorial/cyber-security-books
3.	https://www.tutorialspoint.com/information_security_cyber_law/cyber_security_strategies.htm
4.	https://uru.ac.in/uruonlinelibrary/Cyber_Security/Cybersecurity-for-dummies.pdf

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205						
Programme	**B.E. / B.Tech.**	Programme Code		Regulation	**2019**		
Department	**CSE & IT**			Semester	**-**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
U19CSV23	**Cryptography and Network Security**	3	0	0	3	40	60	100
Course Objective	The student should be made to • Understand the fundamentals of networks security, security architecture, threats and vulnerabilities • Learn various cryptographic algorithms. • Understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.							
Course Outcome	At the end of the course, the student should be able to,						Knowledge level	
	CO1: Classify the Encryption techniques						K2	
	CO2: Apply the different cryptographic operations of symmetric and public cryptographic algorithms.						K3	
	CO3: Evaluate the authentication and hash algorithms.						K3	
	CO4: Differentiate Computer security and network security and develop a system for remote user authentication						K3	
	CO5: Identify how to secure their systems						K4	
Pre-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	2	2	2	2			2					2	3
CO 2	3	3	2	2	2			2					2	2
CO 3	2	3	3	2	2			2					3	2
CO 4	2	3	2	3	2			2					2	3
CO 5	3	3	2	2	2			2					2	2

Course Assessment Methods

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

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Content of the syllabus			
Unit – I	**COMPUTER SECURITY BASICS**	Periods	**9**
Computer Security Concepts, OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, Model for Network Security, Classical Encryption techniques- Substitution and Transposition methods, Block Cipher Principles			
Unit - II	**ENCRYPTION STANDARDS**	Periods	**9**
Data Encryption Standard- DES Encryption- Key Generation- DES Decryption, Advanced Encryption Standard (AES)- AES Transformation Functions, Multiple Encryption and Triple DES- Triple DES with Two Keys- Triple DES with Three Keys.			
Unit – III	**AUTHENTICATION AND HASH FUNCTION**	Periods	**9**
Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols - Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications – Kerberos, X.509			
Unit - IV	**NETWORK SECURITY**	Periods	**9**
Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution using Asymmetric Encryption, Public Key Distribution , Public Announcement of Public Keys ,Publicly available Directory , Public-Key Authority, Public-Key Certificates, Remote User Authentication principles- Remote user Authentication Using Symmetric Encryption, Kerberos, Remote user Authentication using Asymmetric Encryption.			
Unit – V	**SYSTEM SECURITY**	Periods	**9**
Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction, Intruders, Intrusion Detection, Password Management, Malicious Software, Firewalls, Trusted Systems.			
		Total Periods	**45**

Text Books	
1.	Behrouz A. Forouzan, ”Cryptography and Network Security” 3rd Edition, McGraw Hill Publications, 2016.
2.	William Stallings, ”Cryptography and Network Security - Principles and Practice Paperback” – PEARSON, 8th Edition, 2023.
References	
1.	Mohammad Amjad, “Cryptography and Network Security”,Wiley,2019
2.	Bruce Schneier, “Applied Cryptography, Second Edition”, John Wiley & Sons Inc, 2007.
3.	AtulKahate, “Cryptography and Network Security”, Tata McGraw-Hill, 2003
4.	Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Third Edition, Pearson Education, 2003.
E-Resources	
1.	http://nptel.ac.in/courses/106105031/1
2.	http://nptel.ac.in/courses/106102064/23
3.	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-033-computer-system-engineering-spring-2009/video-lectures/ lecture by Prof. Robert Morris and Prof. Samuel Madden MIT
4.	https://www.brainkart.com/article/Remote-User-Authentication-Using-Asymmetric-Encryption_8476/
5.	http://nptel.ac.in/courses/106105031/lecture by Dr. DebdeepMukhopadhyayIITKharagpur

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**B.E. / B.Tech.**	Programme code		Regulation	**2019**			
Department	**CSE, IT & CST**		Semester		**-**			
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV24	**Cyber Law and Ethical Hacking**	3	0	0	3	40	60	100

Course Objective	The student should be made to, ➢ understand the concepts of cyber crime and legal systems of information technology. ➢ gain knowledge on impacts and effects of cyber laws and acts in India ➢ Understand the basics of Ethical Hacking ➢ Learn Tools available for Pen testing	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Define Cyber Crime and explain types of Cyber Crime	K2
	CO2: Recite laws and Acts in India for cyber Crime	K2
	CO3: Explain the basics and phases of Ethical hacking	K3
	CO4: Identify Types of Attacks and their counter measures	K2
	CO5: Work with pen testing tools	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	2					2	2						2	2
CO 2	2					2	2					2	2	2
CO 3	2					2	3					2		2
CO 4	2					2	3							2
CO 5	2				3	2	3					2		2

Course Assessment Methods

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

Content of the syllabus

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Unit – I	CYBER CRIME	Periods	9
Introduction to Cyber Crimes –Nature and Scope of Cyber Crime- Types of Cyber Crime: Internet, Hacking, Cracking, Viruses, Virus Attacks, Pornography, Software Piracy, Intellectual property, Legal System of Information Technology, Social Engineering, Mail Bombs, Bug Exploits, and Cyber Security etc.			
Unit - II	**LAWS AND ACTS**	Periods	**9**
Laws and Ethics - Digital Evidence Controls - Evidence Handling Procedures - Basics of Indian Evidence ACT IPC and CrPC - Electronic Communication Privacy ACT - Legal Policies.			
Unit – III	**ETHICAL HACKING BASICS**	Periods	**9**
Introduction to Ethical Hacking – Types of hacking – Phases of Ethical hacking. **Reconnaissance And Scanning:** Footprinting with DNS – Determining Network Range – Google Hacking. Scanning for targets: Identify Active machines – Port Scanning. Enumeration: Windows Security basics – Enumeration Techniques.			
Unit – IV	**SYSTEM ATTACK & WEB ATTACKS**	Periods	**9**
Sniffing: Communications basics –Sniffing techniques and tools –Network Roadblocks: Intrusion Detection – Session hijacking, System Attack: Windows system hacking – Password Cracking – Exploiting privileges. Social Engineering: Human Based attack – Computer based attack. Web Server Hacking: Web service architecture			
Unit – V	**MALWARES AND PENETRATION TESTING**	Periods	**9**
Web attacks. Web Applications: Web applications attack – Web resources protection. Wireless Attacks – Bluetooth attacks. Malware Attacks: Trojans, viruses and worms. Penetration Testing: Types of Penetration testing – Penetration testing methodologies – Penetration test tools.			
		Total Periods	**45**

Textbooks

1.	Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004.
2.	R K Jha, .Digital Forensic and Cyber Crime Hardcover – 2016,
3.	Matt Walker, "CEH- Certified Ethical Hackers Guide ", 4th Edition, McGraHill Education, 2019
4.	Michael Gregg," Certified Ethical Hacker (CEH) Version 9 Cert Guide", 2nd Edition, Pearson Education, 2018

References

1.	Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", 2nd Edition, Syngress , Elseveir, 2013.
2.	Parteek Sharma," Hacking Revealed", 1st Edition, White Falcon Publishing, 2018.
3.	Reginald Wong, "Mastering Reverse Engineering: Re-engineer your ethical hacking skills", Packt Publishing, 2018.
4.	DafyddStuttard, Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", 2nd Edition, John Weily& Sons, 2011
5.	Monnappa K A,"Learning Malware Analysis: Explore the concepts, tools, and techniques to analyze and investigate Windows malware",1st Edition, Packt Publishing, 2018.

E-Resources

1.	https://doc.lagout.org/security/ceh-official-certified-ethical-hacker-review-guide-exam-312-50.9780782144376.27422.pdf
2.	https://www.mediafire.com/file/dyewn6f3r3olnuw/A_Beginners_Guide_To_Hacking_Computer_Systems.zip/file
3.	https://www.pdfdrive.com/hacking-beginner-to-expert-guide-to-computer-hacking-basic-security-and-penetration-testing-computer-science-series-e175287729.html

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**B.E. / B.Tech.**	Programme code		Regulation	**2019**			
Department	**CSE, IT & CST**		Semester		-			
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV25	**Social Network Analysis**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Understand the concept of semantic web and related applications. • Learn knowledge representation using ontology. • Learn the Extraction and Mining Communities in Web Social Networks • Understand human behavior in social web and related communities. • Learn visualization of social networks.	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Distinguish WWW from semantic web	K2
	CO2: Discover the knowledge using ontology.	K2
	CO3: Identify the communities in social networks.	K3
	CO4: Predict human behavior in social web and related communities.	K2
	CO5: Apply representation techniques for visualizing social networks.	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	2	1	2	2	2	1	1		1		1	2	1
CO 2	3	2		2	2							1	2	1
CO 3	3	2		2	2	2	1	1		1		1	2	1
CO 4	3	2		2	2							1	2	1
CO 5	3	2	2	2	2	2	1	1		1		1	2	1

Course Assessment Methods

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

Content of the syllabus

Unit – I	**INTRODUCTION**	Periods	**9**

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

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Applications of Social Network Analysis.			
Unit - II	**MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION**	Periods	**9**
Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modeling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Aggregating and reasoning with social network.			
Unit – III	**EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS**	Periods	**9**
Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities			
Unit – IV	**PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES**	Periods	**9**
Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.			
Unit – V	**VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS**	Periods	**9**
Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare.			
		Total Periods	**45**

Textbooks

1.	Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2.	BorkoFurht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.
3.	GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
4.	Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.

References

1.	Max Chevalier, Christine Julien and Chantal Soule-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modeling", IGI Global Snippet, 2009.
2.	John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.
3.	Stanley Wasserman, "Social Network Analysis Methods and Applications", Cambridge University Press, June 2012.

E-Resources

1.	Social Network Analysis and Mining | Home (springer.com)
2.	Social network analysis - Wikipedia
3.	Social network analysis: An approach and technique for the study of information exchange - ScienceDirect
4.	SNA-Toolkit.pdf (digitalpromise.org)
5.	Online Social Network Analysis (degruyter.com)

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Programme	**B.E. / B.Tech.**	Programme code		Regulation			**2019**	
Department	**CSE, IT & CST**			Semester			**-**	
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV26	**Semantic Web**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Extrapolate the basic concepts, tasks, methods, and techniques in semantic web • Interpret the concept of RDF and its schemas • Comprehend the ontology and semantic web architecture • Construct logic inference and rule markup in XML. • Recognize and infer the semantic web process and issues	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Describe the features and uses in Semantic Web and its Technologies	K2
	CO2: Construct the RDF data model and defining the vocabularies used in RDF data model	K2
	CO3: Identify the requirements of Ontology and know the sublanguages	K3
	CO4: Write the Monotonic and Non monotonic Rules	K2
	CO5: Relate methodologies and techniques to a range of practical applications in Semantic web technologies**.**	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	2	2	2										2	1
CO 2	2	3	3										2	2
CO 3	2	3	3										2	2
CO 4	2	3	3										2	2
CO 5	2	2	2										2	-

Course Assessment Methods

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

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Content of the syllabus			
Unit – I	**INTRODUCTION**	Periods	**9**
History–Semantic Web Layers– Semantic Web technologies–Semantics in Semantic Web–XML**:** Structuring– Namespaces – Addressing–Querying–Processing			
Unit - II	**RESOURCE DESCRIPTION FRAMEWORK**	Periods	**9**
RDF and Semantic Web–Basic Ideas-RDF Specification–RDF Syntax: XML and Non-XML-RDF elements– RDF relation RDF and Semantic Web–Basic Ideas- RDF Specification–RDF Syntax: XML and Non-XML-RDF elements– RDF relationship: Reification, Container, Collaboration – RDF Schema – Editing, Parsing , Browsing , RDF/XML-RQL-RDQL			
Unit – III	**ONTOLOGY**	Periods	**9**
Why Ontology – Ontology movement– OWL–OWL Specification - OWL Elements–OWL constructs: Simple and Complex – Ontology Engineering : Introduction –Constructing Ontologies – Reusing Ontologies – On-To Knowledge Semantic Web architecture			
Unit – IV	**LOGIC AND INFERENCE**	Periods	**9**
Logic – Description Logics - Rules – Monotonic Rules: Syntax, Semantics and Examples – Non monotonic Rules – Motivation, Syntax and Examples – Rule Markup in XML: Monotonic Rules and Non-Monotonic Rules			
Unit – V	**APPLICATIONS OF SEMANTIC WEBTECHNOLOGIES**	Periods	**9**
RDF Uses: Commercial and Non-Commercial use – Sample Ontology – E-Learning –Web Services – Web mining – Horizontal information – Data Integration – Future of Semantic Web			
		Total Periods	**45**

Textbooks	
1.	Grigoris Antoniou, Frank van Harmelen," A Semantic Web Primer " MIT, 2nd Edition, Press,2020
2.	Spinning the Semantic Web: Bringing the world wide web to its full potential – The MIT Press – 2005
3.	Shelley Powers – "Practical RDF" – O'reilly publishers – First Indian Reprint : 2003
References	
1.	Markus Kroetzsch, Pascal Hitzler, and Sebastian Rudolph," Foundations of Semantic Web Technologies", CRC press, 2009
2.	Michael C. Daconta, Leo J. Obrst, and Kevin T. Smith, "The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management", Fourth Edition, Wiley Publishing, 2003.
3.	John Davies, Rudi Studer, and Paul Warren John, "Semantic Web Technologies: Trends and Research in Ontology-based Systems", Wiley and Son's, 2006.
E-Resources	
1.	https://www.w3.org/standards/semanticweb/
2.	https://www.w3.org/RDF/
3.	https://cse.iitkgp.ac.in/~tkmishra/files/SEMANTIC%20WEB%20report.pdf
4.	https://obitko.com/tutorials/ontologies-semantic-web/
5.	https://www.geektonight.com/web-technologies-notes-pdf/

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**B.E. / B.Tech.**	Programme code		Regulation	**2019**			
Department	**CSE, IT & CST**	Semester			**-**			
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19ITV23	**Cyber Forensics**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Learn about computer investigation
- Understanding and determining data acquisition methods and tools.
- Familiar about identifying the crime scenes and digital evidence.
- Learn about computer forensics tools and Analyze and Validation.
- Know about Email investigation and recovering the graph files

Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1:apply digital forensic investigation with a systematic approach	K3
	CO2:make use of various tools for data acquisition	K3
	CO3 :identify the digital evidence in a crime scene	K3
	CO4: apply forensic tools in forensic examination	K3
	CO5:build the recovery of graph files and investigating E-mail crimes	K3

Pre-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**	**PSO 1**	**PSO 2**
CO 1	3	2	1	1									3	3
CO 2	3	2	1	1									3	3
CO 3	3	2	1	1									3	3
CO 4	3	2	1	1									3	3
CO 5	3	2	1	1									3	3

Course Assessment Methods

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

Content of the syllabus

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Unit – I	Computer Investigations	Periods	9
Computer Investigations: Preparing a Computer investigation – Taking asystematic approach –Assessing the case – Planning Investigation – Securing evidence. Procedures for Corporate High: Tech investigations – Conducting an Investigation – Completing the case.			
Unit - II	**Data Acquisition**	Periods	**9**
Understanding storage formats for digital evidence – Determining the best acquisition method - Contingency planning for image acquisitions – Using Acquisition tools: Windows XP Write-protection with USB Devices – Validating Data Acquisitions: Windows Validation Methods – Performing RAID Data Acquisitions – Using Remote Network Acquisition tools – Using other Forensics Acquisition tools.			
Unit – III	**Processing Crime and Incident Scenes**	Periods	**9**
Identifying Digital Evidence – Collecting Evidence in Private Sector Incident Scenes – Processing Law Enforcement Crime Scenes – Preparing for a Search –Securing a Computer Incident or Crime Scene –Seizing Digital Evidence at the Scene –Storing Digital Evidence –Obtaining a Digital Hash –Reviewing a Case			
Unit – IV	**Computer Forensic Tools, Analysis and Validation**	Periods	**9**
Evaluating Computer Forensics Tool Needs -Computer Forensics Software Tools – Computer Forensics Hardware Tools –Validating and Testing Forensic Software - Computer Forensics Analysis and Validation: Determining Data Collection and Analysis –Validating Forensic Data –Addressing Data-Hiding Techniques –Performing Remote Acquisitions.			
Unit – V	**Recovering Graph Files, Email Investigations**	Periods	**9**
Recognizing Graph File- Understanding Data Compression- Locating And Recovering Graphic Files- Identifying Un known File Formats- Understanding Copyright Issues- Investigating Email Crimes And Violations- Understanding Email Servers- Using Specialized Email Forensic Tools.			
		Total Periods	**45**

CASE STUDY:

Only for Assignment not for end sem examination.

