VIVEKANANDHA
COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous)
Elayampalayam, Tiruchengode -637205

CURRICULUM &

SYLLABI - 2023

FOR

POST GRADUATE (PG)

M.TECH. - INFORMATION TECHNOLOGY

REGULATIONS - 2023

CHOICE BASED CREDIT SYSTEM

Applicable to the students admitted from the academic year 2023-2024 onwards

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(Autonomous)

Elayampalayam, Tiruchengode – 637205.

M.Tech. Information Technology

Regulations – 2023

CHOICE BASED CREDIT SYSTEM

COLLEGE VISION

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

COLLEGE MISSION

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

DEPARTMENT VISION

Providing quality education to transform students into technically competent skilled women to excel in IT profession, innovation and entrepreneurship.

DEPARTMENT MISSION

- To empower knowledge on cutting-edge technologies in the field of InformationTechnology to develop innovative solutions for real-world problems.
- To create a platform for innovation, research and new technology development
- To inculcate ethical practices, life-long learning and sense of societal responsibilities to support the career and personal development of the learner

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) :

PEO 1 : The Leadership and team-player ability that enables the students to play a major role as innovators in product design and development related organizations and as an entrepreneur.

PEO 2 : Students are expertise to think creatively to discover the real time problems which cater the needs of the society.

PEO 3 : To deliver the fundamental responsibilities and progressive knowledge to the graduates that enables them to excellence in delivering lectures, to excel in diverse careers with integrity and ethics.

PROGRAMME OUTCOMES (POs):

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

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

norms of the engineering practice.

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

PROGRAM SPECIFIC OUTCOMES

1. Ability to solve complex Knowledge Engineering problems by building Systems across various domains including Systems Engineering, Software Development & Engineering.
2. Obtain an understanding of Qualitative and quantitative research and apply this knowledge in the context of professional future.

Mapping of Program Educational Objectives with Program Outcomes

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

Programme Educational Objectives	Programme Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
I	√	√	√		√	√		√	√			
II		√		√			√	√	√	√		
III		√	√		√		√		√	√		

CURRICULUM BREAKDOWN STRUCTURE						
Summary of Credit Distribution						
Category	**Semester**				**Total No. of Credits**	**Curriculum Content (% of total number of credits of the program)**
	SEM1	**SEM2**	**SEM3**	**SEM4**		
BSC	3	-	-	-	3	4.2%
PCC	16	11	-	-	27	37.5%
PEC	3	6	6	-	15	20.8%
OEC	-	-	3	-	3	4.2%
EEC	-	-	8	16	24	33.3%
Semester wise Total	22	17	17	16	**72**	**100**

COURSE WITH PROGRAMME OUTCOMES:

SEM	Subject Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
SEM1	Mathematical Foundations of Computer Science*	√	√	√	√	√							
	Advanced Data Structures and Algorithms	√	√	√	√	√	√		√	√	√		√
	Machine Learning Algorithms	√	√	√	√	√	√	√	√	√	√		
	Introduction to Intelligent Systems	√	√	√	√	√	√		√	√	√		√
	Research Methodology and IPR*	√	√	√	√					√	√		
	Professional Elective – 1												
	Audit Course -I												
	Data Structures and Algorithms Laboratory	√	√	√	√	√	√		√	√	√		
	Machine Learning Laboratory*	√	√	√	√	√					√	√	√
SEM 2	Cloud Computing Technologies	√	√	√	√	√	√	√		√	√		√
	Networks and Systems Security	√	√	√	√	√	√	√	√	√	√	√	√
	Parallel Computing*	√	√	√	√								
	Professional Elective - II												
	Professional Elective - III												
	Audit Course -II												
	Security & Forensics Lab	√	√	√	√	√	√	√	√				
	Mini Project	√	√	√	√	√	√	√	√	√	√	√	√

*Common to M.E. – CSE & M.TECH. - IT

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam,Tiruchengode – 637 205				
Programme	**M.Tech.**	Programme Code	**204**	Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**			Semester	**I**

CURRICULUM

(Applicable to the students admitted from the academic year 2023 - 2024 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
P23MA101	Mathematical Foundations of Computer Science *	FC	3	0	0	3	40	60	100
P23IT101	Advanced Data Structures and Algorithms	PCC	3	0	0	3	40	60	100
P23IT102	Machine Learning Algorithms	PCC	3	0	0	3	40	60	100
P23IT103	Introduction to Intelligent Systems	PCC	3	0	0	3	40	60	100
P23CS103	Research Methodology and IPR*	PCC	3	0	0	3	40	60	100
-	Professional Elective – I	PEC	3	0	0	3	40	60	100
-	Audit Course -I	AC	2	-	-	0	100	-	-
PRACTICAL									
P23IT104	Data Structures and Algorithms Laboratory	PCC	0	0	3	2	60	40	100
P23CS105	Machine Learning Laboratory*	PCC	0	0	3	2	60	40	100
					Total Credit	**22**	**360**	**440**	**800**

*Common to M.E. - CSE & M.Tech. - IT

FC-Foundation Courses, **PCC**- Professional Core, **PEC**-Professional Electives, **OEC**-Open Electives, **EEC**- Employability Enhancement Courses, **AC**-Audit Course

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**M.Tech.**	Programme Code	**204**	Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**		Semester		**II**

CURRICULUM

(Applicable to the students admitted from the academic year 2023 - 2024 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
P23IT205	Cloud Computing Technologies	PCC	3	0	0	3	40	60	100
P23IT206	Networks and Systems Security	PCC	3	0	0	3	40	60	100
P23IT207	Parallel Computing*	PCC	3	0	0	3	40	60	100
-	Professional Elective – II	PEC	3	0	0	3	40	60	100
-	Professional Elective – III	PEC	3	0	0	3	40	60	100
-	Audit Course -II	AC	2	-	-	0	100	-	-
PRACTICAL									
P23IT208	Security & Forensics Lab	PCC	0	0	3	1	60	40	100
P23IT209	Mini Project	PCC	0	0	3	1	60	40	100
					Total Credit	**17**	**320**	**380**	**700**

*Common to M.E. - CSE & M.Tech. - IT

PCC- Professional Core, **PEC**-Professional Elective, **OEC**-Open Elective, **EEC**- Employability Enhancement Course , **AC** - Audit Course

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205				
Programme	**M.Tech.**	Programme Code	**204**	Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**			Semester	**III**

CURRICULUM

(Applicable to the students admitted from the academic year 2023 - 2024 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
-	Professional Elective - IV	PEC	3	0	0	3	40	60	100
-	Professional Elective - V	PEC	3	0	0	3	40	60	100
-	Open Elective – I	OEC	3	0	0	3	40	60	100
PRACTICAL									
P23IT310	Project Phase - I	EEC	0	0	16	8	60	40	100
					Total Credit	**17**	**180**	**220**	**400**

*Common to M.E. - CSE & M.Tech. - IT

PEC - Professional Elective Courses, **OEC** - Open Elective Courses, **EEC** - EmployabilityEnhancement Courses

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai) Elayampalayam,Tiruchengode – 637 205				
Programme	**M.Tech.**	Programme Code	**204**	Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**			Semester	**IV**

CURRICULUM

(Applicable to the students admitted from the academic year 2023 - 2024 onwards)

Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
PRACTICAL									
P23IT411	Project Phase - II	EEC	0	0	30	16	60	40	100
					Total Credit	**16**	60	40	100

EEC - Employability Enhancement Course.