1. Illegal money transfer 2. Network data reveals theft of trade secrets 3. Data from vehicle infotainment, telematics and black box systems 4. Intellectual property theft

Textbooks

1.	Nelson Bill, Phillips Amelia and Steuart Christopher, "Guide to Computer Forensics and Investigations", 4th Edition, Cengage Learning, 2020.

References

1.	Marie-Helen Mara, "Computer Forensics", 2nd Edition, Jones and Bartlett Learning, 2015.
2.	Albert Marcella Jr, "Cyber Forensics", 2nd Edition, Auerbach Publications , 2007.

E-Resources

1.	https://www.slideshare.net/sumeetpatel21/data-acquisition-system-40835631
2.	https://samsclass.info/121/ppt/ch05.ppt
3.	https://resources.infosecinstitute.com/topic/7-best-computer-forensics-tools/
4.	https://www.guru99.com/computer-forensics-tools.html
5.	https://www.tutorialspoint.com/python_digital_forensics/python_digital_forensics_investigation_using_emails.htm

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

Programme	**B.E. /B.Tech.**	Programme Code		Regulation	**2019**		
Department	**Computer Science & Technology**			Semester	-		
Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
U19CTV23	**Biometrics Systems**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Understand the basic concept of biometrics systems.
- Describe the principles of the core biometric modalities.
- identify the privacy and security concerns surrounding biometric systems.
- discuss about Deal with poor image qualities and its effect in biometrics.
- Organize and conduct biometric data collections, and apply biometric databases in 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 authenticationscenarios.	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.- Symmetric key 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 ofImage 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", CengageLearning,,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, "Guideto 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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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**B.E.**	Programme Code		**101**	Regulation		**2019**	
Department	**COMPUTER SCIENCE AND ENGINEERING**				Semester		-	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV31	**Data Warehousing and Data Mining**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Construct data warehouse using OLAP, OLTP processing and application tool. • Describing and demonstrating basic data mining algorithms, methods and tools. • Understand the various classification algorithms. • Have knowledge on clustering algorithm.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Identify the fundamentals of various data warehousing components.	K2
	CO2: Analyze the online analytical processing tools and multidimensional data warehousing models.	K3
	CO3: Describe the data mining basics and how to integrate with data warehouse.	K3
	CO4: Implement various association and classification techniques	K4
	CO5: Examine the various clustering algorithms for data mining.	K3
Pre-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	2				2							3	3	2
CO 2	2	2		3	2							2	3	2
CO 3	2	2	2	3	2							3	3	2
CO 4	2	2	2	3	2							3	3	2
CO 5	2	2	2	3	3							2	3	2

Course Assessment Methods

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

Content of the syllabus

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Unit – I	DATA WAREHOUSING	Periods	9
Data warehousing Components –Building a Data warehouse –- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.			
Unit – II	**BUSINESS ANALYSIS**	Periods	**9**
Reporting and Query tools and Applications–Tool Categories–The Need for Applications–Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet.			
Unit - III	**DATA MINING**	Periods	**9**
Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.			
Unit – IV	**ASSOCIATION RULE MINING AND CLASSIFICATION**	Periods	**9**
Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.			
Unit - V	**CLUSTERING AND TRENDS IN DATA MINING**	Periods	**9**
Cluster Analysis-Types of Data–Categorization of Major Clustering Methods–K-means–Partitioning Methods–Hierarchical Methods-Density-Based Methods–Grid Based Methods–Model-Based Clustering Methods–Clustering High Dimensional Data-Constraint–Based Cluster Analysis–Outlier Analysis–Data Mining Applications.			
		Total Periods	**45**

Text Books	
1.	Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2.	Jiawei Han & Michelin Kamber, Data Mining Concepts & Techniques, 3rd Edition, Elsevier, 2012.
References	
1.	Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Person Education, 2007.
2.	K.P. Soman, Shyam Diwakar and V. Aja, "Insight into Data Mining Theory and Practice", Eastern Economy Edition, Prentice Hall of India, 2006.
3.	G.K.Gupta, Introduction to Data Mining with Case Studies, EEE, PHI, India, 2006.
E-Resources	
1.	https://www.tutorialspoint.com/dwh/index.htm
2.	https://en.wikipedia.org/wiki/Data_warehouse
3.	https://docs.oracle.com/cd/B10500_01/server.920/a96520/concept.htm

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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	**101**	Regulation	**2019**		
Department	**Computer Science and Engineering**			Semester	**-**		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV32	**Data Science and Analytics**	3	0	0	3	40	60	100

Course Objective

The Main Objective of the course is to

- know the fundamental concepts of Data Science
- learn the Analytical Processing in Big Data
- learn to analyze the Data using Intelligent Techniques
- learn the techniques for Mining Data Streams
- know the various techniques in Visualization

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Examine the Data Science Process.	K2
	CO2: Generalize the Data Analytics process.	K2
	CO3: Select the appropriate Data Analysis Techniques	K3
	CO4: Detect the output using algorithms for mining the data stream	K4
	CO5: Apply the various visualization techniques	K3

Pre-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	3	1								1	3	2
CO 2	3	3	3	1								1	2	3
CO 3	3	3	2	3	3							2	3	3
CO 4	3	3	3	2	2							3	3	2
CO 5	3	3	3	2	2							2	3	2

Course Assessment Methods

Direct

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

Indirect

1. Course - end survey

Content of the syllabus

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Unit – I	INTRODUCTION TO DATA SCIENCE	Periods	8
Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications			
Unit - II	**DATA ANALYTICS**	Periods	**9**
Characteristics – Evolution - Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Analytic Processes – Analytic Tools and methods - Analysis vs. Reporting – Statistical Concepts: Sampling Distributions - Statistical Inference - Prediction Error – Resampling			
Unit – III	**DATA ANALYSIS**	Periods	**10**
Types of Data Analysis, Regression Modeling - Multivariate Analysis - Bayesian Inference and Networks - Support Vector and Kernel Methods - Rule Induction - Neural Networks: Learning and Generalization - Competitive Learning – Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees			
Unit - IV	**MINING DATA STREAMS**	Periods	**9**
Introduction – Stream Data Management Systems – Data Stream Mining - Examples of Data Stream Application – Stream Queries – Issues in Data Stream Query Processing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream –Querying on Windows: Counting Ones in a Window – Decaying Window – Real Time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis – Stock Market Predictions.			
Unit – V	**VISUALIZATION**	Periods	**9**
Visualizations – Classification of Visual Data Analysis Techniques – Data Type to be Visualized – Visual Techniques – Specific Visual Data Analysis Techniques - Interaction Techniques - Social Network Analysis – Collective Inferencing – Egonets - Systems and Applications			
		Total Periods	**45**

Text Books:	
1.	David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016
2.	Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007
References:	
1.	Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
2.	Bart Baesens,”Analytics in a Big Data World – The Essentials Guide to Data Science and its Applications”, Wiley, 2014
3.	RadhaShankarmani, M.Vijayalakshmi, “Big Data Analytics”, Wiley, 2016
4.	SeemaAcharya, SubhashiniChellapan, “Big Data Analytics”, Wiley, 2018 Reprinted.
E-Resources	
1.	https://www.simplilearn.com/tutorials/data-science-tutorial/what-is-data-science
2.	https://www.ibm.com/cloud/learn/data-science-introduction
3.	https://www.educba.com/data-science/data-science-tutorials/data-analytics-basics/
4.	https://www.mygreatlearning.com/blog/understanding-data-visualization-techniques/

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Programme	**B.E.**	Programme code	**101**	Regulation	**2019**			
Department	**Computer Science and Engineering**		Semester		**-**			
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV33	**Fundamentals of Deep Learning**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Understand the context of neural networks and deep learning • Identify how to use a neural network • Understand the data needs of deep learning • Have a working knowledge of neural networks and deep learning • Discover the parameters for neural networks	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: apply the concepts of machine learning algorithms to solve simple problems	K2
	CO2: solve simple problems using the concepts of deep neural networks	K2
	CO3: use different regularization methods for Deep learning	K3
	CO4: exemplify the concepts of CNN models and apply it for solving computer vision related problems	K2
	CO5:explicate the concepts of RNN models and apply it for solving Natural Language problems	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	3	3	2	1	3	2	1	1	1	-	1	3	1	2
CO 2	3	3	2	1	3	2	1	1	1	-	1	3	1	2
CO 3	3	2	1	2	3	1	1	1	1	-	1	3	2	2
CO 4	3	1	1	2	3	1	1	-	1	-	-	3	2	2
CO 5	3	2	1	2	3	1	1	-	1	-	-	3	2	2

Course Assessment Methods

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

Content of the syllabus

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Unit – I	**Overview of Machine Learning**	Periods	**9**
Learning Algorithms – Capacity, Overfitting and Underfitting – Hyperparameters and Validation Sets – Estimators, Bias and Variance – Bayesian Estimates – Maximum Likelihood Estimation –Stochastic Gradient Descent – Building a Machine Learning Algorithm – Challenges Motivating Deep Learning.			
Unit - II	**Deep Feed forward Networks**	Periods	**9**
Deep Feed forward Networks: Learning XOR – Gradient-Based Learning – Hidden Units – Architecture Design – Back-Propagation and Other Differentiation Algorithms.			
Unit – III	**Regularization for Deep Learning**	Periods	**9**
Parameter Norm Penalties – Dataset Augmentation – Noise Robustness – Semi-Supervised Learning – Multi-Task Learning – Early Stopping – Parameter Tying and Parameter Sharing – Bagging and Other Ensemble Methods – Dropout – Adversarial Training.			
Unit – IV	**Sequence Modeling: Recurrent and Recursive Nets**	Periods	**9**
Recurrent Neural Networks – Bidirectional RNNs – Encoder-Decoder Sequence-to-Sequence Architectures – Deep Recurrent Networks – Recursive Neural Networks – The Long Short-Term Memory and other Gated RNNs.			
Unit – V	**Convolutional Networks**	Periods	**9**
The Convolution Operation – Motivation – Pooling – Variants of the Basic Convolution Function – Structured Outputs Efficient Convolution Algorithms.			
		Total Periods	**45**

Textbooks	
1.	Ian Goodfellow, YoshuaBengio, and Aaron Courvill, "Deep Learning", MIT Press, USA, 2016.
2.	Josh Patterson and Adam Gibson, "Deep Learning – A Practitioner‟s Approach", 1 Edition, O‟Reilly Series, 2017.
References	
1.	Indra den Bakker, "Python Deep Learning Cookbook", 1 Edition, Packt Publishing, 2017.
2.	David Feldspar · Narrated by Jason R. Gray, “Deep Learning: Guide for Machine Learning, Neural Networks, and Data Analytics”, 1 Edition, Aug 2019.
E-Resources	
1.	https://www.deeplearningbook.org/
2.	https://www.simplilearn.com/tutorials/deep-learning-tutorial
3.	https://www.kaggle.com/kanncaa1/deep-learning-tutorial-for-beginners
4.	https://www.coursera.org/learn/introduction-tensorflow?specialization=tensorflow-in-practice

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Programme	**B.E. / B.Tech.**	Programme Code		Regulation	**2019**		
Department	**CSE & IT**			Semester	-		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
U19CSV34	**Advanced Database Systems**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Understand the basics of Query processing. • Apply indexing and hashing techniques in the design of relational database. • Learn the concepts of Object Oriented database. • Listening the concept of Database security. • Enrich the knowledge of NoSQL, MongoDB.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Outline the features of Query processing and relational algebra operations	K2
	CO2: Apply indexing and hashing techniques in the design of relational database	K3
	CO3: Explain the concepts of Object Oriented and Extended Relational Database Technologies	K2
	CO4: Analyze & tune the Database security	K4
	CO5: Apply the principles & techniques of Advanced Databases.	K3
Pre-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	2	3	3	3	2							2	2	3
CO 2	1	3	3	2	2							3	2	2
CO 3	2	2	3	3	2							2	2	3
CO 4	2	2	3	2	2							2	2	3
CO 5	2	2	3	3	2							3	2	2

Course Assessment Methods

Direct

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

Indirect

1. Course - end survey

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Content of the syllabus

Unit – I	QUERY PROCESSING	Periods	9
Basic concepts of query processing - converting SQL queries into Relational Algebra - Basic Algorithms for executing query operations - Query tree and query graph - Heuristic optimization of query tree.			
Unit – II	**INDEXING, HASHING AND CURRENT ISSUES**	Periods	**9**
Ordered indices – B tree index files – B+ Tree index files – Multiple key access – Static and Dynamic Hashing – Bitmap indices- Active Database Concepts – Introduction to Deductive Databases – Clausal Form and Horn Clauses – Interpretation of Rules – Use of Relational Operations – Multimedia Databases			
Unit - III	**OBJECT ORIENTED AND EXTENDED RELATIONAL DATABASE TECHNOLOGIES**	Periods	**9**
Overview of Object oriented database - OO Concepts - Encapsulation of Operations and methods – Inheritance - Object Model - Object definition language - Object Query Language - Object Relational Concepts.			
Unit – IV	**DATABASE SECURITY**	Periods	**9**
Introduction to Database Security Issues- Discretionary Access Control Based on Granting and Revoking Privileges- Mandatory Access Control and Role-Based Access Control for Multilevel Security- Introduction to Statistical Database Security- Encryption and Public Key Infrastructures- Challenges to Maintaining Database Security- Oracle Label-Based Security			
Unit - V	**ADVANCED DATABASE TECHNIQUES**	Periods	**9**
NoSQL (Not Only SQL)) - Introduction to MongoDB – Term Used in RDBMS and MongoDB – Data Types in MongoDB – MongoDB Query Language- MongoDB Atlas – Introduction to Apache Cassandra – CQL Data Types – CQLSH – CRUD operations –Collections – Using a counter – Time to Live – Alter Commands – Import and Export – Querying System Tables.			
		Total Periods	**45**

Text Books

1.	Elmasri & Navathe Fundamentals of Database Systems, Pearson Education, 7th Edition,2016
2.	Rini Chakrabarti , Shilbhadra Dasgupta Advanced Database Management System (MISL-DT), Dreamtech press,2014
3.	Silberschatz Abraham, Korth Henry F. and Sudarshan S., ―Database System Concepts‖, 7th Edition, McGraw Hill, New York, 2019.

References

1.	Database Illuminated, Catherine Ricarso, Second Edition, Jones & Bartleft Learning.2013
2.	Database Management System , S K Sinha, Second Edition, Pearson Publication 2011
3.	Data Base Management System, Leon & Leon, Vikas Publications ,2010
4.	Introduction to Database Systems, Bipin C Desai, Galgotia, 2012

E-Resources

1.	https://www.tutorialspoint.com/distributed_dbms/distributed_dbms_relational_algebra_query_optimization.htm
2.	https://phoenixnap.com/kb/object-oriented-database
3.	https://www.analyticsvidhya.com/blog/2020/09/different-nosql-databases-every-data-scientist-must-know/

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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	**101**	Regulation	**2019**			
Department	**Computer Science and Engineering**		Semester		**-**			
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV35	**Soft Computing**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Learn the various types of soft computing frameworks. • Understand the knowledge about Genetic Algorithms. • Design various types of neural networks. • Understand the concepts of neuro fuzzy. • Gain knowledge on Artificial Intelligence.	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Describe human intelligence and how intelligent system works.	K2
	CO2: Apply basics of Fuzzy logic and neural networks	K2
	CO3: Discuss about Neuro Fuzzy concepts	K3
	CO4: Describe with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations	K2
	CO5: Develop some familiarity with current research problems and research methods in Soft Computing Techniques.	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	1	1	3	2	3	2	-	2	1	2	2	2	2	3
CO 2	1	2	1	1	3	2	-	2	1	2	2	1	3	2
CO 3	2	2	2	2	2	2	-	3	1	2	1	2	1	3
CO 4	2	3	1	3	3	3	-	3	1	2	2	2	2	1
CO 5	2	3	2	2	2	3	-	2	1	3	2	1	2	1

Course Assessment Methods

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

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Content of the syllabus			
Unit – I	**NEURAL NETWORKS**	Periods	**9**
Introduction to ANS - Adaline - Back propagation network - Hopfield network - Boltzman machine - Self organizing maps- Support Vector Machines-Spike Neuron Models.			
Unit - II	**FUZZY LOGIC**	Periods	**9**
Fuzzy sets - Fuzzy rules and fuzzy reasoning –Defuzzification- Fuzzy inference system - Mamdani fuzzy model - Sugenofuzzy model - Tsukamoto fuzzy model			
Unit – III	**NEURO FUZZY**	Periods	**9**
Adaptive Neuro Fuzzy Inference System - Coactive neuro-fuzzy modelling - Classification and regression trees - Data Clustering Algorithm - Rule based structure - Neuro - Fuzzy control I - Neuro -Fuzzy control II - Fuzzy decision making.			
Unit – IV	**GENETIC ALGORITHM**	Periods	**9**
Introduction - Implementation of GA - Reproduction - Crossover - Mutation - Coding - Fitness scaling - Application of GA.			
Unit – V	**ARTIFICIAL INTELLIGENCE**	Periods	**9**
Introduction - Searching techniques - First order Logic - Forward reasoning - Backward reasoning - Semantic – Frames.			
		Total Periods	**45**

Textbooks	
1.	James A. Freeman and David M. Skapura, ―Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.
2.	S.R.Jang, C.T. Sun And E.Mizutani, "Neuro-Fuzzy And Soft Computing", PHI / Pearson Education 2004.
3.	David E. Goldberg, "Genetic Algorithm In Search Optimization And Machine Learning" Pearson Education India, 2013.
4.	Stuart J. Russel, Peter Norvig, "Artificial Intelligence A Modern Approach", 2nd Edition, Pearson Education, 2003.
References	
1.	S.N.Sivanandam ,S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd., 2nd Edition, 2011.
2.	S.Rajasekaran, G.A.VijayalakshmiPai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt. Ltd., 2017.
3.	S.N.Sivanandam • S.N.Deepa, ― Introduction to Genetic Algorithms‖, Springer, 2007.
E-Resources	
1.	http://home.iitk.ac.in/~utsav/ChE645pdf.pdf
2.	https://onlinecourses.nptel.ac.in/noc22_cs02/preview
3.	https://www.tutorialspoint.com/fuzzy_logic/index.htm
4.	https://towardsdatascience.com/soft-computing-6cef872f7704
5.	https://lecturenotes.in/subject/124/soft-computing-sc/124

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Programme	**B.E.**	Programme code	**101**	Regulation	**2019**			
Department	**Computer Science and Engineering**		Semester		**-**			
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV36	**Knowledge Management**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Study the basic concepts of knowledge management. • Learn the life cycle evolution of knowledge management. • Study the basic concepts of Expert Knowledge. • Be familiar with tools. • Learn the Knowledge Transfer and Sharing of Knowledge Management.	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Implement knowledge management concepts, in all aspect.	K2
	CO2: Demonstrate the knowledge management life cycle.	K2
	CO3: Compute the fuzzy logic in designing expert system.	K3
	CO4: Analyze the knowledge management system using tools & testing techniques.	K2
	CO5: Infer the knowledge transfer & shearing in knowledge management application.	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	3	2	1						3		2		3	2
CO 2	3	3	2	1	1				2				3	1
CO 3	2	3	3			2						2	2	2
CO 4	3	3	2		3				2			2	3	3
CO 5	3	2	2						1	1		2	2	2

Course Assessment Methods

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

Content of the syllabus

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Unit – I	**KNOWLEDGE MANAGEMENT**	Periods	**9**
KM Myths – KM Life Cycle – Understanding Knowledge – Knowledge, intelligence –Experience – Common Sense – Cognition and KM – Types of Knowledge – Expert Knowledge – Human Thinking and Learning.			
Unit - II	**KNOWLEDGE MANAGEMENT SYSTEM LIFE CYCLE**	Periods	**9**
Challenges in Building KM Systems – Conventional vs KM System Life Cycle (KMSLS) – Knowledge Creation and Knowledge Architecture – Nonaka's Model of Knowledge Creation and Transformation. Knowledge Architecture.			
Unit – III	**KNOWLEDGE CAPTURING**	Periods	**9**
Evaluating the Expert – Developing a Relationship with Experts – Fuzzy Reasoning and the Quality of Knowledge – Knowledge Capturing Techniques, Brain Storming – Protocol Analysis – Consensus Decision Making – Repertory Grid- Concept Mapping – Blackboarding.			
Unit – IV	**KNOWLEDGE CONVERSION AND TESTING**	Periods	**9**
Modes of Knowledge Conversion – Codification Tools and Procedures – Knowledge Developer's Skill Sets – System Testing and Deployment – Knowledge Testing – Approaches to Logical Testing, User Acceptance Testing – KM System Deployment Issues – User Training – Post implementation.			
Unit – V	**KNOWLEDGE TRANSFER AND SHARING**	Periods	**9**
Transfer Methods – Role of the Internet – Knowledge Transfer in e-world – KM System Tools – Neural Network – Association Rules – Classification Trees – Data Mining and Business Intelligence – Decision Making Architecture – Data Management – Knowledge Management Protocols – Managing Knowledge Workers.			
		Total Periods	**45**

Textbooks

1.	Elias. M. Award & Hassan M. Ghaziri "Knowledge Management" Pearson, Education 2003.
2.	Guus Schreiber, Hans Akkermans, Anjo Anjewierden, Robert de Hoog, Nigel Shadbolt, Walter Van de Velde and Bob Wielinga, "Knowledge Engineering and Management", Universities Press, 2001.

References

1.	C.W. Holsapple, "Handbooks on Knowledge Management", International Handbooks on Information Systems, Vol 1 and 2, 2004
2.	Ronald maiser "Information and Communication Technologies for Knowledge Management" 3rd Edition,2007

E-Resources

1.	Knowledge Management - Course (nptel.ac.in)
2.	www.cs.unibo.it/~gaspari/www/teaching/slides_KM2.pdf
3.	What is Knowledge Management? The 2022 Guide | Guru (getguru.com)

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Programme	**B.E. / B.TECH**	Programme Code		Regulation	**2019**			
Department	**CSE, IT**			Semester				
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19ITV34	**BUSINESS INTELLIGENCE AND ITS APPLICATIONS**	3	0	0	3	50	50	100
Course Objective	The student should be able to, • Understand and critically apply the concepts and methods of business analytics • Identify, model and solve decision problems in different settings • Interpret results/solutions and identify appropriate courses of action for a given managerial situation whether a problem or an opportunity							
Course Outcome	At the end of the course ,the student should be able to,						Knowledge Level	
	CO1: Know about enterprise view of IT applications and identify the different types of digital data						K2	
	CO2: Understand BI concepts and techniques to experiment ETL process						K2	
	CO3: Compare and Contrast OLTP with OLAP systems and design dimensional model						K3	
	CO4: Experiment an model of Dashboard Creation for Performance Management						K3	
	CO5: Apply BI to mobile, cloud, ERP and social CRM systems						K3	
Pre-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	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	2	1											2	2
CO 2	2	1											2	2
CO 3	3	2	1	1									3	3
CO 4	3	2	1	1									3	3
CO 5	3	2	1	1									3	3

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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	**Business View of IT Applications**	Periods	**9**
Introduction to Business View of Information -Core Business Processes – Baldrige Business Excellence Framework – Purpose of using IT in Business – Characteristics of Internet-ready IT Applications – Enterprise Applications – Information users and their requirements.- Types of Digital Data: Introduction – Structured Data – Unstructured Data – Semi-Structured Data – Difference between semi-structured and structured data.			
Unit - II	**Business Intelligence and Data Integration**	Periods	**9**
Business Intelligence: Definition – Evolution – Need for BI – BI Value Chain – Business Analytics – BI Framework – BI Users – BI Applications – BI Roles and Responsibilities – Data Integration : Need for Data Warehouse – Definition of Data Warehouse – Data mart – Ralph Kimball‘s Approach vs. W.H.Inmon‘s Approach – Goals of Data Warehouse – ETL Process – Data Integration Technologies – Data Quality – Data Profiling.			
Unit –III	**OLTP, OLAP and Multidimensional Data Modeling**	Periods	**9**
OLTP – OLAP – OLAP Architectures – Data Models – Role of OLAP Tools in BI – OLAP Operations – Basics of Data Modeling – Types of Data Model – Data Modeling Techniques – Fact Table – Dimension Table – Dimensional Models – Dimensional Modeling Life Cycle – Designing the Dimensional Model.			
Unit - IV	**Performance Management and Enterprise Reporting**	Periods	**9**
Measures, Metrics, KPIs and Performance Management: Understanding Measures and Performance – Measurement System – Role of metrics – KPIs – Enterprise Reporting: Reporting Perspectives – Report Standardization and Presentation Practices – Enterprise Reporting Characteristics – Balanced Scorecard – Dashboards – Creating Dashboards – Scorecards vs. Dashboards – Analysis.			
Unit –V	**BI Applications**	Periods	**9**
Understanding Business Intelligence and Mobility– the need for business intelligence on the move – BI Mobility time line – Data Security Concerns for Mobile BI – Business Intelligence and Cloud Computing – Business Intelligence for ERP systems – Social CRM and Business Intelligence			

Text Books

1.	Prasad R.N. and Seema Acharya, "Fundamentals of Business Analytics", 2nd Edition, Wiley, 2016.

References

1.	Ramesh Sharda, DursunDelen, Efraim Turban, "Business Intelligence, Analytics, and Data Science: A Managerial Perspective", 4th Edition, Pearson Education, 2017.
2.	David Loshin, "Business Intelligence: The Savvy Manager‘s Guide", 2nd Edition, Morgan Kaufmann , 2012.

E-Resources

1.	https://www.coursera.org/learn/business-intelligence-tools
2.	https://www.udemy.com/courses/search/?src=ukw&q=business+intelligence+andits+applications

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Programme	**B.E. / B.TECH**	Programme Code			Regulation	**2019**			
Department	CSE, IT			Semester					
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
U19ITV35	**Digital ImageProcessing**	3	0	0	3	50	50	100	

Course Objective	The student should be made to, • Learn digital image fundamentals. • Be exposed to simple image processing techniques. • Be familiar with image compression and segmentation techniques. • Learn Wavelets and image compression techniques • Learn to represent image in form of features	
Course Outcome	At the end of the course, the student should be able to,	KL
	CO1: Analyze general terminology of digital image processing	K3
	CO2: Examine various types of images, intensity transformations and spatial filtering and develop for image processing in frequency domain.	K2
	CO3: Evaluate the methodologies for image segmentation and restoration etc.	K3
	CO4: Implement image process and analysis and algorithms	K2
	CO5: Apply image processing algorithms in practical applications	K3
Pre-requisites	Linear signals, Fourier transforms, Probability theory	

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													**CO/PSO Mapping**	
COs	Programme Outcomes (POs)												PSOs	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	3	2											2	
CO 2	1	1	1											2
CO 3		1	1		2	1								2
CO 4			1	1		1			2					
CO 5		1						1					2	2

Course Assessment Methods

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	**DIGITAL IMAGE FUNDAMENTALS**	Periods	**8**
Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models.			
Unit – II	**IMAGE ENHANCEMENT**	Periods	**10**
Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – **Frequency Domain:** Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.			
Unit – III	**IMAGE RESTORATION AND SEGMENTATION**	Periods	**9**
Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering **Segmentation:** Detection of Discontinuities– Edge Linking and Boundary detection – Region based segmentation Morphological processing-erosion and dilation.			
Unit – IV	**WAVELETS AND IMAGE COMPRESSION**	Periods	**9**
Wavelets – Subband coding - Multiresolution expansions - **Compression:** Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.			
Unit – V	**IMAGE REPRESENTATION AND RECOGNITION**	Periods	**9**
Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.			
Total Periods			**45**

Text Books	
1	Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.
2	Deitel and Deitel and Nieto, "Internet and World Wide Web - How to Program", Prentice Hall,5th Edition, 2011.
3	Herbert Schildt, "Java-The Complete Reference", Eighth Edition, Mc Graw Hill Professional, 2011.
References	
1	Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2	Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd. 2011.
3	Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
4	Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.
E-Resources	
1	http://eeweb.poly.edu/~onur/lectures/lectures.html.
2	https://www.caen.uiowa.edu/~dip/LECTURE/lecture.html

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Programme	**B.E. / B.Tech.**	Programme Code			Regulation	**2019**		
Department	**CSE, IT & CST**				Semester	**-**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV41	**Embedded Systems**	3	0	0	3	40	60	100

Course Objective	The Main Objective of the course is to • Learn the architecture and programming of ARM processor. • Be familiar with the embedded computing platform design and analysis. • Learn the system design techniques and networks for embedded systems • Discuss the major components that constitute an embedded system. • Implement small programs to solve well-defined problems on an embedded platform.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Describe the architecture & programming of ARM processor.	K1
	CO2: Discuss different memory management schemes.	K2
	CO3: Analyze embedded core based design & real time OS	K3
	CO4: Use the system design techniques to develop software for embedded system	K4
	CO5: Formulate real time examples using embedded system	K2
Pre-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		2								2	2	
CO 2	2	1	2		1								3	2	
CO 3	3	2	2		1								2	1	
CO 4	2	3	3		2								2	2	
CO 5	2	2	2		1								3	2	

Course Assessment Methods

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

Content of the syllabus

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Unit – I	EMBEDDED COMPUTING	Periods	9
Introduction to Embedded Systems –Structural units in embedded processor, selection of processor & memory management methods devices- Embedded system design process. Embedded processors – 8051 Microcontroller, ARM processor – Architecture, Instruction sets and programming.			
Unit - II	**MEMORY AND INPUT / OUTPUT MANAGEMENT**	Periods	**9**
Programming Input and Output – Memory system mechanisms – Memory and I/O devices and interfacing – Interrupts handling.			
Unit – III	**PROCESSES AND OPERATING SYSTEMS**	Periods	**9**
Multiple tasks and processes – Context switching – Scheduling policies – Inter process communication mechanisms – Performance issues.			
Unit - IV	**EMBEDDED SOFTWARE**	Periods	**9**
Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modeling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.			
Unit – V	**EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT**	Periods	**9**
Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM machine – surveillance camera			
		Total Periods	**45**

Text Books:

1.	Wayne Wolf, "Computers as Components - Principles of Embedded Computing System Design", Third Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012
2.	Michael J. Pont, “Embedded C”, Pearson Education, 2007