Cumulative Credits: 72

PROFESSIONAL ELECTIVE COURSES (PEC)

PROFESSIONAL ELECTIVE – I										
S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	Maximum Marks		
								CA	ESE	T
1	P23ITE01	Quantum Computing	PEC	3	0	0	3	40	60	100
2	P23ITE02	Big Data Analytics	PEC	3	0	0	3	40	60	100
3	P23ITE03	Social Network Analysis*	PEC	3	0	0	3	40	60	100
4	P23ITE04	Pattern Recognition	PEC	3	0	0	3	40	60	100
5	P23ITE05	Crptocurrency Fundamentals	PEC	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE – II										
S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	Maximum Marks		
								CA	ESE	T
1	P23CSE16	Deep Learning Techniques*	PEC	3	0	0	3	40	60	100
2	P23CSE19	Information Security*	PEC	3	0	0	3	40	60	100
3	P23CSE24	Mining Massive Data sets*	PEC	3	0	0	3	40	60	100
4	P23ITE06	GPU Computing*	PEC	3	0	0	3	40	60	100
5	P23ITE07	Ethical Hacking	PEC	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – III										
S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	Maximum Marks		
								CA	ESE	T
1	P23ITE08	Data Science	PEC	3	0	0	3	40	60	100
2	P23ITE09	Computer Vision*	PEC	3	0	0	3	40	60	100
3	P23ITE10	Digital Image Processing and Applications	PEC	3	0	0	3	40	60	100
4	P23ITE11	Information theory and Coding Techniques	PEC	3	0	0	3	40	60	100
5	P23ITE12	Digital and Cyber Forensics	PEC	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – IV

S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	Maximum Marks		
								CA	ESE	T
1	P23ITE13	Optimization Techniques	PEC	3	0	0	3	40	60	100
2	P23ITE14	Block chain Technologies	PEC	3	0	0	3	40	60	100
3	P23ITE15	Distributed Databases	PEC	3	0	0	3	40	60	100
4	P23ITE16	5G Networks	PEC	3	0	0	3	40	60	100
5	P23CSE13	Virtualization Techniques*	PEC	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – V

S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	Maximum Marks		
								CA	ESE	T
1	P23ITE17	SentimentAnalysis	PEC	3	0	0	3	40	60	100
2	P23ITE18	Information Retrieval*	PEC	3	0	0	3	40	60	100
3	P23ITE19	Speech and Natural language processing	PEC	3	0	0	3	40	60	100
4	P23ITE20	Mobile Network Systems	PEC	3	0	0	3	40	60	100
5	P23CSE01	Advanced Software Testing*	PEC	3	0	0	3	40	60	100

*common to M.E. – CSE & M.Tech. - IT

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LIST OF OPEN ELECTIVES

S.NO	COURSE CODE	COURSE NAME	CATEGORY	L	T	P	C	Maximum Marks		
								CA	ESE	T
1	P23ITOE1	Cloud Computing Principles	OEC	3	0	0	3	40	60	100
2	P23ITOE2	Research Publication Ethics	OEC	3	0	0	3	40	60	100
3	P23ITOE3	Game Development	OEC	3	0	0	3	40	60	100
4	P23ITOE4	IoT for Smart Systems	OEC	3	0	0	3	40	60	100
5	P23ITOE5	Robotics	OEC	3	0	0	3	40	60	100

AUDIT COURSES (AC)

S.NO	Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
				L	T	P	C	CA	ESE	Total
1.	P23AC001	Research Process and Methodologies#	AC	2	0	0	0	100	0	100
2.	P23AC002	Pedagogy Studies#	AC	2	0	0	0	100	0	100
3.	P23AC003	Disaster Management#	AC	2	0	0	0	100	0	100
4.	P23AC004	Value Education#	AC	2	0	0	0	100	0	100
5.	P23AC005	Constitution of India#	AC	2	0	0	0	100	0	100
6.	P23AC006	English for Research Paper Writing#	AC	2	0	0	0	100	0	100
7.	P23AC007	Personality Development through Life Enlightenment Skills#	AC	2	0	0	0	100	0	100
8.	P23AC008	Universal Human Values#	AC	2	0	0	0	100	0	100
9.	P23AC009	Online Course#	AC	2	0	0	0	100	0	100

Common to M.E. CSE, M.E. PSE, M.E. VLSI, M.Tech BT

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SEMESTER - I

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.E./M.Tech.**	Programme Code			Regulation	**2023**		
Department	**CSE & IT**				Semester	**I**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23MA101	**Mathematical Foundations of Computer Science***	3	0	0	3	40	60	100
Course Objective	The main objective of the course is to • Understand the elementary aspects of statistics and probability theory • Analyze and interpret statistical data using appropriate probability distribution • Identify and demonstrate suitable sampling and data collection process. • Understand fundamentals of Graph theory. • Analyze strategic in decision making.							
Course Outcome	At the end of the course, the student should be able to						Knowledge Level	
	CO1: Inculcate the habit of statistical thinking.						K1,K2	
	CO2: Enable to identify various probability distribution						K2, K4	
	CO3: Apply appropriate modern technology to explore probability/statistical concepts						K2, K3	
	CO4: Apply suitable graph model and algorithm for solving applications.						K3, K4	
	CO5: To evaluate determining different strategies to get optimum solution.						K4, 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**	**PSO1**	**PSO 2**
CO 1	3	2	1		1								2	1
CO 2	3	2		1	1								2	1
CO 3	3	2	1	1									2	1
CO 4	3	2	1		1								2	1
CO 5	3	2	1		1								2	1

Course Assessment Methods

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

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Content of the syllabus

Unit – I	**RANDOM VARIABLES**	Periods	**9**
Random Variables-Probability Function-Moments-Moment Generation Function and their Properties-Binomial-Poisson-Geometric, Uniform, Exponential and Normal Distributions			
Unit – II	**TWO DIMENSIONAL RANDOM VARIBLE**	Periods	**9**
Joint Distributions-Marginal and Conditional distributions-Functions of two dimensional random variables-Regression curve-Correlation			
Unit – III	**ESTIMATION THEORY**	Periods	**9**
Unbiased Estimators-Methods of Moments-Maximum Likelihood Estimation-Curve Fitting by Principle of Least Squares-Regression lines.			
Unit – IV	**GRAPH THEORY**	Periods	**9**
Graphs – Introduction – Isomorphism – Sub graphs – Walks, Paths, Circuits –Connectedness – Components – Euler graphs – Hamiltonian paths and circuits – Trees – Properties of trees – Distance and centers in tree – Rooted and binary trees.			
Unit – V	**GAME THEORY**	Periods	**9**
Game Theory-Two person Zero sum games-Saddle point, Dominance Rule, Convex Linear Combination (Averages), methods of matrices, graphical method.			
		Total Periods	**45**

Text Books	
1.	Montgomery, D.C. and Runger, C.G., Applied Statistics and Probability for Engineers, 6th Edition, Wiley Students Edition, Wiley, 2016.
2.	Ravichandran, J., Probability and statistics for Engineers, 1st Edition, Wiley India Ltd, 2012.
References	
1.	Gupta S.C. and Kapoor V.K, Fundamentals of Mathematical Statistics, 1st Edition, Sultan an Sons, 2001.
2.	Devore, J.L., Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage Learning, 2011.
3.	Johnson, R.A., Miller, I. and Freund, J., Miller & Freund's Probability and Statistics for Engineers 8th Edition, Pearson Education, 2010.
4.	Narsingh Deo, "Graph Theory with Application to Engineering and Computer Science", Prentice-Hall of India Pvt.Ltd, 2003.
5.	Bondy, J. A. and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication,2008.
6.	Hamdy A.Taha, Operations Research an Introduction, 10th Edition, Pearson Publications, 2019
E-Resources	
1.	https://www.youtube.com/
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	**M.Tech.**	Programme Code		**204**	Regulation		**2023**	
Department	**INFORMATION TECHNOLOGY**				Semester		**I**	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23IT101	**Advanced Data Structures and Algorithms**	3	0	0	3	40	60	100
Course Objective	The Main Objective of the course is to • Learn the usage of algorithms in computing. • Learn the basic and advanced data structures and its operations. • Learn the graph applications. • Learn the various advanced algorithms and analysis techniques							

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Describe the usage of algorithms in computing.	K1
	CO2: Discuss advanced data structures and its operations.	K2
	CO3: Demonstrate various graph traversal techniques	K3
	CO4: Examine various advanced analysis techniques	K4
	CO5: Apply String matching algorithms, Computational geometry algorithms to solve problem	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	2	3	2	-	1	2	-	-	1	2		1	2	1
CO 2	2	1	-	3	1	1	-	-	1	1		1	2	1
CO 3	2	2	1	2	-	1	-	2	-	1		1	2	2
CO 4	1	-	2	-	2	3	-	-	1	-		1	2	1
CO 5	3	2	1	2	-	1	-	-	1	2		1	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

Unit – I	**Introduction to Algorithms**	Periods	**9**

The role of algorithms in computing – Analyzing and Designing Algorithms- O notation, Ω notation and Θ

notation- Asymptotic Notation – Standard Notations and Common Functions- Recurrences: The Substitution Method – The Recursion-Tree Method			
Unit - II	**Elementary and Advanced Data Structures**	Periods	**9**
Array, Linked List, Stack, Queue – Hash tables – Binary Search Trees – Querying Binary Search Tree – Insertion and Deletion – Red Black Trees – Properties- Rotation – Insertion and Deletion of Red Black Trees - Augmenting Data Structures – How to augment a data Structure – Interval Trees – B Trees			
Unit – III	**Graphs**	Periods	**9**
Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components –The algorithms of Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs; All-Pairs Shortest Paths: The Floyd Warshall Algorithm;			
Unit - IV	**Advanced Design and Analysis Techniques**	Periods	**9**
Dynamic Programming: Rod cutting - Matrix-Chain Multiplication – Elements of Dynamic Programming –- Optimal Binary Search Trees - Greedy Algorithms: Elements of the Greedy Strategy- Huffman Codes.			
Unit – V	**Advanced Algorithms**	Periods	**9**
String matching: Naive string-matching algorithm, Rabin-Karp algorithm, String matching with finite automata, Knuth-Morris-Pratt algorithm– Computational Geometry – NP-Completeness –Approximation algorithms.			
		Total Periods	**45**
Text Books:			
1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms", Fourth Edition, Mcgraw Hill/ MIT Press, 2022		
REFERENCE BOOKS			
1.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 2005.		
2.	Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, ―Data Structures and Algorithms‖, Pearson Education, Reprint 2006.		
E-Resources			
1.	https://www.geeksforgeeks.org/advanced-data-structures/		

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

Programme	**M.Tech.**	Programme code	**204**	Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**			Semester	**I**

Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23IT102	**Machine Learning Algorithms**	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Know the characteristics of machine learning that make it useful to real-worldproblems and the basic underlying concepts
- Know Characteristics of supervised machine learning algorithms
- To learn unsupervised algorithms for clustering, Instance-based learning andPrincipal Component Analysis
- The inference and learning algorithms for the hidden Markov model and Bayesian networks and few machine learning tools
- Various advanced machine learning algorithms in a range of real-world applications.

Course Outcome

At the end of the course, the student should be able to,	Knowledge level
CO1: Understand the basic concepts, fundamental issues and challenges of machine learning algorithms and the paradigms of supervised learning.	K2
CO2: Understand the basic concepts of un-supervised machine learning.	K2
CO3: Design and implement basic machine learning algorithms using tools.	K3
CO4: Understand the basic concepts and architecture of reinforcement learning algorithms	K2
CO5: Design and implement various advanced machine learning algorithms in a range of real world applications.	K3

Pre- requisites Artificial Intelligence

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

CO/PSO Mapping

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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	**Introduction**	Periods	**9**

Introduction - classic and adaptive machines - Types of machine learning – Deep Learning and Bio inspired Adaptive Systems – Machine Learning and Bigdata – Elements: Data Formats – Learnability – Statistical Learning Approaches.