REFERENCE BOOKS

1.	Steve Heath, “Embedded System Design”, Elsevier, 2005.
2.	Muhammed Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinlay, “The 8051 Microcontroller and Embedded Systems”, Pearson Education, Second edition, 2008

E-Resources

1.	https://www.digimat.in/nptel/courses/video/108102045/L01.html

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Programme	**B.E. / B.Tech.**	Programme Code	**101**	Regulation	**2019**		
Department	**CSE,IT & CST**			Semester	-		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV42	**Smart Sensor Technologies**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Select the right sensor for a given application. • Design basic circuit building blocks. • Simulate, synthesize, and layout a complete sensor or sensor system.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Analyze the sensors available in IoT based on application requirement and the Sensing methods	K2
	CO2: Analyze the sensors available in IoT based on application requirement and the Sensing methods	K3
	CO3: Interfacing different types of Sensors with MCU	K3
	CO4: Infer Wireless Sensing, RF Sensing and RF MEMS	K4
	CO5: Design a real-time application for landslide monitoring and hazard mitigation	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	2	2	2	2						3			2	2
CO 2	1	3	2	2						3			2	2
CO 3	1	3	2	2						2			2	2
CO 4	3	2	2	2						3			2	2
CO 5	2	3	2	2						2			2	2

Course Assessment Methods

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

Content of the syllabus

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Unit – I	BASICS OF SENSORS	Periods	9
Introduction- Sensor Vs Transducer, Nature of Sensors, Sensor Output Characteristics, Sensing Technologies, Digital Output Sensors.			
Unit – II	**APPLICATION SPECIFIC SENSORS**	Periods	**9**
Occupancy and motion detectors: ultrasonic – microwave – capacitive detectors- optical presence sensor, Light Detectors: Photo diodes – photo transistor – photo resistor- CCD and CMOS image sensors, Temperature Sensors: thermos-resistive sensors – thermoelectric contact sensor			
Unit - III	**SENSOR WITH MICROCONTROLLER**	Periods	**9**
Introductions, Amplification and Signal Conditioning, Integrated Signal Conditioning, Digital Conversion, MCU Control, MCUs for Sensor Interface, Techniques and Systems Considerations, Sensor Integration			
Unit – IV	**WIRELESS SENSING**	Periods	**9**
Wireless Data and Communications, Wireless Sensing Networks, Industrial Wireless Sensing Networks, RF Sensing, Telemetry, RF MEMS, Complete System Consideration.			
Unit – V	**SMART APPLICATIONS AND SYSTEM REQUIREMENTS**	Periods	**9**
Automotive Applications, Industrial (Robotic) Applications, Consumer Applications, Future Sensor Plus Semiconductor Capabilities, Future System Requirements.			
		Total Periods	**45**

Text Books

1.	Frank, Randy, "Understanding smart sensors", Artech House integrated microsystems series, 3rd Edition, 2013.

References

1.	Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", 5th Edition, Springer, 2016
2.	VlasiosTsiatsis, Stamatis Karnouskos, Jan Holler, David Boyle, Catherine Mulligan, "Internet of Things: Technologies and Applications for a New Age of Intelligence", Academic Press, 16-Nov-2018.
3.	Henry Leung, Subhas Chandra Mukhopadhyay, "Intelligent Environmental Sensing", Springer, 22-Jan-2015.

E-Resources

1.	https://www.techbriefs.com/component/content/article/tb/pub/features/articles/33212
2.	https://www.azosensors.com/article.aspx?ArticleID=1289
3.	https://360digitmg.com/iot-smart-sensors

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Programme	**B.E./B.Tech.**	Programme Code		Regulation	**2019**		
Department	**CSE, IT & CST**			Semester	-		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV43	**Security in Computing**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Understand security design principles and secure programming techniques.
- Understand the mathematics behind cryptography.
- Know the standard algorithms used to provide confidentiality, integrity and authenticity.
- Understand the security requirements in operating systems and databases.

Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Illustrate the various threats and design principles in security.	K2
	CO2: Discuss on various types of attacks and their characteristics	K3
	CO3: Apply symmetric encryption algorithms for providing security	K3
	CO4: Implement asymmetric encryption techniques.	K4
	CO5: Design a secure OS.	K3

Pre-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	1	2	2	2	3	2							2	2
CO 2	1	3	2	2	3	2							2	2
CO 3	2	2	2	2	2	2							2	2
CO 4	2	3	2	3	2	2							2	2
CO 5	2	2	2	3	2	2							2	2

Course Assessment Methods

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	**SECURITY DESIGN PRINCIPLES**	Periods	**9**
Security Goals – Secure System Design – Understanding Threats – Designing-In Security – Convenience and Security – Security in Software Requirements – Security by Obscurity – Secure Design Principles – Defense in Depth – Diversity in Defense – Securing the Weakest Link – Fail-Safe Stance.			
Unit – II	**SECURE PROGRAMMING TECHNIQUES**	Periods	**9**
Worms and Other Malware – Buffer Overflows – Client State Manipulation – SQL Injection – Password Security – Cross Domain Security in Web Applications – Attack Patterns – Preventing XSRF – Preventing XSSI - Preventing XSS.			
Unit - III	**SYMMETRIC CIPHERS & INTRODUCTION TO NUMBER THEORY**	Periods	**9**
Overview - Classical Encryption Techniques – Block Ciphers and the Data Encryption Standard – Basic Concepts in Number Theory and Finite Fields – Advanced Encryption Standard – Block Cipher Operation - Fermat's and Euler's Theory – CRT – Discrete Logarithms.			
Unit – IV	**PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS**	Periods	**9**
Public Key Cryptography and RSA – Diffie-Hellman Key Exchange – Elgamal Cryptographic System – Elliptic Curve Cryptography – Cryptographic Hash Functions – Message Authentication Code - Digital Signature - Certificates.			
Unit - V	**SECURITY APPLICATIONS**	Periods	**9**
Security in Operating Systems - Security in the Design of OS – Rootkit- Open Web Application Security – Wireless Network Security – Introduction to Mobile Security.			
		Total Periods	**45**

Text Books	
1.	Neil Daswani, Christoph Kern, and Anita Kesavan, Foundations of Security: What Every Programmer Needs to Know, First Edition, Apress, 2008.
2.	William Stallings, Cryptography and Network Security: Principles and Practices‖, 8th Edition, Pearson Education, 2023.
References	
1.	
2.	Charles P. Pfleeger, Shari Lawrence Pfleeger and Jonathan Margulies, Security in Computing, Fifth Edition, Pearson Education, 2015.
3.	AtulKahate, Cryptography and Network Security, Tata McGraw Hill, 2003.
4.	Reshetova, Ahmad-Reza Sadeghi, Mobile Platform Security, First Edition, Morgan and Claypool Publishers Series, 2014.
E-Resources	
1.	http://index-of.co.uk/Hacking-Coleccion/Foundations%20of%20Security%20- % 20 What % 20 Every %20Programmer%20Needs%20to%20Know.pdf
2.	https://www.tutorialspoint.com/computer_security/index.htm
3.	https://www.javatpoint.com/cyber-security-tutorial
4.	https://www.brainkart.com/subject/Security-in-Computing_156/

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Programme	**B.E. /B.Tech.**	Programme Code		Regulation	**2019**		
Department	**CSE, IT**			Semester	**-**		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV44	**Industry 4.0**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • impart basic idea in Industry 4.0 • Learn the design and analysis of Industry 4.0 systems for Energy and smart vehicular applications • provide students with good depth of knowledge of designing Industrial 4.0 Systems for various application

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1:know basic concepts of Industry 4.0 and the other related fields	K2
	CO2:explore the basics of industrial internet of things	K2
	CO3:interpret the concepts of various architectures and components	K3
	CO4:analyze the cloud computing, fogcomputing, and big data technology.	K3,K4
	CO5:examine the importance of IIoT analytics for various use cases	K3,K4

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**	**PSO1**	**PSO 2**
CO 1	2	1	3	1		1			1				1	2
CO 2	2	1	3	2	2	1			1			2	3	2
CO 3	3	2	3		2	2		1	2		1	2	3	2
CO 4	3	3	3		2	2		1	2		1	1	2	2
CO 5	2	3	3	2	2	2		1	2		1	2	3	2

Course Assessment Methods

Direct

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

Indirect

1. Course - end survey

Content of the syllabus

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Unit – I	Overview of Industry 4.0	Periods	9
Introduction-Industry 4.0: Phases of development - Evolution of Industry 4.0 - Environmental impacts of industrial revolution - Industrial Internet-Applications of Industry 4.0. IIoT: Prerequisites of IIoT-Basics of CPS-CPS and IIoT-Applications of IIoT.			
Unit - II	**Industry 4.0: Basics**	Periods	**9**
Industry 4.0: Basics: Introduction - Design requirements of Industry 4.0 -Drivers of Industry 4.0 - Sustainability Assessment of industries -Smart Business Perspective. Impacts of Industry 4.0: Economy Perspective-Business Perspective-Global perspective			
Unit – III	**Business Models and Reference Architecture of IIoT**	Periods	**9**
Introduction - Definition of a business model - Business Models of IoT-Business models of IIoT- Reference architecture of IoT - Reference Architecture of IIoT- IIRA -Key Performance Indicators for Occupational Safetyand Health			
Unit - IV	**Off-site and On-site Technologies**	Periods	**9**
Introduction -Cloud Computing-Fog Computing. On-site Technologies: Introduction -Augmented Reality-Virtual Reality-Big Data and Advanced Analytics -Smart factories- Lean manufacturing system.			
Unit – V	**Industrial Data Acquisition and Applications**	Periods	**9**
Introduction-Distributed Control System-PLC-SCADA. Introduction to IIoT Analytics: Introduction-IIoT Analytics: Categorization of analytics: IIoT and Industry 4.0 context-Usefulness of IIoT analytics-Challenges of analytics in industries-Mapping of analytics with the IIRA architecture-Deployment of analytics-Artificial intelligence-Applications of analytics across value chain. **Case Studies:** Healthcare Applications in Industries.			
		Total Periods	**45**

Text Books

1.	SudipMisra, Chandana Roy, Anandarup Mukherjee, "Introduction to Industrial Internetof Tings and Industry 4.0", First edition published 2021by CRC PressTaylor & Francis Group.
2.	Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", 1st Edition, Apress Media, NewYork, 2016

References

1.	DimitriosSerpanos and Marilyn Wolf, "Internet-of-Things (IoT) Systems, Architectures, Algorithms, Methodologies", SpringerInternational Publishing AG, Switzerland, 2018
2.	Alp Ustundag and EmreCevikcan, "Industry 4.0: Managing the Digital Transformation", Springer series in AdvancedManufacturing, Switzerland, 2018.
3.	Jean-Claude André, ―Industry 4.0‖, Wiley- ISTE, July 2019, ISBN: 781786304827,2019.
4.	Diego GalarPascual, Pasquale Daponte, Uday Kumar, ―Handbook of Industry 4.0 andSMART Systems‖ Taylor and Francis,2020

E-Resources

1.	https://onlinecourses.nptel.ac.in/noc20_cs69/preview
2.	https://library.oapen.org/bitstream/handle/20.500.12657/43836/external_content.pdf?sequence=1&isAllowed=y
3.	https://www.i-scoop.eu/industry-4-0/
4.	https://en.wikipedia.org/wiki/Fourth_Industrial_Revolution
5.	https://www.ibm.com/topics/industry-4-0

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**B.E. / B.TECH**	Programme code		Regulation	**2019**			
Department	**CSE, IT**		Semester					
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19ITV41	**Software Defined Networks**	3	0	0	3	50	50	100

Course Objective	The student should be made to, • Understand the concepts of software defined networks • Explore modern approaches like openflow, openstack • Learn the interface between networking devices and the software controlling them • Know about SDN in data centers. • Study about the various applications of SDN.	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Differentiate between traditional networks and software defined networks.	K2
	CO2: Understand advanced and emerging networking technologies.	K2
	CO3: Learn how to use SDN controllers to perform complex networking tasks.	K2
	CO4: Demonstrate the skills to do advanced networking research and programming.	K3
	CO5: Apply the knowledge on SDN and measures to solve real world problems	K3
Pre-requisites	Computer 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**	**PSO1**	**PSO 2**
CO 1	2	-	-									-	2	2
CO 2	2	1	-									-	2	2
CO 3	2	1	-									-	2	2
CO 4	3	2	2									1	2	3
CO 5	3	3	2									1	2	3

Course Assessment Methods

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

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Content of the syllabus			
Unit – I	**Introduction to SDN**	Periods	**9**
Introduction to SDN: Basic packet switching terminology – The modern data center – Traditional switch architecture – Autonomous and dynamic forwarding table. Why SDN?: Evolution of switches and control planes – Cost-Data center innovation – Data center needs. The Genesis of SDN: The evolution of networking technology – Forerunners of SDN			
Unit - II	**SDN and OpenFlow**	Periods	**9**
How SDN works: Fundamental characteristics of SDN – SDN operation – SDN devices – SDN controllers – Alternate SDN methods. The OpenFlow specification: OpenFlow overview – OpenFlow 1.0 and OpenFlow basics – OpenFlow 1.1 Additions – OpenFlow 1.2 Additions – OpenFlow 1.3 Additions – OpenFlow Limitations.			
Unit – III	**SDN Interfaces**	Periods	**9**
SDN Interfaces: Alternative definitions of SDN: Potential drawbacks of open SDN – SDN via APIs – SDN via hypervisorbased overlays – SDN via opening up the device – Network Functions virtualization – Alternatives overlap and ranking. SDN open source: Open source licensing issues – OpenFlow source code – Switch implementation – Controller implementations – Orchestration and Network virtualization – Simulation, Testing and Tools – OpenStack – Applying SDN open source			
Unit – IV	**SDN in Data Center**	Periods	**9**
Data center definition – Data center demands – Tunneling technologies for the data center- Path technologies in the data center – SDN and shortest path complexity – Ethernet fabrics in the data center – SDN use cases in the data center – Open SDN versus Overlays in the data center – Real-world data center implementation.			
Unit – V	**SDN Environments and Applications**	Periods	**9**
SDN in other environment: Wide area networks – Service provider and carrier networks – Campus networks – Hospitality networks – Mobile networks – In-Line network functions – Optical networks. SDN Applications: Reactive versus Proactive applications – A simple reactive Java application – Creating network virtualization tunnels – offloading flows in the data center – Access control for the campus – Traffic engineering for the service providers.			
		Total Periods	**45**

Textbooks	
1.	Paul Goransson and Chuck Black, "Software Defined Networks: A Comprehensive Approach",2nd Edition, Morgan Kaufmann, 2016.
References	
1.	Siamak Azodolmolky, "Software Defined Networking with OpenFlow", 2nd Edition, Packet Publishing, 2017.
2.	Thomas D. Nadeau, Ken Gray, "SDN: Software Defined Networks", 1st Edition, O'Reilly Media, 2013.
E-Resources	
1.	https://www.cs.tau.ac.il/~msagiv/courses/rsdn/SDN-TAU.pdf
2.	https://www.cse.wustl.edu/~jain/tutorials/ftp/sd_hs14.pdf
3.	https://networklessons.com/cisco/ccna-routing-switching-icnd2-200-105/introduction-to-sdn-software-defined-networking

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Programme	**B.E. / B.TECH**	Programme code		Regulation	**2019**		
Department	**CSE, IT**			Semester			

Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19ITV42	**Information Storage And Management**	3	0	0	3	50	50	100

Course Objective	The student should be made • To understand the basic components of Storage System Environment. • To examine emerging technologies including IP-SAN. • To describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities.	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Understand the storage system architecture and RAID techniques.	K2
	CO2: Understand storage components and its access.	K2
	CO3: Infer the different backup and recovery	K2
	CO4: Demonstrate information and storage networking security	K3
	CO5: Identify parameters for managing and monitoring storage infrastructure	K2
Pre-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	2	1											2	2
CO 2	2	1											2	2
CO 3	2	1											2	2
CO 4	3	2	1	1									2	2
CO 5	2	1											2	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

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Unit – I	INTRODUCTION TO STORAGE SYSTEM	Periods	9
Introduction to evolution of storage architecture - key data center elements - virtualization, and cloud computing – Host (or compute), connectivity, storage. RAID implementations, techniques and levels along with the impact of RAID on application performance- Components of intelligent storage systems- Front end - Cache - Back end - Physical disk.			
Unit – II	**STORAGE NETWORKING TECHNOLOGIES**	Periods	**9**
Fibre channel SAN components, connectivity options - FC protocol stack - FC addressing operations - Zoning - SAN-based virtualization - iSCSI and FCIP protocols for storage access over IP network, Converged protocol FCoE and its components			
Unit - III	**BACKUP, ARCHIEVE AND REPLICATION**	Periods	**9**
Business continuity terminologies - BC planning life cycle - Failure analysis - Business impact analysis - BC Technology solutions- Backup and recovery – methods, targets and topologies, Data Deduplication for backup - backup in virtualized environment - Data archive - Local replication in classic virtual environments, Remote replication and migration in a virtualized environments.			
Unit – IV	**SECURING STORAGE INFRASTRUCTURE**	Periods	**9**
Information security Framework – Risk Triad – Security Implementations in Storage Networking: FC SAN – NAS – IP SAN – Securing storage infrastructure in Virtualized and Cloud environments.			
Unit - V	**MANAGING STORAGE INFRASTRUCTURE**	Periods	**9**
Monitoring storage infrastructure – Storage Infrastructure Management Activities –Storage infrastructure management challenges – Developing Idea solutions - Information lifecycle management - Storage tiering			
		Total Periods	**45**

Text Books

1.	EMC Education Services, "Information Storage and Management: Storing Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments", 2nd Edition, Wiley, 2015.