Unit - II	**Feature Selection and Feature Engineering**	Periods	**9**

scikit-learn toy datasets - Creating training and test sets - Managing categorical data - Managing missing features - Data scaling and normalization - Feature selection and filtering - Principal component analysis - Atom extraction and dictionary learning.

Unit – III	**Linear and Logistic Regression**	Periods	**9**

Linear models - A bidimensional example - Linear regression with scikit-learn and higher dimensionality - Polynomial regression - Isotonic regression

Logistic Regression: Implementation and optimizations - Stochastic gradient descent algorithms - Classification metrics - ROC curve

Graphical Models -Undirected graphical models - Markov Random Fields - Directed Graphical Models - Bayesian Networks - Conditional independence properties - Inference – Learning - Generalization - Hidden Markov Models – Machine learning tools – R, Scikit Learn, Octave, BigML , WEKA.

Unit – IV	**Classification and Clustering Algorithms**	Periods	**9**

Bayes' theorem - Naive Bayes classifiers - Naive Bayes in scikit-learn - Support Vector Machines - Decision Trees and Ensemble Learning - Clustering basics - K-means - DBSCAN - Spectral clustering - Evaluation methods based on the ground truth - Hierarchical Clustering

Unit – V	**Advanced Concepts**	Periods	**9**

Introduction to Recommendation Systems - Introduction to Natural Language Processing - Topic Modeling and Sentiment Analysis in NLP - Introduction to Deep Learning and TensorFlow

	Total Periods	**45**

References

1.	Giuseppe Bonaccorso , “Machine Learning Algorithms”, Packt Publishing, July 2017,ISBN: 9781785889622
2.	Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012
3.	Ethem Alpaydin, “Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)”, Third Edition, MIT Press, 2014

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/

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205						
Programme	**M.Tech.**	Programme Code	**204**	Regulation	**2023**		
Department	**INFORMATION TECHNOLOGY**			Semester	**I**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
P23IT103	**Introduction to Intelligent Systems**	3	0	0	3	40	60	100

Course Objective	The student should be made to, • To introduce the basic intelligent system concepts • To describe and learn various algorithms in the neural networks for optimizing real world problems • To learn fuzzy logic and its implementation methods	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand fundamental concepts of Intelligence systems	K1 & K2
	CO2: Analyze the Genetics and Fuzzy Logic of Intelligence systems	K2
	CO3: Identify the Optimization Search in Fuzzy Logic	K3
	CO4: Enhance the fuzzy set and Knowledge Representation	K2
	CO5: Identify the challenges in Reasoning Techniques	K4
Pre-requisites	Artificial Intelligence	

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

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	**INTRODUCTION AND BASIC CONCEPTS**	Periods	**9**

Biological foundations to intelligent systems I: Artificial neural networks, Backpropagation networks, Radial basis function networks, and recurrent networks

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Unit – II	FOUNDATIONS OF INTELLIGENT SYSTEMS	Periods	9
Biological foundations to intelligent systems II: Fuzzy logic, knowledge Representation and inference mechanism, genetic algorithm, and fuzzy neural networks.			
Unit – III	**SEARCHING**	Periods	**9**
Search Methods Basic concepts of graph and tree search. Three simple search methods: breadth-first search, depth-first search, iterative deepening search. Heuristic search methods: best-first search, admissible evaluation functions, hill climbing search. Optimisation and search such as stochastic annealing and genetic algorithm.			
Unit – IV	**KNOWLEDGE REPRESENTATION**	Periods	**9**
Knowledge representation and logical inference Issues in knowledge representation. Structured representation, such as frames, and scripts, semantic networks and conceptual graphs. Formal logic and logical inference. Knowledge-based systems structures, its basic components. Ideas of Blackboard architectures.			
Unit – V	**REASONING**	Periods	**9**
Reasoning under uncertainty and Learning Techniques on uncertainty reasoning such as Bayesian reasoning, Certainty factors and Dempster-Shafer Theory of Evidential reasoning, A study of different learning and evolutionary algorithms, such as statistical learning and induction learning.			
		Total Periods	**45**

REFERENCE BOOKS

1.	Luger G.F. and Stubblefield W.A. (2008). Artificial Intelligence: Structures and strategies for Complex Problem Solving. Addison Wesley, 6th edition.
2.	Russell S. and Norvig P. (2009). Artificial Intelligence: A Modern Approach. Prentice-Hall, 3rd edition.
3.	Kosko B, "Neural Networks and Fuzzy Systems: A dynamical system approach to machine intelligence", Prentice Hall of India, 2009
4.	Rao V.B and Rao H.V., "C++, Neural Networks and Fuzzy Logic", BPB Publications, 2003
5.	Simon Kendal, Malcolm Creen, "An Introduction to Knowledge Engineering", Springer-Verlag Limited, 2007

E-Resources

1.	http://www.pzs.dstu.dp.ua/logic/bibl/yuan.pdf

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Programme	**M.E. & M.Tech.**	Programme code			Regulation	**2023**		
Department	**CSE & IT**				Semester	**I**		
Course code	Course name	Periods /per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23CS103	**Research Methodology and IPR***	3	0	0	3	40	60	100
Course Objective	The student should be made to, • Understand the importance of Research • Acquire knowledge in Data Collection • Acquire knowledge in Analysis of Data • Effectively write reports • Gain knowledge about IPR							
Course Outcome	At the end of the course, the student should be able to,							Knowledge level
	CO1: identify the research problem and its types							K2
	CO2: design experiments for different research concepts							K2
	CO3: analyze data collection methods and choose appropriate method for the research problem							K3
	CO4: explore parametric tests of hypotheses and write research proposals and Reports							K3
	CO5: apply IPR to the research work							K2
Prerequisites	-							

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

Course Assessment Methods.

Direct

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

Indirect

1. Course - end survey

Content of the syllabus

Unit - I	INTRODUCTION TO RESEARCH	Periods	9
Introduction: Meaning of research - Objectives of Research - Types of Research -Research Approaches- Significance of Research - Research Methods versus Methodology -Research and Scientific Method- Research Process-Criteria of Good Research - Problems Encountered by Researchers in India. **Defining the Research Problem**: Research Problem - Selecting the Problem - Necessity of Defining the Problem- Technique Involved in Defining a Problem- An Illustration.			
Unit – II	**RESEARCH DESIGN AND MEASUREMENT & SCALING**	Periods	**9**
Research Design: Meaning of Research Design-Need for Research Design- Features of a Good Design- Important Concepts Relating to Research Design-Different Research Designs-Basic Principles of Experimental Designs- Important Experimental Designs. **Measurement and Scaling**: Quantitative andQualitative Data - Classifications of Measurement Scales- Goodness of Measurement Scales- Sources of Error in Measurement- Techniques of Developing Measurement Tools- Scaling- Scale Classification Bases- Scaling Techniques- Multidimensional Scaling- Deciding the Scale.			
Unit – III	**DATA COLLECTION AND DATA PREPARATION**	Periods	**9**
Data Collection: Introduction – Experiments and Surveys - Collection of Primary Data- Collection of Secondary Data- Selection of Appropriate Method for Data Collection. **Data Preparation:** Data Preparation Process - Some Problems in Preparation Process - Missing Values and Outliers - Types of Analysis- Statistics in Research.			
Unit – IV	**TESTING AND REPORT WRITING**	Periods	**9**
Testing of Hypothesis: Hypothesis introduction - Basic Concepts Concerning Testing of Hypothesis - Testing the Hypothesis - Test Statistic and Critical Region- Critical Value and Decision Rule- Procedure for Hypothesis Testing - Hypothesis Testing for Mean, Proportion, Variance, Difference of Two Mean, Difference of Two Proportions, Two Variances - P-Value Approach- Power of the Test- Limitations of the Tests of Hypotheses. **Chi-Square Tests.** **Report Writing:** Meaning of Interpretation- Technique of Interpretation-Precaution in Interpretation- Significance of Report Writing-Different Steps in Writing Report-Layout of the Research Report-Types of Reports-Oral Presentation-Mechanics of Writing a Research Report-Precautions for Writing Research Reports			
Unit – V	**INTELLECTUAL PROPERTY RIGHTS (IPR)**	Periods	**9**
Nature of Intellectual Property: Patents, Designs, Trade and Copyright-IPR History-Patent Law—Trade Secret Law -Geographical Indications.			
		Total Periods	**45**

References

1.	C. R. Kothari, ―Research Methodology – Methods and Techniques‖, 4th Edition, New Age International Publishers, 2020 (Reprint)
2.	Bordens, K. S. and Abbott, B. B., ―Research Design and Methods – A Process Approach‖, 8th Edition, McGraw-Hill, 2011
3.	Robert P. Merges, Peter S. Menell, Mark A. Lemley, ―Intellectual Property in New Technological Age‖, 2016.
4.	Davis, M., Davis K., and Dunagan M., ―Scientific Papers and Presentations‖, 3rd Edition, Elsevier Inc.
5.	Robert P. Merges, Peter S. Menell, Mark A. Lemley,―Intellectual Property in New Technological Age‖. Aspen Law & Business; 6 edition July 2012

E-Resources

1	https://www.questionpro.com/blog/research-design/
2	https://research-methodology.net/research-methods/data-collection/
3	https://www.wipo.int/edocs/pubdocs/en/intproperty/958/wipo_pub_958_3.pdf

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

Programme	**M.Tech.**	Programme Code			**204**	Regulation	**2023**	
Department	**INFORMATION TECHNOLOGY**				Semester		**I**	
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23IT104	**Data Strucutres and Algorithms Laboratory**	0	0	4	2	60	40	100

Course Objective

The Main Objective of the course is to

- Design of algorithms using Greedy Techniques.
- Implement Graph algorithms and Matrix operations.
- Implement String matching algorithms
- Implement computational geometry and approximation algorithms

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Design and analyze algorithms using divide and conquer, dynamic programming, greedy algorithms	K3
	CO2: Implement various types of tree implementation Techniques	K3
	CO3: Design Algorithms using Graph Structures	K3
	CO4: Design and analyze algorithms using greedy technique	K3
	CO5: Apply String matching algorithms, Computational geometry algorithms to solve problem.	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**	**PO5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO 1	2	1	2		1	1		1	2	-			2	2
CO 2	3	2	-	2	1	1		-	1	2			-	1
CO 3	1	3	2	-	1	3		1	3	-			1	-
CO 4	2	-	1	2	3	2		1	-	1			2	1
CO 5	-	3	1	1	1	- 1		2	1	2			-	2

Course Assessment Methods

Direct

1. Prelab and Post Lab
2. Record
3. End-Semester Examinations

Indirect

1. Course - end survey

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Content of the syllabus	CO's
1. Implement an algorithm that combines k sorted lists in time O(n log k) where n is the total number of elements	**CO1**
2. Implementation of a Binary Search Tree	**CO2**
3. Red-Black Tree Implementation	**CO2**
4. Heap Implementation	**CO2**
5. Implement Graph Traversal algorithms	**CO3**
6. Implement Bellmen Ford Algorithms	**CO3**
7. Implement an algorithm to solve Matrix Multiplication problem	**CO4**
8. Implement an algorithm based on greedy approach to solve knapsack problem	**CO4**
9. Implement String Matching Algorithms	**CO5**
10. Implement Computational Geometry algorithms	**CO5**
Total Periods	**45**

E-Resources

1.	http://camelliait.ac.in/Lab%20Manual/ADA%20Lab%20Programs.pdf
2.	http://camelliait.ac.in/Lab%20Manual/ADA%20Lab%20Programs.pdf

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.E./M.Tech.**	Programme Code			Regulation	**2023**		
Department	**CSE & IT**				Semester	**I**		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23CS105	**Machine Learning Laboratory**	0	0	4	2	60	40	100
Course Objective	The student should be made to, • Provide students with an in-depth introduction to two main areas of Machine Learning: supervised and unsupervised. • Learn main models and algorithms for regression, classification, clustering and Markov decision processes. • Know linear and logistic regression, regularization, MLE, probabilistic (Bayesian) inference. • Know SVMs and kernel methods, ANNs, clustering, and dimensionality reduction. • Know the Python programming language and assumes familiarity with linear algebra, probability theory, and programming in Python.							
Course Outcome	At the end of the course, the student should be able to,					Knowledge level		
	CO1: Develop an appreciation for what is involved in learning from data.					K3		
	CO2: Understand a wide variety of learning algorithms.					K2		
	CO3: Understand how to apply a variety of learning algorithms to data.					K2		
	CO4: Understand about Bayesian classifier.					K2		
	CO5: Understand how to perform evaluation of learning algorithms and model selection.					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**	**PO5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO 1	3	3	3	3	2					2	1		3	2
CO 2	3	3	3	3	2					2	1		1	1
CO 3	3	2	2	3	1					2	1		3	1
CO 4	2	1	3	2	1					2	1		1	1
CO 5	3	3	2	2	1					2	1		2	2