References

1.	Anthony T Velte, "Cloud Computing: A practical Approach", 1st Edition, Tata McGraw-Hill, 2009.
2.	Mark Lippitt and Erik Smith, "Networked Storage Concepts and Protocols Tech book", V2.3 Edition, EMC Tech books, 2014.
3.	Soren Lauesen , "Software Requirements: Styles & Techniques", First edition, Addison Wesley Professional publications, 2002

E-Resources

1.	https://vdocument.in/cccloud-computing-a-practical-approach.html?page=46
2.	https://www.slideshare.net/SudarshanDhondale/storage-area-networks-unit-1-notes

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Programme	**B.E. / B.Tech.**	Programme Code			Regulation	**2019**		
Department	**CSE, IT & CST**				Semester	-		
Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTV41	**Fundamentals of Virtualization**	3	0	0	3	40	60	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 (3/2/1 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				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**	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 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 practices for VM memory			
Unit - III	**Storage Management in Virtual Machine**	Periods	**9**
Managing Storage for a virtual machine-Understanding storage virtualization, Configuring VM Storage , options, Tuning practices for VM storage, SCSI- Speaking SCSI- Using SCSI buses – Fiber Channel – Fiber Channel Cables – Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI, Server virtualization concepts, Introduction to server virtualization, Types of server virtualization 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 network securityconsiderations, 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				Regulation	**2019**	
Department	**CSE, IT & CST**					Semester	-	
Course Code	**Course Name**	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CTV43	**Big Data Tools and Techniques**	3	0	0	3	40	60	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 NoSQL databases	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	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 withNoSQL, 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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Programme	**B.E.**	Programme code		Regulation			**2019**	
Department	**CSE, CST**		Semester				**-**	
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV51	**Design Thinking**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • familiarize students with design thinking concepts and principles • ensure students can practices the methods, processes and tools of design thinking. • ensure students can apply the design thinking approach and have ability to model real world situations. • enable students to analyze primary and secondary research in the introduction to design thinking	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Outline Design Thinking concepts and principles	K2
	CO2: Apply the Design Thinking approach and model to real world situations	K3
	CO3: develop many creative ideas through structured brainstorming sessions.	K3
	CO4: develop proof of Concept or story boarding to bring the ideas into reality	K3
	CO5: plan the implementation of the any system considering the real time feedback	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	3	3	3	2	2	2	3	3					3	3
CO 2	3	3	3	1	2	2	3	3					2	2
CO 3	3	3	1	1	2	1	2	3					2	2
CO 4	3	3	1	1	3	2	2	1					2	2
CO 5	3	2	1	1	2	2	1	2					2	2

Course Assessment Methods

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

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Content of the syllabus			
Unit – I	**INTRODUCTION**	Periods	**9**
Introduction – Need for design thinking - Phases of Design Thinking –Visualization – Four Questions, Ten Tools – Explore – STEEP Analysis – Strategic Priorities – Activity System – Stakeholder Mapping – Opportunity Framing.			
Unit - II	**VISUALIZATION**	Periods	**9**
Introduction – Visualization – Journey Mapping – Value Chain Analysis – Mind Mapping – Empathize – Observations – Need Finding – User Personas.			
Unit – III	**BRAINSTORMING**	Periods	**9**
Introduction – Brainstorming – Concept Development – Experiment – Ideation – Prototyping – Idea Refinement.			
Unit – IV	**ASSUMPTION TESTING**	Periods	**9**
Introduction – Assumption Testing – Rapid Prototyping – Engage – Storyboarding			
Unit – V	**CUSTOMER CO-CREATION LEARNING LAUNCH**	Periods	**9**
Introduction – Customer Co-Creation Learning Launch – Leading Growth and Innovation – Evolve– Concept Synthesis – Strategic Requirements – Evolved Activity Systems – Quick Wins.			
		Total Periods	**45**

Textbooks	
1.	Jeanne Liedtka and Tim Ogilvie, "Designing for Growth: A Design Thinking Tool Kit for Managers", Columbia University Press, 2011.
2.	Lee Chong Hwa, "Design Thinking The Guidebook", Design Thinking Master Trainers of Bhutan, 2017.
References	
1.	Jeanne Liedtka, Tim Ogilvie, and Rachel Brozenske, "The Designing for Growth Field Book: A Step-by-Step Project Guide", Columbia University Press, 2014.
E-Resources	
1.	https://www.collectivecampus.io/blog/6-resources-to-help-you-learn-design-thinking
2.	https://thisisdesignthinking.net/on-design-thinking/design-thinking-resources/
3.	http://hs.griet.ac.in/pdf/studymaterials-gr20/Design%20Thinking%20Lab%202020-21.pdf

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Programme	**B.E.**	Programme code		Regulation		**2019**		
Department	**CSE, CST**		Semester					
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV52	**Agile Software Development**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Learn the background and origins of various agile concepts and methodologies. • Apply the fundamental principles and practices of agile software development on a project of interest and relevance. • Successfully manage a project in the business environment. • Select and use both classical and modern project management tools. • Understand and be able to integrate both the customer and the quality tools into project management.

Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Explain the background and driving forces for taking an Agile approach to software development	K2
	CO2: Recognize the business value of adopting Agile approaches	K2
	CO3: Drive development with unit tests using Test Driven Development	K3
	CO4: Apply design principles and refactoring to achieve Agility	K2
	CO5: Deploy automated build tools, version control and continuous integration	K4

Pre-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**	**PSO 1**	**PSO 2**
CO 1	3	2	1	1	3	1	-	1	2	1	1	3	3	2
CO 2	3	2	1	2	3	1	1	2	2	1	2	3	1	2
CO 3	3	1	1	2	3	1	-	1	2	1	1	3	2	2
CO 4	3	2	1	2	3	1	1	2	2	1	2	3	1	2
CO 5	3	2	1	2	3	1	-	2	2	1	2	3	3	2

Course Assessment Methods

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

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Content of the syllabus			
Unit – I	**FUNDAMENTALS OF AGILE**	Periods	**9**
The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools.			
Unit - II	**AGILE SCRUM FRAMEWORK**	Periods	**9**
Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management.			
Unit – III	**AGILE TESTING**	Periods	**9**
The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester			
Unit – IV	**CORBA**	Periods	**9**
Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control.			
Unit – V	**INDUSTRY TRENDS**	Periods	**9**
Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies.			
		Total Periods	**45**

Textbooks	
1.	Ken Schawber, Mike Beedle, "Agile Software Development with Scrum", Pearson Publications, 2008.
2.	Robert C. Martin, "Agile Software Development, Principles, Patterns and Practices", Prentice Hall Publications, 2002.
References	
1.	Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams", Addison Wesley Publications, 2008.
2.	Alistair Cockburn, "Agile Software Development: The Cooperative Game", Addison Wesley Publications, 2006.
3.	Mike Cohn, "User Stories Applied: For Agile Software", Addison Wesley Publications, 2004.
E-Resources	
1.	http://martinfowler.com/agile.html
2.	https://www.tutorialspoint.com/agile/index.htm
3.	https://www.tutorialspoint.com/scrum/index.htm
4.	https://www.edureka.co/blog/what-is-agile-testing/

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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	**101**	Regulation	**2019**			
Department	**Computer Science and Engineering**			Semester	**-**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV53	**Software Project Management**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- outline the need for Software Project Management
- highlight different techniques for software cost estimation and activity planning
- Learn about activity planning and risk management
- Learn the project management control

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Describe the need for software project management and control.	K3
	CO2: Classify the various activities of project scheduling & evaluation	K3
	CO3: Outline the risk assessment and management process	K2
	CO4: Demonstrate the different models of software process and network planning	K2
	CO5: Summarize organizational behaviors management	K3

Pre-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**	**PSO 1**	**PSO 2**
CO 1	3	3	3	2					2		2		3	3
CO 2	3	3	3	3					2		2		2	3
CO 3	3	3	3	2					2		2		2	2
CO 4	3	3	3	2					2		2		2	2
CO 5	3	3	3	3					2		2		2	3

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment/Quiz/ Seminar **3.** End-Semester Examinations
Indirect
1. Course - End Survey

Content of the syllabus

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Unit - I	**PROJECT EVALUATION AND PROJECT PLANNING**	**Periods**	**9**
Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting Objective – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.			
Unit – II	**PROJECT LIFE CYCLE AND EFFORT ESTIMATION**	**Periods**	**9**
Software process and Process Models – Choice of Process models - mental delivery – Rapid Application development – Agile methods – Extreme Programming – SCRUM – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II A Parametric Productivity Model - Staffing Pattern.			
Unit – III	**ACTIVITY PLANNING AND RISK MANAGEMENT**	**Periods**	**9**
Objective of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical patterns – Cost schedules.			
Unit - IV	**PROJECT MANAGEMENT AND CONTROL**	**Periods**	**9**
Framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking – Change control- Software Configuration Management – Managing contracts – Contract Management.			
Unit – V	**STAFFING IN SOFTWARE PROJECTS**	**Periods**	**9**
Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham-Hackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Team structures – Virtual teams – Communications genres – Communication plans.			
		Total Periods	**45**

Text Books	
1.	Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Sixth Edition, Tata McGraw Hill, New Delhi, 2017
2.	Robert K. Wysocki "Effective Software Project Management" – Wiley Publication, 2011.
References	
1.	Walker Royce: "Software Project Management"- Addison-Wesley, 1998.
2.	Gopalaswamy Ramesh, "Managing Global Software Projects" – McGraw Hill Education (India), Fourteenth Reprint 2013.
E-Resources	
1.	https://www.tutorialspoint.com/software_engineering/software_project_management.htm
2.	https://docs.google.com/presentation/d/1hYtTO5nJ1yTlOXPWPZTTGtCbYqPEM-bB5GVnxYjuoe0/htmlpresent
3.	https://www.edutechlearners.com/download/Software%20Project%20Management.pdf

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Programme	**B.E.**	Programme Code	**101**	Regulation	**2019**			
Department	**Computer Science and Engineering**			Semester	-			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV54	**Software Testing and Quality Assurance**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Learn about Automatic Testing Tools
- Understand the various Testing Issues
- Explore the basics of Software Quality Assurance
- Learn the Quality Standards available for Software with Quality Metric System

Course Outcome

At the end of the course, the student should be able to,	Knowledge level
CO1: Analyze the automatic testing tools.	K3
CO2: Design test cases suitable for software's developed in different domains	K3
CO3: Describe the quality assurance process and its role in software development.	K2
CO4: List out appropriate Quality Standards for Software.	K2
CO5: Demonstrate proficiency in managing a software project to customer requirements	K3

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**
CO 1	3	3	2						2				2	3
CO 2	3	3	2						2				2	3
CO 3	3	3							2				2	2
CO 4	3	3							2				2	2
CO 5	3	3							2				2	3

Course Assessment Methods

Direct

1. Continuous Assessment Test I, II & III
2. Assignment/Quiz/ Seminar
3. End-Semester Examinations

Indirect

1. Course - End Survey

Content of the syllabus

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Unit - I	SOFTWARE TESTING – INTRODUCTION	Periods	9
Basic Definitions - Software Testing Principles – Role of Process in Software Quality – Testing as a Process — The Tester's Role in a Software Development Organization – Origins of Defects – Defect Classes – The Defect Repository and Test Design – Defect Examples – Developer/Tester Support for Developing a Defect Repository.			
Unit – II	**TESTING ISSUES**	**Periods**	**9**
Introduction to Testing Design Strategies – The Smarter Tester –Test Case Design Strategies – Using Black Box Approach to Test Case Design – Black-box Test Design Approaches – COTS – Using White-Box Approach to Test design - Test Adequacy Criteria- Additional White Box Test Design Approaches – Evaluating Test Adequacy Criteria.			
Unit – III	**FUNDAMENTALS OF SOFTWARE QUALITY ASSURANCE**	**Periods**	**9**
Ethical Basis for Software Quality – Goals of SQA- Roles of SQA- Responsibilities- Total Quality Management - Primary Elements- Benefits- History and Evolution- Deming's 14 Points for TQM - Principles – Software Processes and Methodologies.			
Unit - IV	**QUALITY STANDARDS**	**Periods**	**9**
Quality Standards –CMMI model- Practices and Conventions – Software Configuration Management – Need – Task in SCM- Baseline- SCM Plan- Reviews and Audits –Enterprise Resource Planning Software.			
Unit – V	**QUALITY METRIC SYSTEM**	**Periods**	**9**
Measurement Theory – Software Quality Metrics – Designing Software Measurement Programs – Complexity Metrics and Models – Organizational Learning – Improving Quality with Methodologies – Structured/Information Engineering.			
		Total Periods	**45**

Text Books

1.	KshirasagarNaik, PriyadarshiTripathy, Software Testing and Quality Assurance: Theory and Practice, Wiley Publishing, 2018
2.	MilindLimaye, Software Quality Assurance, Tata McGraw-Hill, 2011.

References

1.	Mauro Pezzè, Michal Young, Software Testing and Analysis: Process, Principles, and Techniques, Wiley 2015
2.	Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, John Wiley and Sons, 2015
3.	Stephan Goericke, The Future of Software Quality Assurance, Springer, 2019
4.	Liliana Iancu, QA Quality Assurance & Software Testing Fundamentals, 2019

E-Resources

1.	https://www.javatpoint.com/quality-assurance
2.	https://www.ibm.com/topics/software-testing
3.	https://www.bmc.com/blogs/quality-assurance-software-testing
4.	https://www.softwaretestinghelp.com/software-quality-assurance/
5.	https://www.tutorialspoint.com/software_quality_management/software_quality_management_metrics.htm

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Programme	**B.E.**	Programme code		Regulation		**2019**		
Department	**CSE, CST**		Semester			**-**		
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSV55	**Total Quality Management**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Facilitate the understanding of Quality Management principles and process. • Understand the philosophy and core values of total quality management. • Determine the influence of the customer and the impact of quality on economic performance.	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Outline the dimensions and barriers regarding with quality.	K2
	CO2: Evaluate the principles of quality management and explain how these principles can be applied within quality management system.	K2
	CO3: Demonstrate tools utilization for quality improvement.	K3
	CO4: Explain the various types of techniques used to measure quality.	K2
	CO5: Apply various quality system and auditing on implementation of TQM.	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	3	3	3			2		2			3		1	
CO 2	3	3	3						3		3			2
CO 3	3	3	3								3			2
CO 4	3	3	3			3			3		3			
CO 5	3	3	3								3			

Course Assessment Methods

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

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Content of the syllabus			
Unit – I	**INTRODUCTION**	Periods	**9**
Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.			
Unit - II	**TQM PRINCIPLES**	Periods	**9**
Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.			
Unit – III	**TQM TOOLS AND TECHNIQUES I**	Periods	**9**
The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.			
Unit – IV	**TQM TOOLS AND TECHNIQUES II**	Periods	**9**
Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.			
Unit – V	**QUALITY SYSTEMS**	Periods	**9**
Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors.			
		Total Periods	**45**

Textbooks	
1.	James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2.	Joel E. Ross, Total Quality Management -Text, Cases, and Readings, Third Edition, Taylor and Francis, 2017
3.	Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
4.	Besterfield Dale H., BesterfieldCarol ,Besterfield Glen H., Besterfield Mary, Urdhwareshe Hemant, UrdhwareshеRashmi, Total Quality Management (TQM) 5e by Pearson, Pearson Education (30 October 2018
References	
1.	Vikrant Prasad, Quality Management and Control, Bioscientific Publisher, 2021
2.	Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
3.	M.P.Poonia, Total Quality Management, Khanna Publishing; First edition (1 May 2017)
4.	Logothetis N., "Managing for Total Quality – From Deming to Taguchi and SPC", Prentice Hall of India Pvt. Ltd.1996.
E-Resources	
1.	https://www.managementstudyguide.com/total-quality-management.htm
2.	https://asq.org/quality-resources/total-quality-management
3.	https://www.geektonight.com/total-quality-management-pdf/
4.	https://www.educba.com/total-quality-management-notes/
5.	https://www.managementstudyguide.com/total-quality-management.htm

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Programme	**B.E.**	Programme Code	**101**	Regulation	**2019**		
Department	**Computer Science and Engineering**			Semester	**-**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
U19CSV56	**E-Commerce**	3	0	0	3	40	60	100
Course Objective	The Main Objective of the course is to • Various e-commerce business models • Underlying telecommunication network, hardware, and software technologies; • How to plan and execute e-commerce projects • E-Payment and Security in E-Commerce • Compare B2B and B2C E-Commerce strategies, including market segmentation						
Course Outcome	At the end of the course, the student should be able to,					Knowledge level	
	CO1: Outline the components & roles of electronic commerce environment					K2	
	CO2: Explain the E-commerce business model					K2	
	CO3: Classify the various supply chain management techniques					K3	
	CO4: Analyze the E-commerce payment systems and choose to apply.					K4	
	CO5: Indentify how security is provided in the E-commerce					K3	
Pre-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	3	1								1	3	2
CO 2	3	3	3	1								1	2	3
CO 3	3	3	2	3								2	3	3
CO 4	3	3	3	2								3	3	2
CO 5	3	3	3	2								2	3	2

Course Assessment Methods

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

Content of the syllabus

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Unit – I	INTRODUCTION	Periods	9
E-Commerce: Overview -Definitions- Advantages & Disadvantages - Threats of E – Commerce, Managerial Prospective, Rules & Regulations for Controlling E – Commerce, Cyber Laws. Relationship Between E – Commerce & Networking, Different Types of Networking for E – Commerce, Internet, Intranet & Extranet, EDI Systems. Wireless Application Protocol-Infrastructure Requirement For E – Commerce			
Unit - II	**BUSINESS MODELS**	Periods	**9**
Business Models of e – commerce: Model Based On Transaction Type, Model Based On Transaction Party - B2B, B2C, C2B, C2C, E – Governance. E – strategy: Overview, Strategic Methods for developing E – commerce. Four C's: Convergence, Collaborative Computing, Content Management & Call Center			
Unit – III	**SUPPLY CHAIN MANAGEMENT**	Periods	**9**
E – logistics, Supply Chain Portal, Supply Chain Planning Tools (SCP Tools), Supply Chain Execution (SCE), SCE - Framework, Internet's effect on Supply Chain Power.			
Unit - IV	**E – PAYMENT MECHANISM**	Periods	**9**
E – Payment Mechanism: Payment through card system, E – Cheque, E – Cash, E – Payment Threats & Protections. E – Marketing: Home –shopping, E-Marketing, Tele-marketing. Electronic Data Interchange (EDI) : Meaning, Benefits, Concepts, Application, EDI Model, Protocols (UN EDI FACT / GTDI, ANSI X – , Data Encryption (DES / RSA).			
Unit – V	**SECURITY IN E-COMMERCE**	Periods	**9**
Risk of E – Commerce: Overview, Security for E – Commerce, Security Standards, Firewall, Cryptography, Key Management, Password Systems, Digital certificates, Digital signatures. Enterprise Resource Planning (ERP) : Features, capabilities and Overview of Commercial Software, re-engineering work processes for IT applications, Business Process Redesign, Knowledge engineering and data warehouse			
		Total Periods	**45**

Text Books:

1.	Adesh k. Pandey, "Electronic Commerce" (Fourth Edition) : Pete Loshin,2011
2.	Adesh K. Pandey Fundamentals of Electronics Commerce, 2010
3.	Dave Chaffey, "E-Business and E-Commerce Management", 3rd Edition, 2009, Pearson Education Inc., New Delhi

References:

1.	"E-Business (9th edition)" by Gary Schneider, China Machine Press, 2011.
2.	David Whiteley, "E-Commerce: Strategy, Technologies And Applications (Information Systems Series)", McGraw-Hill Higher Education, 2017
3.	Gary P. Schneider, "Electronic Commerce", 7th Edition, Cengage Learning India Pvt. Ltd., New Delhi

E-Resources

1.	http://notes4learners.blogspot.com/p/ecommerce-unit-1.html
2.	http://oms.bdu.ac.in/ec/admin/contents/387_P16MCE4A_2020051801071611.pdf
3.	https://www.nerdwallet.com/article/small-business/what-is-a-business-model
4.	https://www.tutorialspoint.com/e_commerce/e_commerce_security.htm
5.	https://www.lyra.com/in/e-payments/

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Programme	**B.E.**	Programme code	**101**	Regulation	**2019**				
Department	**Computer Science and Engineering**		Semester		**-**				
Course Code	Course name	Periods per week			Credit	Maximum Marks			
U19CSV57	**Professional Ethics in Engineering**	L	T	P	C	CA	ESE	Total	
		3	0	0	3	40	60	100	

Course Objective

The student should be made to,

- Stimulate critical and responsible reflections on moral issues surrounding engineering practices
- Provide conceptual tools necessary for pursuing those issues.
- Create awareness on assessment of safety and risk.
- Aware of the different ethical issues, codes for conduct for engineers in society and moralities in an organization.
- Create awareness on computer and environmental ethics.

Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Outline the basic perception of profession, professional ethics, various moral & social issues, industrial standards, code of ethics.	K2
	CO2: Analyze the role of professional ethics in engineering field.	K2
	CO3: Assessment of safety and risk and understanding of risk benefit analysis.	K3
	CO4: Identify the professional rights and responsibility of an engineer.	K2
	CO5: Apply ethical principles to solve situation that arise in the global society.	K3

Pre-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**	**PSO 1**	**PSO 2**
CO 1	3	2	1	1	1	2	2	2	2	-	1	2	1	1
CO 2	3	2	1	1	1	2	3	2	2	-	1	2	2	1
CO 3	3	2	1	1	1	2	3	2	2	2	2	2	2	1
CO 4	3	2	-	-	1	-	2	3	3	1	2	2	-	2
CO 5	3	2	1	1	1	2	3	2	2	2	2	2	1	1

Course Assessment Methods

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

Content of the syllabus

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Unit – I	ENGINEERING ETHICS	Periods	9
Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories			
Unit - II	**ENGINEERING AS SOCIAL EXPERIMENTATION**	Periods	**9**
Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study			
Unit – III	**ENGINEER'S RESPONSIBILITY FOR SAFETY**	Periods	**9**
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal			
Unit – IV	**RESPONSIBILITIES AND RIGHTS**	Periods	**9**
Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination			
Unit – V	**GLOBAL ISSUES**	Periods	**9**
Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct			
		Total Periods	**45**

Textbooks	
1.	Mike W Martin and Roland Schinzinger, Ethics in Engineering,4th edition, Tata McGraw Hill Publishing Company Pvt Ltd,2017.
2.	Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases", Thompson Learning, 2000.
References	
1.	Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.
2.	David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)
3.	Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004
E-Resources	
1.	https://www.brainkart.com/subject/Professional-Ethics-in-Engineering_182/
2.	https://nptel.ac.in/courses/110105097
3.	https://www.coursera.org/lecture/ethical-issues-data-science/professional-society-codes-of-ethics-2Wqrx
4.	https://www.udemy.com/course/human-values-and-professional-ethics/

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Programme	**B.E. / B.TECH**	Programme Code		Regulation	**2019**		
Department	**CSE**			Semester			
Course Code	Course Name	Periods Per Week		Credit	Maximum Marks		
		L T P		C	CA	ESE	Total
U19ITV56	**BUILDING ENTERPRISE APPLICATION**	3 0 0		3	50	50	100
Course Objective	The student should be made to, • Introduces the concepts, architecture, different design modeling techniques of Enterprise applications and different issues related to their implementation • Understand the importance of application framework and designing other application components. • Introduce the different testing techniques for Enterprise application and methodologies used to roll out these applications.						
Course Outcome	At the end of the course, the student should be able to,						KL
	CO1: Identify challenges in building an enterprise applications and build a model						K2
	CO2:understand a logical ,technical and data architecture of an application						K2
	CO3: understand application framework components and perform code review and analysis						K2
	CO4: describe various testing methods and rolling out an enterprise applications						K2
	CO5: apply different framework components to design enterprise applications						K3
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	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	2	1											2	2
CO 2	2	1											2	2
CO 3	2	1											2	2
CO 4	2	1											2	2
CO 5	3	2	1										2	2

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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	**INTRODUCTION**	Periods	**9**
Introduction to enterprise applications - Software engineering methodologies - Life cycle of raising an enterprise application - Key determinants of successful enterprise applications - Measuring the success of enterprise applications. Inception of enterprise applications: Enterprise analysis- business modeling- requirements elicitation and analysis-requirements validation- planning and estimation.			
Unit - II	**ARCHITECTURE AND DESIGNING**	Periods	**9**
Architecture, view and viewpoints-Enterprise application architecture perspective - Logical architecture - Technical architecture and Design- - Data architecture - Infrastructure architecture and design- infrastructure architecture and building blocks –Networking, internetworking and Communication Protocol – IT hardware and software – Middleware – Policies for infrastructure management – Deployment Strategy - Documentation: system architecture documentation - design documentation			
Unit – III	**CONSTRUCTING ENTERPRISE APPLICATION**	Periods	**9**
Construction readiness - code review – objective – Process - static code analysis – Coding style – Logical bugs – Security vulnerabilities – Code quality -build and testing-build process – unit testing - Dynamic code analysis – Code profiling – Code coverage			
Unit - IV	**TESTING AND ROLLING OUT ENTERPRISE APPLICATION**	Periods	**9**
Testing enterprise applications – enterprise application environments - integration testing - system testing – Performance, Penetration, Usability, Globalization, Interface Testing - user acceptance testing - rolling out enterprise application			
Unit – V	**APPLICATION IMPLEMENTATION**	Periods	**9**
Infrastructure services Layer Framework components – Presentation Layer Framework components – Business Layer Framework components – Data Access Layer Framework components			
		Total Periods	**45**

Text Books

1.	AnubhavPradhan, Satheesha B. Nanjappa, Senthil K. Nallasamy, Veerakumar Esakimuthu, "Raising Enterprise Applications", 1st Edition, Wiley India Pvt. Ltd, 2010.

References

1.	Brian Berenbach, Daniel J. Paulish, Juergen Kazmeier, Arnold Rudorfer, "Software Systems Requirements and Engineering: In Practice", 1st Edition, McGraw-Hill Education, 2009.
2.	Srinivasan Desikan, Gopalaswamy Ramesh, "Software Testing Principles and Practices ", 1st Edition, Pearson Education, 2006.
3.	Soren Lauesen , "Software Requirements: Styles & Techniques", First edition, Addison Wesley Professional publications, 2002

E-Resources

1.	https://slideplayer.com/slide/15865992/
2.	https://slideplayer.com/slide/14417244/

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Open Elective Courses

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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	**101**	Regulation	**2019**		
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	**-**		

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSOE1	**Introduction to IoT**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Understand the definition and significance of the Internet of Things • Discuss the architecture, operation, and business benefits of an IoT solution • Identify how IoT differs from traditional data collection systems • Examine the potential business opportunities that IoT can uncover	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Outline the IoT concept fits within the broader ICT industry and possible future trends	K2
	CO2: Familiar with the key technologies and protocols employed at each layer of the stack	K3
	CO3: Design a simple IoT system comprising sensors, edge devices, wireless network connections and data analytics capabilities.	K3
	CO4: Apply various security and authentication methods in IoT applications	K4
	CO5: Use the knowledge and skills acquired during the course with respective applications	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	2	3	3	3		2						2	2	3
CO 2	1	3	3	2		2						3	2	2
CO 3	2	2	3	3		2						2	2	3
CO 4	2	2	3	2		2						2	2	3
CO 5	2	2	3	3		2						3	2	2

Course Assessment Methods

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

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Content of the syllabus			
Unit – I	**INTRODUCTION TO INTERNET OF THINGS**	Periods	**9**
The technology of the internet of things, making the internet of things, Elements of an IoT ecosystem, design principles for connected devices, Web thinking for connected devices.			
Unit – II	**NETWORKS AND COMMUNICATION**	Periods	**9**
Networking Technology, Communication Technology, Processes Data Management, Prototyping embedded devices, Sensors and actuators, Embedded computing basics, Introduction to ARDUINO, RASPBERRY PI. Case Study: Study of sensors used in IoT devices, IoT standards in practice.			
Unit - III	**FOUNDATIONAL ELEMENTS OF AN IOT SOLUTION**	Periods	**9**
The Edge of the IoT, An Abstract Edge Architecture Model, Device Types, The Cloud Cloud-to-Device Connectivity, Topology of the Cloud Data Normalization and Protocol Translation			
Unit – IV	**SECURITY AND PRIVACY CHALLENGE**	Periods	**9**
Steps towards a Secure Platform, Privacy-Preserving sharing of IOT Data, Secure Authentication and Access Control in Constrained Devices, Smarties Approach.			
Unit - V	**IoT APPLICATIONS**	Periods	**9**
IoT Applications —Value Creation for Industry, Value Creation and Challenges, The Smart Factory Initiative, Cost-effective Process Integration of IoT Devices, IoT for Retailing Industry.			
		Total Periods	**45**

Text Books

1.	Ovidiu Vermesan, Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems" River Publishers, 2013.

References

1.	Adrian McEwen, Hakim Cassimally "Designing the Internet of Things", John Wiley & Sons, 2014.
2.	Joe Biron and Jonathan Follett"Foundational Elements of an IoT Solution: The Edge, The Cloud, and Application Development", First Edition. Cisco Press, 2017.
3.	Qusay F. Hassan, "Internet of Things A to Z: Technologies and Applications", John Wiley & Sons, 2018.
4.	Alessandro Bassi, Martin Bauer, "Enabling Things to Talk: Designing IoT solutions with the IoT Architectural Reference Model", Springer, 2013.