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Course Assessment Methods

Direct
1. Prelab and Post Lab 2. Record 3. End-Semester Examinations
Indirect
1. Course - end survey

Content of the syllabus	**CO's**
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. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.	**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 Back propagation algorithm and test the same using appropriate data sets.	**CO3**
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.	**CO4**
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.	**CO4**
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 Java/Python ML library classes/API.	**CO4**
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/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. Java/Python ML library classes can be used for this problem.	**CO5**
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.	**CO5**
Total Periods	**45**

E-Resources

1.	http://cittumkur.org/ads/csml1819.pdf
2.	https://www.imperial.ac.uk/data-science/research/multidisciplinary-labs/machine-learning-lab/

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SEMESTER -II

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

Programme	**M.Tech.**	Programme Code	**204**	Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**		Semester		**II**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23IT205	**Cloud Computing Technologies**	3	0	0	3	40	60	100

Course Objective

The Main Objective of the course is to

- Gain expertise in Virtualization, Virtual Machines and deploy practical virtualization solution
- Understand the architecture, infrastructure and delivery models of cloud computing
- Explore the roster of AWS services and illustrate the way to make applications in AWS
- Gain knowledge in the working of Windows Azure and Storage services offered by Windows Azure
- Develop the cloud application using various programming model of Hadoop

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Employ the concepts of virtualization in the cloud computing	K3
	CO2:Identify the architecture, infrastructure and delivery models of cloud computing	K2
	CO3: Develop the Cloud Application in AWS platform	K3
	CO4: Apply the concepts of Windows Azure to design Cloud Application	K3
	CO5: Develop services using various Cloud computing programming models.	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	2	1	-	2	2			3	2
CO 2	3	3	3	3	2	2	1	-	1	2			2	2
CO 3	3	3	2	3	1	3	1	-	1	2		1	3	2
CO 4	3	3	3	2	1	2	1	-	1	2			1	1
CO 5	3	3	2	2	1	2	1	-	1	2		1	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	**VIRTUALIZATION AND VIRTUALIZATION INFRASTRUCTURE**	Periods	**9**
Basics of Virtual Machines - Process Virtual Machines – System Virtual Machines –Emulation – Interpretation – Binary Translation - Taxonomy of Virtual Machines. Virtualization –Management Virtualization — Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization- Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices virtual clusters and Resource Management – Virtualization for data center automation			
Unit – II	**CLOUD PLATFORM ARCHITECTURE**	Periods	**9**
Cloud Computing: Definition, Characteristics - Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design – Layered cloud Architectural Development – Architectural Design Challenges			
Unit – III	**AWS CLOUD PLATFORM - IAAS**	Periods	**9**
Amazon Web Services: AWS Infrastructure- AWS API- AWS Management Console - Setting up AWS Storage - Stretching out with Elastic Compute Cloud - Elastic Container Service for Kubernetes- AWS Developer Tools: AWS Code Commit, AWS Code Build, AWS Code Deploy, AWS Code Pipeline, AWS code Star			
Unit – IV	**PAAS CLOUD PLATFORM**	Periods	**9**
Windows Azure: Origin of Windows Azure, Features, The Fabric Controller – First Cloud APP in Windows Azure- Service Model and Managing Services: Definition and Configuration, Service runtime API- Windows Azure Developer Portal- Service Management API- Windows Azure Storage Characteristics-Storage Services-REST API- Blops			
Unit – V	**PROGRAMMING MODEL**	Periods	**9**
Introduction to Hadoop Framework – Map reduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster			
		Total Periods	**45**

Text Books:	
1.	Danielle Ruest, Nelson Ruest, ―Virtualization: A Beginner‟s Guide‖, McGraw-Hill Osborne Media, 2009.
2.	John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010
3	Raoul Alongi, AWS: The Most Complete Guide to Amazon Web Service from Beginner to Advanced Level, Amazon Asia- Pacific Holdings Private Limited, 2019.
REFERENCE BOOKS	
1.	Bernard Golden, Amazon Web Service for Dummies, John Wiley & Sons, 2013.
2.	Sriram Krishnan, Programming: Windows Azure, O'Reilly,2010.
3.	Rajkumar Buyya, Christian Vacchiola, S.Thamarai Selvi, Mastering Cloud Computing , MCGraw Hill Education (India) Pvt. Ltd., 2013.
4.	Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005
5.	Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, 2009.
E-Resources	
1.	https://azure.microsoft.com/en-us/resources/cloud-computing-dictionary/what-is-a-virtual-machine#:~:text=It%20has%20a%20CPU%2C%20memory,servers%2C%20existing%20only%20as%20code.
2	https://www.geeksforgeeks.org/cloud-deployment-models/

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205												
Programme	**M.Tech.**		Programme code	**204**		Regulation	**2023**						
Department	**INFORMATION TECHNOLOGY**					Semester	**II**						
Course Code	Course name		Periods per week			Credit	Maximum Marks						
			L	T	P	C	CA	ESE	Total				
P23IT206	**Networks and Systems Security**		3	0	0	3	40	60	100				
Course Objective	The student should be made to, • provides focused coverage of network and system security technologies. • explores practical solutions to a wide range of network and systems security issues. • building a secure organization, cryptography, system intrusion, Linux security • building a Internet security, intranet security, LAN security; wireless network security, cellular network security, RFID security												
Course Outcome	At the end of the course, the student should be able to,								Knowledge level				
	CO1: Apply fundamental concepts of network security								K2				
	CO2: Analyze the possible security issues in LINUX security								K2				
	CO3: Identify the security issues in the Internet Security and Intranet Security								K3				
	CO4: Enhance the security policies of Local Area Network Security and Wireless Network Security								K2				
	CO5: identify the challenges in Cellular Network Security and Radio Frequency Identification Security								K3				
Pre-requisites	Computer Networks												