E-Resources

1.	https://www.techtarget.com/iotagenda/Ultimate-IoT-implementation-guide-for-businesses
2.	https://www.tutorialspoint.com/internet_of_things/index.htm
3.	https://360digitmg.com/iot-trends
4.	https://www.insiderintelligence.com/insights/iot-security-privacy/

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

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSOE2	**Ethical Hacking**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Plan a vulnerability assessment and penetration test for a network. • Execute a penetration test using standard hacking tools in an ethical manner. • Report on the strengths and vulnerabilities of the tested network. • Identify legal and ethical issues related to vulnerability and penetration testing.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Know the concept of Ethical Hacking and Cryptographic techniques	K2
	CO2: Identify the DNS, IP address, range and Operating System etc., related to a remote system.	K3
	CO3: Analyze the packets and able to find the intruders	K3
	CO4: Discover Vulnerabilities in a web application and servers	K4
	CO5: Implement Pentest tools.	K3
Pre-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**	**PSO 1**	**PSO 2**	
CO 1	1	3			2			2					2	3	
CO 2	2	3		2	2			2					2	2	
CO 3	2	2		2	3			2					2	2	
CO 4	2	2		3	3			2					2	3	
CO 5	2	3		3	2			2					2	3	

Course Assessment Methods

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

Content of the syllabus

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Unit – I	ETHICAL HACKING BASICS	Periods	9
Introduction to Ethical Hacking –Types of hacking –Phases of Ethical hacking. Cryptography: Cryptography and encryption – PKI, Digital certificates and digital signature – Encrypted communication and Cryptography attacks			
Unit – II	**RECONNAISSANCE AND SCANNING**	Periods	**9**
Foot printing : Foot printing with DNS – Determining Network Range. Scanning for targets: Identify Active machines – Port Scanning. Enumeration: Windows Security basics – Enumeration Techniques.			
Unit – III	**SYSTEM ATTACK**	Periods	**9**
Sniffing: Communications basics –Sniffing techniques and tools –Network Roadblocks: Intrusion Detection – Session hijacking, Firewalls and Honey pots, Denial of Service attacks. System Attack: Windows system hacking – Password Cracking – Exploiting privileges. Social Engineering: Human Based attack – Computer based attack.			
Unit – IV	**WEB BASED AND WIRELESS HACKING**	Periods	**9**
Physical Security. Web Server Hacking: Web service architecture –Web attacks. Web Applications: Web applications attack – Web resources protection. Wireless Attacks – Bluetooth attacks.			
Unit – V	**MALWARES AND PENETRATION TESTING**	Periods	**9**
Malware Attacks: Trojans, viruses and worms. Penetration Testing: Types of Penetration testing – Penetration testing methodologies – Penetration test tools.			
		Total Periods	**45**

Text Books

1.	Matt Walker, "CEH- Certified Ethical Hackers Guide ", 4th Edition, McGrawHill Education, 2019

References

1.	Michael Gregg," Certified Ethical Hacker (CEH) Version 9 Cert Guide", 2ndEdition, Pearson Education, 2018
2.	Patrick Engebretson," The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", 2nd Edition, Syngress , Elseveir, 2013.
3.	Parteek Sharma," Hacking Revealed", 1stEdition, White Falcon Publishing, 2018
4.	Reginald Wong, "Mastering Reverse Engineering: Re-engineer your ethical hacking skills", Packt Publishing,2018

E-Resources

1.	https://www.mediafire.com/file/dyewn6f3r3olnuw/A_Beginners_Guide_To_Hacking_Computer_Systems.zip/file
2.	https://www.mediafire.com/file/8derf9dueyq64i5/Computer_Viruses%252C_Hacking_and_Malware_attacks_for_Dummies.zip/file
3.	https://www.udemy.com/course/

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

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSOE3	**Smart Sensor Technologies**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Select the right sensor for a given application. • Design basic circuit building blocks. • Simulate, synthesize, and layout a complete sensor or sensor system.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Analyze the sensors available in IoT based on application requirement and the Sensing methods	K2
	CO2: Create a Real-time application by choosing appropriate sensors for temperature monitoring.	K3
	CO3: Interfacing different types of Sensors with MCU	K3
	CO4: Infer Wireless Sensing, RF Sensing and RF MEMS	K4
	CO5: Design a real-time application for landslide monitoring and hazard mitigation	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	1	2	3		2	2							2	2
CO 2	2	2	3		2	2							2	2
CO 3	2	2	3		2	2							2	2
CO 4	2	2	3		2	2							2	2
CO 5	2	2	3		2	2							2	2

Course Assessment Methods

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

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Content of the syllabus			
Unit – I	**BASICS OF SENSORS**	Periods	**9**
Introduction- Sensor Vs Transducer, Nature of Sensors, Sensor Output Characteristics, Sensing Technologies, Digital Output Sensors.			
Unit – II	**APPLICATION SPECIFIC SENSORS**	Periods	**9**
Occupancy and motion detectors: ultrasonic – microwave – capacitive detectors- optical presence sensor, Light Detectors: Photo diodes – photo transistor – photo resistor- CCD and CMOS image sensors, Temperature Sensors: thermos-resistive sensors – thermoelectric contact sensor			
Unit – III	**SENSOR WITH MICROCONTROLLER**	Periods	**9**
Introductions, Amplification and Signal Conditioning, Integrated Signal Conditioning, Digital Conversion, MCU Control, MCUs for Sensor Interface, Techniques and Systems Considerations, Sensor Integration			
Unit – IV	**WIRELESS SENSING**	Periods	**9**
Wireless Data and Communications, Wireless Sensing Networks, Industrial Wireless Sensing Networks, RF Sensing, Telemetry, RF MEMS, Complete System Consideration.			
Unit – V	**SMART APPLICATIONS AND SYSTEM REQUIREMENTS**	Periods	**9**
Automotive Applications, Industrial (Robotic) Applications, Consumer Applications, Future Sensor Plus Semiconductor Capabilities, Future System Requirements.			
		Total Periods	**45**

Text Books

1.	Randy Frank, "Understanding smart sensors", Artech House integrated microsystems series, 3rd Edition, 2013.

References

1.	Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", 5th Edition, Springer, 2016
2.	Vlasios Tsiatsis, Stamatis Karnouskos, Jan Holler, David Boyle, Catherine Mulligan, "Internet of Things: Technologies and Applications for a New Age of Intelligence", Academic Press, 16-Nov-2018.
3.	Henry Leung, Subhas Chandra Mukhopadhyay, "Intelligent Environmental Sensing", Springer, 22-Jan-2015.

E-Resources

1.	https://www.techbriefs.com/component/content/article/tb/pub/features/articles/33212
2.	https://www.azosensors.com/article.aspx?ArticleID=1289
3.	https://360digitmg.com/iot-smart-sensors

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

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSOE4	**Web Designing**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • Describe the various steps in designing a creative and dynamic website. • Create web pages using html, JavaScript & CSS • Understand the basics of open source database • Create the three tier applications using PHP & MySQL • Create the dynamic application using AJAX.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: describe the basics of internet and web design using HTML	K2
	CO2: Design the Web pages with CSS & Java script	K3
	CO3: Build a dynamic web pages using JavaScript & Ajax	K3
	CO4: Develop simple web application using server side programming with Database Connectivity using MySQL	K4
	CO5: Design and implement a web-applications using PHP.	K3
Pre-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**	**PSO 1**	**PSO 2**
CO 1	1				2								3	2
CO 2	1	3	3	3	3								3	2
CO 3	2	2	3	3	3								3	2
CO 4	2	3	3	3	3								3	2
CO 5	2	3	3	3	3								3	2

Course Assessment Methods

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

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Content of the syllabus

Unit – I	**HTML & XHTML**	Periods	**9**
An Introduction to HTML History-Versions- Basic XHTML Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists- tables-Frames- Forms-Creating HTML Documents.			
Unit – II	**CSS & JAVA SCRIPT**	Periods	**9**
Style Sheets: CSS-Introduction to Cascading Style Sheets-Features- Core Syntax-Style Sheets and HTML Box Model. Client-Side Programming: The JavaScript Language-History and Versions -Syntax-Variables and Data Types-Statements- Operators- Literals-Functions-Objects-Arrays- Built-in Objects.			
Unit – III	**AJAX**	Periods	**9**
DHTML with JavaScript.- DOM-BOM-AJAX Introduction - XML Http Request Object-Call back Methods			
Unit – IV	**MYSQL**	Periods	**9**
Introduction to MYSQL - Data definition in SQL, Queries and update statements, Integrity constraints- Drop Database & Table - Modifying Record - WHERE Clause -Using Operators - Sorting Records -Eliminating Duplicates - Grouping Records, Having Clause -Joins - Sub queries.			
Unit – V	**PHP**	Periods	**9**
Essential PHP - Operators and Flow control - Strings and Arrays - Creating functions - Reading data in web pages - PHP Browser Handling Power - File Handling -Session Handling in PHP – Cookies – Connection with Mysql			
		Total Periods	**45**

Text Books

1.	Jeffrey C. Jackson, "Web Technologies - A Computer Science Perspective", Pearson Education, 2011.

References

1.	Deitel and Deitel and Nieto, “Internet and World Wide Web - How to Program”, Prentice Hall, 5th Edition, 2011.
2.	Rasmus Lerdorf and Levin Tatroe, “Programming PHP”, O’Reilly,2002
3.	Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.

E-Resources

1.	https://www.tutorialspoint.com/mysql/index.htm
2.	https://www.tutorialspoint.com/php/php_and_ajax.htm
3.	https://www.tutorialspoint.com/html/index.htm

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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	**101**	Regulation	**2019**		
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	-		
Course code	Course name	Periods per week			Credit	Maximum Marks	
U19CSOE5	**Data Analytics**	L	T	P	C	CA	ESE	Total
		3	0	0	3	40	60	100
Course Objective	The student should be made to, • Understand Statistical methods • Learn Bayesian, Support Vector and Kernel Methods • Study Time Series Analysis and Rule Induction • Know Neural networks and Fuzzy Logic • Understand Visualization Techniques						
Course Outcome	At the end of the course, the student should be able to,					Knowledge Level	
	CO1: Explain how data is collected, managed and stored for data science					K2	
	CO2: Describe the key concepts in data science					K2	
	CO3: Describe real-world applications					K2	
	CO4: Describe toolkit used by data scientists					K2	
	CO5: Implement data collection and management scripts using MongoDB					K3	
Pre-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	2	3	3	2	2							2	1	2
CO 2	3	3	3	3	2							2	3	3
CO 3	3	3	2	3	3							3	3	3
CO 4	3	3	3	3	2							1	2	3
CO 5	3	3	3	2	2							3	3	3

Course Assessment Methods

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

Content of the syllabus

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Unit - I	STATISTICAL CONCEPTS AND METHODS	Periods	9
Statistical Concepts: Probability, Sampling and Sampling Distributions, Statistical Inference, Prediction and Prediction Errors–Resampling- Statistical Method: Linear Models, Regression Modeling, Multivariate Analysis.			
Unit - II	**BAYESIAN METHODS AND SUPPORT VECTOR AND KERNEL METHODS**	Periods	**9**
Bayesian Methods: Bayesian Paradigm, modeling, inference and networks – Support Vector and Kernel Methods: Kernel Perceptron, Overfitting and Generalization Bounds, Support Vector Machines, Kernel PCA and CCA.			
Unit - III	**TIME SERIES ANALYSIS AND RULE INDUCTION**	Periods	**9**
Analysis of time series: linear systems analysis, nonlinear dynamics, Delay Coordinate Embedding - Rule induction: Propositional Rule Learning, Rule Learning as search, Evaluating quality of rules, Propositional rule induction, First order rules-ILP systems.			
Unit - IV	**NEURAL NETWORKS**	Periods	**9**
Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks. Prescriptive analytics - creating data for analytics: Active learning & Reinforcement learning.			
Unit - V	**VISUALIZATION**	Periods	**9**
Visualization : Classification of Visual Data Analysis Techniques, Data Type to be Visualized, Visualization Techniques, Interaction Techniques and Specific Visual Data Analysis Techniques.			
		Total Periods	**45**

Text Books

1.	Bill Franks, ―Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streamswith advanced analytics, John Wiley & sons, 2012.

References

1.	Michael Berthold, David J. Hand, ―Intelligent Data Analysis-An Introduction‖, Second Edition, Springer, 2007.
2.	Jimmy Lin and Chris Dyer, ― Data Intensive Text Processing using Map Reduce‖, Morgan and Claypool Publishers, 2010.
3.	Tom White, ―Hadoop: The Definitive Guide‖, O`Reilly Publishers, 2012.

E-Resources

1.	https://link.springer.com/article/10.1023/A:1012489924661
2.	https://www.ibm.com/topics/neural-networks
3.	https://www.tableau.com/learn/articles/data-visualization

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Programme	**B.E.**	Programme Code	**101**	Regulation	**2019**			
Department	**Computer Science and Engineering**			Semester	**-**			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSOE6	**Enterprise Java**	3	0	0	3	40	60	100

Course Objective	The Student should be made to, • Understand basic concepts of J2EE • Understand basic concepts of JSON • Know networking Applications. • Study the Java beans technology • Learn Angular JS.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Examine the requirements of J2EE.	K2
	CO2: Describe the concepts of JSP and JSON	K3
	CO3: Construct the networking	K3
	CO4: illustrate the concepts of javabeans	K3
	CO5: Describe Angular JS working procedure	K2
Pre-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	2	3	3		2								1	2
CO 2	3	3	3	3	2								3	3
CO 3	3	3	2	3	3							3	3	3
CO 4	3	3	3	3	2							1	2	3
CO 5	3	3	3	2	2							3	3	3

Course Assessment Methods

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

Content of the syllabus

Unit – I	**J2EE OVERVIEW**	Periods	**9**

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Distributed Multi-tiered Applications - J2EE: Components – Container and Connectors – Java2EE Modules - Structure of Java2EE Application - Packaging and Deploying Java2EE Applications			
Unit - II	**JAVA SERVER PAGES TECHNOLOGY**	Periods	**9**
Introduction to JSP: JSP Architecture – Life Cycle of JSP - Expression – Comments – Database Connectivity – Example Program. Java Server Pages Standard Tag Library: Using JSTL - Core Tag Library - XML Tag Library - SQL Tag Library - Introduction to JSON.			
Unit – III	**NETWORKING**	Periods	**9**
The Design of JDBC. The Structured Query Language, JDBC Installation, Basic JDBC Programming Concepts, Query Execution, Scrollable and Updatable Result Sets, Metadata, Row Sets, Transactions - Connecting to a Server, Implementing Servers, Sending E-Mail, Making URL Connections,			
Unit - IV	**JAVABEANS COMPONENTS**	Periods	**9**
Beans, The Bean-Writing Process, Using Beans to Build an Application, Naming Patterns for Bean, Components and Events Bean Property, Tuples, Bean info Classes, Property editor, Customizers.			
Unit – V	**ANGULAR JS**	Periods	**9**
Angular JS – Introduction – MVC Architecture - Expressions – Modules: Application Module, Controller Module – Controllers - Filters – Tables – SQL – Forms – Validation - Introduction to Node JS – Modules			
		Total Periods	**45**

Text Books	
1.	H. M.Deitel, P. J. Deitel, S. E. Santry “Advanced Java 2 Platform How To Program” Prentice Hall, Fifth Edition, 2010.
2.	Jim Keogh, “J2EE: The Complete Reference”, McGraw-Hill Education, 2017
3.	Ken Williamson, “Learning Angular JS: A Guide to Angular JS Development”, O’Reilly Publication. First Edition, 2015.
References	
1.	John Hunt, Chris Loftus, Guide to J2EE: Enterprise Java (Springer Professional Computing), 2012
2.	Bryan Basham, Kathy Sierra, Bert Bates, “First Head Servlet & JSP”, Second Edition O’Reilly Publication, Second Edition, 2008.
3.	Marty Hall, Larray Brown, Core Servlets and Java Server Pages, Second Edition, Pearson Education, 2008.
4.	Ken Williamson, “Learning Angular JS: A Guide to Angular JS Development”, 1st Edition, Kindle Edition, 2015.
E-Resources	
1.	https://docs.oracle.com/javaee/5/tutorial/doc/bnaay.html
2.	https://www.simplilearn.com/tutorials/java-tutorial/java-servlets
3.	https://www.guru99.com/jsp-tutorial.html
4.	https://docs.angularjs.org/guide/concepts
5.	http://index-of.es/Java/Java%20Advanced%20How%20to%20Program%20(redistilled%20in%20one%20book)%202001.pdf

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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		**101**	Regulation		**2019**	
Department	**COMPUTER SCIENCE AND ENGINEERING**				Semester		-	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSOE7	**Open Source Software**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Promoting the use of OSS in learning, teaching and administrative IT infrastructure.
- Train the students in Linux.
- Make the student to develop websites using PHP and Mysql
- Understand the open source scripting languages Perl
- Exploring the use of the Common Gateway Interface (CGI) scripting language to Serve dynamic content.

Course Outcome

At the end of the course, the student should be able to,	Knowledge Level
CO1: Outline the benefits of OSS and essential structure of Linux.	K2
CO2: List out the various version of Linux OS.	K3
CO3: Design & implement a small to medium size web enabled information storage & retrieval system using PHP & MYSQL.	K3
CO4: Enumerate the syntax and style of PERL scripting.	K3
CO5: Develop the interactive web pages.	K3

Pre-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**
-	2		3								-	2	2	3
-	1		3								-	3	2	2
-	2	2	3	3	2						-	2	2	3
-	2	2	3	2	1					2	-	2	2	3
-	2	2	3	3	1					2	-	3	2	2

Course Assessment Methods

Direct

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

Indirect

1. Course - end survey

Content of the syllabus

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Unit – I	INTRODUCTION TO OPEN SOURCES	Periods	9
Introduction to Open sources – Need of Open Sources – Advantages of Open Sources – Application of Open Sources. FOSS- Licensing Models - FOSS Licenses – FOSS Examples- Linux Overview.			
Unit – II	**LINUX OPERATING SYSTEM**	Periods	**9**
Linux system structure - Kernel and User mode Operations - Process – Signals – Linux Distributions : Cent OS- Debian-Fedora-Redhat- Ubuntu- User Management in Linux –Configuration Services.			
Unit – III	**PHP WITH MYSQL**	Periods	**9**
Essential PHP - Operators and Flow control - Strings and Arrays - Creating functions - Reading data in web pages - PHP Browser Handling Power - File Handling -Session Handling in PHP – Cookies –Introduction to MYSQL - Working with Databases –Connection with Mysql			
Unit – IV	**INTRODUCTION TO PERL**	Periods	**9**
PERL overview - Variables and Data types – Arrays- Control Structures – Subroutines, Packages and Modules-Error Handling – Regular Expressions.			
Unit – V	**PERL AND CGI**	Periods	**9**
Working with Files – Sending Emails - Database Access – Perl Process Management – Perl CGI Programming – GET and POST Methods – Cookies in CGI.			
		Total Periods	**45**

Text Books

1	Remy Card, Eric Dumas and Frank Mevel, ―The Linux Kernel Book‖, Wiley Publications, January 2013

References

1	Steve Suchring, ―MySQL Bible, John Wiley, 2012
2	Rasmus Lerdorf and Levin Tatroe, ―Programming PHP‖, O'Reilly,
3	Martin C. Brown, ―Perl: The Complete Reference‖, 2nd Edition, TataMcGraw-Hill

E-Resources

1.	https://www.synopsys.com/glossary/what-is-open-source-software.html
2.	https://opensource.org/
3.	https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_open_source_software.htm
4.	https://www.javatpoint.com/open-source-operating-system

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Programme	**B.E.**	Programme Code	**101**	Regulation	**2019**			
Department	**COMPUTER SCIENCE AND ENGINEERING**			Semester	-			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U19CSOE8	**Python Programming**	3	0	0	3	40	60	100

Course Objective	The students will able to, • learn basics of Python programming. • define string methods. • learn functions and classes used in python. • learn how to read and write files in Python • learn how to build and package Python modules for reusability.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge Level
	CO1: Describe python programming elements to solve and debug simple logical problems.	K2
	CO2: Develop Python programs using strings.	K3
	CO3: Develop programs using functions and classes.	K3
	CO4: Implement various file handling operations.	K3
	CO5: Demonstrate various libraries and modules in python.	K3
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**	**PSO1**	**PSO 2**
CO 1	3	2	1	-	1							2	3	2
CO 2	3	3	1	1	2							2	3	2
CO 3	3	3	1	2	2							2	3	2
CO 4	3	3	1	2	2							2	3	2
CO 5	3	3	1	2	2							2	3	2

Course Assessment Methods

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

Content of the syllabus

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Unit – I	INTRODUCTION TO PYTHON	Periods	9
Introduction to python – Installation – Python Interpreter – working with interpreter -Variables - Unbound Variables - Case Sensitive - Native Data Types - Booleans - Numbers - Lists - Tuples - Sets - Dictionaries			
Unit – II	**STRINGS**	Periods	**9**
Strings - Unicode - Formatting - String Methods - Bytes - Encoding - Regular Expressions - Verbose - Case Studies.			
Unit – III	**CLASSES**	Periods	**9**
Function Declaration - Closures - List of Functions - List of Patterns - File of Patterns - Generators - Defining Classes - Instantiating Classes - Instance Variables - Iterators – Itertools - Assert - Generator Expressions.			
Unit – IV	**FILE HANDLING**	Periods	**9**
Reading and Writing Text Files - Binary Files - Stream Objects - Standard Input, Output and Error.			
Unit – V	**LIBRARIES AND MODULES**	Periods	**9**
Text operations – Persistent and Databases – Controlling Executions – Threads and Processing – Numeric Processing – Extending and Embedding Classical Python. **Modules**: Math - Statistics - random - Date & time.			
		Total Periods	**45**

Text Books	
1	John V. Guttag, - Introduction to Computation and Programming using Python, Prentice Hall of India, 2014.
References	
1	Mark Pilgrim, -Dive into Python, Apress,edition
2	Mark Lutz, -Learning Python: Powerful Object-Oriented Programming, Fifth Edition, O Reilly, Shroff Publishers and Distributors, 2013.
3	Allen Downey, Jeffrey Elkner, Chris Meyers, -How to Think Like a Computer Scientist - Learning with Python, Green Tea Press,
E-Resources	
1.	https://www.w3schools.com/python/python_intro.asp
2.	https://onlinecourses.nptel.ac.in/noc22_cs26/preview
3.	https://www.javatpoint.com/python-tutorial
4.	https://www.tutorialspoint.com/python/index.htm
5.	https://www.w3schools.com/python/python_modules.asp

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

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks
		L	T	P	C	Total
U19CSOC7	**AI Specific Skills on Data Science**	1	0	2	1	100

Course Objective	The students will able to, • Learn artificial intelligence on Data Science
Course Outcome	At the end of the course, the student should be able to,
	CO1: Inspire and acquire the artificial intelligence fundamentals and sub domains
	CO2: Experience and empower the machine learning methods with statistical data
Pre-requisites	Any programming language

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

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	1									3	3
CO 2	3	3	2	1									3	3

Course Assessment Methods

Direct
1. Written Test 2. Mini Project
Indirect

Content of the syllabus

Phases	Module	Sub Topic	Expected Hours
Inspire	Inspire (Excite)	- What is AI? - The 3 domains of AI - Statistical Data, Computer Vision, Natural Language Processing	3
	Inspire (Relate)	-AI Applications	
	Inspire (Purpose)	- Appreciate the complexity of social issues - Understand the concept of leverage within a system - Be able to determine where AI solutions would be appropriate - Project: Draw a Systems Map	
	Inspire (Possibilities)	- AI in industries - UN Sustainable Development Goals	
	Inspire (Pitfalls)	- Discuss AI ethics issues e.g. privacy, bias, access to AI	
Acquire	Acquire [AI	- AI Project Cycle	3

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	fundamentals] (Introduction to AI Project Cycle)	- Problem scoping	
	Acquire [AI fundamentals] (Data Acquisition & Exploration)	- Data Acquisition - Data Visualization	
	Acquire [AI fundamentals] (Data Modeling)	- Decision Trees - How computer see and classify images?	
	Acquire [AI fundamentals] (Neural Networks)	- Introduction to Neural Networks	
	Acquire [Domain-specific Concepts] (Statistical Data)	- Python for Statistics - Python List - Probability - Supervised vs unsupervised learning - Classification vs regression vs clustering	3
Experience [Statistical Data]	Experience [Statistical Data] (Data Import and Processing)	- Obtaining data - Basic data processing and visualisation - Handling erroneous and missing data	6
	Experience [Statistical Data] (Machine Learning Techniques)	- Supervised learning techiques - Artificial neural networks - Model outputs - Output visualisation and validation	6
	Experience [Statistical Data] (AI for Data Walkthrough)	- Produce data visualisation - Interpret data - Make predictions with data	6
Empower	Empower (Exemplar AI use cases with AI project cycle)	- AI use cases for all three domains (Data, CV and NLP) - AI Project Cycle as applied to AI use cases	1
	Empower (Project Work-time and Presentation)	- Youth will build their own AI enabled social impact solutions - Project presentation	2
		Total Hours	**30**

References

1	Materials from Intel : https://drive.google.com/drive/folders/1J4Sj_PUTij5f8VXZDmAkw2PhOX1lZ9hi?usp=sharing
2	Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997
3	Understanding Machine Learning. Shai Shalev-Shwartz and Shai Ben-David. Cambridge University Press. 2017

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

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks
		L	T	P	C	Total
U19CSOC8	**AI Specific Skills on Natural Language Processing**	1	0	2	1	100

Course Objective	The students will able to, • Learn artificial intelligence on Natural Language Processing
Course Outcome	At the end of the course, the student should be able to,
	CO1: Inspire and acquire the artificial intelligence fundamentals and neural networks
	CO2: Experience and empower the Classification & creating Chatbot
Pre-requisites	Any programming language

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	1									3	3
CO 2	3	3	2	1									3	3

Course Assessment Methods

Direct
1. Written Test 2. Mini Project
Indirect

Content of the syllabus

Phases	Module	Sub Topic	Expected Hours
Inspire	Inspire (Excite)	- What is AI? - The 3 domains of AI - Statistical Data, Computer Vision, Natural Language Processing	3
	Inspire (Relate)	-AI Applications	
	Inspire (Purpose)	- Appreciate the complexity of social issues - Understand the concept of leverage within a system - Be able to determine where AI solutions would be appropriate - Project: Draw a Systems Map	
	Inspire (Possibilities)	- AI in industries - UN Sustainable Development Goals	
	Inspire (Pitfalls)	- Discuss AI ethics issues e.g. privacy, bias, access to AI	

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Acquire	Acquire [AI fundamentals] (Introduction to AI Project Cycle)	- AI Project Cycle - Problem scoping	3
	Acquire [AI fundamentals] (Data Acquisition & Exploration)	- Data Acquisition - Data Visualization	
	Acquire [AI fundamentals] (Data Modeling)	- Decision Trees - How computer see and classify images?	
	Acquire [AI fundamentals] (Neural Networks)	- Introduction to Neural Networks	
	Acquire [Domain-specific Concepts] (Natural Language Processing)	- Applications of NLP - NLP data processing - Bag of words - Understanding algorithms used in NLP	3
Experience [Natural Language Processing]	Experience [NLP] (Data Collection and Processing for NLP)	- Requesting website information with Python - Storing data - Curated data sources - NLP tools - Processing NLP data	6
	Experience [NLP] (Classification for NLP)	- Converting data into a bag of words - Selecting important words from a list of words using tfidf method - Choose a machine learning model using the sklearn library - Data pipelining	6
	Experience [NLP] (Creating a Chatbot)	- Introduction to chatbots - Finding your chatbot's specialty - Teach your chatbot to match topics - Get your chatbot to say its first words - Teach and play with your chatbot	6
Empower	Empower (Exemplar AI use cases with AI project cycle)	- AI use cases for all three domains (Data, CV and NLP) - AI Project Cycle as applied to AI use cases	1
	Empower (Project Work-time and Presentation)	- Youth will build their own AI enabled social impact solutions - Project presentation	2
		Total Hours	**30**

References

1	Materials from Intel : https://drive.google.com/drive/folders/1J4Sj_PUTij5f8VXZDmAkw2PhOX1lZ9hi?usp=sharing

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

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks
		L	T	P	C	Total
U19CSOC9	**AI Specific Skills on Computer Vision**	1	0	2	1	100

Course Objective	The students will able to, • Learn artificial intelligence on Computer Vision
Course Outcome	At the end of the course, the student should be able to,
	CO1: Inspire and acquire the artificial intelligence fundamentals and sub domains
	CO2: Experience and empower the techniques and models in Computer Vision
Pre-requisites	Any programming language

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

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	1									3	3
CO 2	3	3	2	1									3	3

Course Assessment Methods

Direct
1. Written Test 2. Mini Project
Indirect

Content of the syllabus

Phases	Module	Sub Topic	Expected Hours
Inspire	Inspire (Excite)	- What is AI? - The 3 domains of AI - Statistical Data, Computer Vision, Natural Language Processing	3
	Inspire (Relate)	-AI Applications	
	Inspire (Purpose)	- Appreciate the complexity of social issues - Understand the concept of leverage within a system - Be able to determine where AI solutions would be appropriate - Project: Draw a Systems Map	
	Inspire (Possibilities)	- AI in industries - UN Sustainable Development Goals	
	Inspire (Pitfalls)	- Discuss AI ethics issues e.g. privacy, bias, access to AI	

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Acquire	Acquire [AI fundamentals] (Introduction to AI Project Cycle)	- AI Project Cycle - Problem scoping	3
	Acquire [AI fundamentals] (Data Acquisition & Exploration)	- Data Acquisition - Data Visualization	
	Acquire [AI fundamentals] (Data Modeling)	- Decision Trees - How computer see and classify images?	
	Acquire [AI fundamentals] (Neural Networks)	- Introduction to Neural Networks	
	Acquire [Domain-specific Concepts] (Computer Vision)	- Applications of CV - How a computer analyse images (pixels. RGB) - Convolutional Neural Network - Support Vector Machine	3
Experience [Computer Vision]	Experience [CV] (Basic Techniques in Computer Vision)	- How do computer see? - How image is represented with numbers (RGB) - Tresholding, masking and region of interest - Geometric transformation, resizing and cropping	6
	Experience [CV] (From Traditional Computer Vision to Artificial Intelligence)	- Feature extraction - selecting appropriate features - Pre processing images - Introduction to K-Nearest neighbour algorithm - Training a simple machine learning algorithm with a few samples - Support Vector Machines	6
	Experience [CV] (Types of Inference Models with OpenVINO and NCS2)	- Use Pre-trained model from OpenVINO - Run an inference model using the Neural Compute Stick 2 - Image classification - Object detection	6
Empower	Empower (Exemplar AI use cases with AI project cycle)	- AI use cases for all three domains (Data, CV and NLP) - AI Project Cycle as applied to AI use cases	1
	Empower (Project Work-time and Presentation)	- Youth will build their own AI enabled social impact solutions - Project presentation	2
		Total Hours	**30**

References

1	Materials from Intel : https://drive.google.com/drive/folders/1J4Sj_PUTij5f8VXZDmAkw2PhOX1lZ9hi?usp=sharing

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