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	1	1	2	-	1	1	2		1	2	1
CO 2	1	1	1	3	2	1	-	-	1	1		1	2	-
CO 3	2	2	-	2	-	1	-	2	-	1		1	1	2
CO 4	2	1	2	-	2	3	-	-	1	-		1	-	1
CO 5	3	2	1	2	-	1	-	-	1	2		1	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	**Introduction**	Periods	**9**
What is Network Security? - Definition & Fundamentals, Types of Network Security, How to Test Network Security? - Types of Attacks in Network Security - Procedures & Examples -Building a Secure Organization-Obstacles to Security, Ten Steps to Building a Secure Organization-A Cryptography Famous Cryptographic Devices, Ciphers, Modern Cryptography, The Computer Age-Preventing System Intrusions-Guarding Against Network Intrusions			
Unit – II	**Unix and Linux Security**	Periods	**9**
Unix and Security: Basic Unix Security, Protecting User Accounts and Strengthening Authentication, Reducing Exposure to Threats by Limiting Superuser Privileges, Safeguarding Vital Data by Securing Local and Network File Systems-Eliminating the Security Weakness of Linux Operating System : Introduction to Linux, Hardening Linux, Proactive Defense for Linux.			
Unit – III	**Internet Security and Intranet Security**	Perios	**9**
Internet Protocol Architecture- An Internet Threat Model: The Dolev–Yao Adversary Model, Layer Threats-Defending Against Attacks on the Internet-The Botnet Problem: Botnet Overview, Typical Bot Life Cycle, The Botnet Business Model, Botnet Defense, Botmaster Traceback. **Intranet Security :** Plugging the Gaps: Network Access Control and Access Control, Measuring Risk: Audits, Guardian at the Gate: Authentication and Encryption, Wireless Network Security , Shielding the Wire: Network Protection			
Unit – IV	**Local Area Network Security and Wireless Network Security**	Periods	**9**
Local Area Network Security -Identify Network Threats: Disruptive, Unauthorized Access, Establish Network Access Controls, Risk Assessment, Listing Network Resources, Threats, Security Policies, The Incident-Handling Process, Secure Design through Network Access Controls, IDS Defined, Network-Based IDS Firewalls **Wireless Network Security:** Cellular Networks, Wireless Ad Hoc Networks, Security Protocols, Secure Routing, Key Establishment			
Unit – V	**Cellular Network Security and RF Identification Security**	Periods	**9**
Cellular Network Security –Overview of Cellular Networks, The State of the Art of Cellular Network Security, Cellular Network Attack Taxonomy, Cellular Network Vulnerability Analysis **Radio Frequency Identification Security-** Radio Frequency Identification Introduction, RFID Challenges, RFID Protections			
		Total Periods	**45**
Text Books			
1.	John R. Vacca, “Network and System Security” ,Second Edition ,2014		
References			
1. .	Tyler Wrightson, “Wireless Network Security A Beginner's Guide”, McGraw-Hill, May 2012(Unit –IV)		
2.	Rolf Oppliger , “Internet Security and Intranet Security”, Second Edition ,2001(Unit –III)		
E-Resources			
1.	https://www.academia.edu/45634449/Network_and_System_Security		
2.	https://study.com/academy/course/computer-science-202-network-and-system-security.html		

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

Programme	**M.E./ M.Tech.**	Programme Code		Regulation	**2023**
Department	**CSE /IT**			Semester	**II**

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23IT207	**Parallel Computing**	3	0	0	3	40	60	100

Course Objective

The Main Objective of the course is to

- study the scalability and clustering issues and the technology necessary for them.
- understand the technologies enabling parallel computing.
- study the different types of interconnection networks.
- study the different parallel programming models.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand about parallel programming, process, threads and issues.	K2
	CO2: Analyze the performance and benchmarks of parallel computing.	K3
	CO3: Understand the technologies enabling parallel computing.	K2
	CO4: Illustrate different types of interconnection networks.	K2
	CO5: Analyze various parallel programming platforms.	K3

Prerequisites Computer Organization and Architecture

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

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	**Introduction to Parallel Programming**	Periods	**9**
Evolution of Computer Architecture –System Architectures - Dimensions of Scalability – Parallel Computer Models: Semantic Attributes- Performance Attributes – Basic Concepts of Clustering – Scalable Design Principles Parallel Programming Overview – Processes, Tasks and Threads – Parallelism Issues – Interaction / Communication Issues.			
Unit – II	**Performance Metrics and Benchmarks of Parallelism**	Periods	**9**
Performance of Parallel Computing- Parallelism Overhead – Process Management- Grouping Operations – Process Inquiry Operations – Interaction Overhead – Synchronization – Communication – Aggregation – Broadcast, Scatter, gather, Total Exchange – Performance Metrics – Scalability and Speed up Analysis.			
Unit – III	**Enabling Technologies**	Periods	**9**
Microprocessor Architecture Families – Memory Hierarchy – Cache Coherence Protocols – Shared Memory Consistency – Distributed Cache Memory Architecture – Latency Tolerance Techniques – Multithreaded Latency Hiding.			
Unit – IV	**System Interconnections**	Periods	**9**
Basics of Interconnection Networks – Network Component, Charteristics, Properties - Network Topologies – Buses, Crossbar and Multistage Switches, Software Multithreading – Synchronization Mechanisms.			
Unit – V	**Parallel Programming Platforms**	Periods	**9**
Implicit Parallelism: Trends in Microprocessor Architectures - Limitations of Memory System Performance Dichotomy of Parallel Computing Platforms - Physical Organization of Parallel Platforms - Communication Costs in Parallel Machines - Routing Mechanisms for Interconnection Networks.			
		Total Periods	**45**

Text Books:	
1.	Kai Hwang and Zhi.Wei Xu, “Scalable Parallel Computing”, Tata McGraw-Hill, New Delhi, 2003.
2.	A Grama, A Gupta, G Karypis, and V Kumar, Introduction to Parallel Computing. 2nd Ed., Addison-Wesley, 2003.
REFERENCE BOOKS	
1.	David E. Culler & Jaswinder Pal Singh, “Parallel Computing Architecture: A Hardware/Software Approach”, Morgan Kaufman Publishers, 1999.
2.	Michael J. Quinn, “Parallel Programming in C with MPI & OpenMP”, Tata McGraw-Hill, New Delhi, 2003.
E-Resources	
1.	https://www.slideshare.net/AkhilaPrabhakaran/introduction-to-parallel-computing-86473048
2.	https://www.geeksforgeeks.org/introduction-to-parallel-computing/

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

Programme	**M. Tech.**	Programme code	**204**	Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**			Semester	**II**

Course code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23IT208	**Security and Forensics Laboratory**	0	0	4	2	60	40	100

Course Objective

The student should be made to,
- Design of algorithms using Divide and Conquer, Dynamic programming approach.
- Design of algorithms using Greedy and Back Tracking Techniques.
- Implement Graph algorithms and Matrix operations.
- Implement String matching algorithms
- Implement computational geometry and approximation algorithms.

Course Outcome

At the end of the course, the student should be able to,	Knowledge level
CO1: Design and analyze encryption, decryption using the cipher substitution techniques	K3
CO2: Perform Port Scanning with nmap, superscan	K4
CO3: Demonstrate intrusion detection system (ids) using software tool	K3
CO4: Study computer forensics and different tools used for forensic investigation	K3
CO5: Analyze how to recover deleted files, last used pc ,last connected using forensics tools.	K3

Pre-requisites: Data Structures Laboratory

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

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Course Assessment Methods

Direct
1. Prelab and Post lab questions 2. End-Semester Examinations
Indirect
1. Course - end survey

Content of the syllabus

SUGGESTED LIST OF EXPERIMENTS	**CO'S**
1. Perform encryption, decryption using the following substitution techniques i. Ceaser cipher ii. Playfair cipher iii. Hill Cipher	**CO1**
2. Perform an experiment for Port Scanning with nmap, superscan or any other equivalent software	**CO1**
3. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.	**CO2**
4. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (Gnu PG)	**CO2**
5. Apply AES algorithm for practical applications	**CO3**
6. Study of computer forensics and different tools used for forensic investigation	**CO3**
7. Analyze how to recover deleted files using forensics tools	**CO4**
8. Analyze last connected USB on your system (USB Forensics)	**CO4**
9. Analyze how to view last activity of your PC	**CO5**
Total Periods : 45 Hours	

E-Resources

1. https://www.studocu.com/in/document/gyan-ganga-institute-of-technology-and-sciences/masters-in-technology/digital-forensics-lab-manual/39441861

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M. Tech.**	Programme code	**204**	Regulation	**2023**			
Department	**INFORMATION TECHNOLOGY**			Semester	**II**			
Course code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23IT209	**Mini Project**	0	0	4	2	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: Demonstrate a sound technical knowledge of their selected project topic.	K2
CO2:Apply engineering Knowledge, Skills and management principles to achieve project goal.	K3
CO3: Implement hardware and/or software tools with Test Solutions	K3
CO4: Test/verify the modules of implemented mini- project.	K2
CO5: Express the engineering activities with effective presentation, report and Evaluation metrics.	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	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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PROFESSIONAL ELECTIVE – I

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
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Programme	**M.Tech.**	Programme Code	**204**	Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**			Semester	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23ITE01	**Quantum Computing**	3	0	0	3	40	60	100

Course Objective

The Main Objective of the course is to

- Introduce the building blocks of Quantum computers and highlight the paradigm changebetween conventional computing and quantum computing
- Understand the Quantum state transformations and the algorithms
- Understand entangled quantum subsystems and properties of entangled states
- Explore the applications of quantum computing

Course Outcome

At the end of the course, the student should be able to,	Knowledge level
CO1: Understand the basic principles of quantum computing.	K1
CO2: Gain knowledge of the fundamental differences between conventional computing andquantum computing.	K2
CO3: Understand several basic quantum computing algorithms.	K3
CO4: Understand the classes of problems that can be expected to be solved well by quantumcomputers.	K3
CO5: Simulate and analyze the characteristics of Quantum Computing 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**	**PSO1**	**PSO 2**
CO 1	3	2	1									1	2	2
CO 2	3	2	-	1		1							3	3
CO 3	2	2	2										3	3
CO 4	2	2	-										2	2
CO 5	3	2	2	1		2						1	1	1

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	**INTRODUCTION TO QUANTUM**	Periods	**9**

The Quantum Mechanics of Photon Polarization, Single-Qubit Quantum Systems, Quantum State Spaces,

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Entangled States, Multiple-Qubit Systems, Measurement of Multiple-Qubit States, EPR Paradox and Bell's Theorem, Bloch sphere			
Unit - II	**QUANTUM STATE TRANSFORMATIONS**	Periods	**9**
Unitary Transformations, Quantum Gates, Unitary Transformations as Quantum Circuits, Reversible Classical Computations to Quantum Computations, Language for Quantum Implementations.			
Unit – III	**QUANTUM ALGORITHMS**	Periods	**9**
Computing with Superpositions, Quantum Subroutines, Quantum Fourier Transformations, Shor's Algorithm and Generalizations, Grover's Algorithm and Generalizations			
Unit - IV	**ENTANGLED SUBSYSTEMS AND ROBUST QUANTUM COMPUTATION**	Periods	**9**
Quantum Subsystems, Properties of Entangled States, Quantum Error Correction, Graph states and codes, CSS Codes, Stabilizer Codes, Fault Tolerance and Robust Quantum Computing			
Unit – V	**QUANTUM INFORMATION AND CRYPTOGRAPHY**	Periods	**9**
Limitations of Quantum Computing, Alternatives to the Circuit Model of Quantum Computation, Quantum Protocols, Building Quantum, Computers, Simulating Quantum Systems, Bell states. Quantum teleportation. Quantum Cryptography, no cloning theorem			
		Total Periods	**45**

Text Books:	
1	John Gribbin, Computing with Quantum Cats: From Colossus to Qubits, 2021
2	William (Chuck) Easttom, Quantum Computing Fundamentals, 2021
3	Parag Lala, Quantum Computing, 2019
REFERENCE BOOKS	
1	Eleanor Rieffel and Wolfgang Polak, QUANTUM COMPUTING A Gentle Introduction, 2011
2	Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press.2002
E-Resources	
1	https://www.ibm.com/topics/quantum-computing

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Elayampalayam, Tiruchengode – 637 205

Programme	**M.Tech.**	Programme Code	**204**	Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**			Semester	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23ITE02	**Big Data Analytics**	3	0	0	3	40	60	100

Course Objective

The Main Objective of the course is to
- Understand big data platform and its analysis techniques.
- Design efficient algorithms for mining the data from large volumes in Weka.
- Model a framework to manage huge data with hadoop and its tools
- Analyze the big data for useful business applications.
- Perform mining on streaming data

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Explain the need and challenges of Big data and analytics.	K1
	CO2: Apply and write jobs in Hadoop and map reduce framework	K2
	CO3: Create NoSQL database and apply CRUD operations in MongoDB.	K3
	CO4: Create database and apply CRUD operations in Cassandra and Hive .	K3
	CO5: Write PigLatin scripts for database maintenance and explore application areas and techniques applied in different domains	K2

Pre-requisites -

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

CO/PSO Mapping

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	**Introduction**	Periods	**9**

Types of Digital Data – Introduction to Big Data - Big Data Analytics - classification of Analytics – Greatest Challenges that Prevent Businesses from Capitalizing on Big Data - Top Challenges Facing Big Data - Why is

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Big Data Analytics Important? - Data Science - Terminologies Used in Big Data Environment - Few Top Analytics Tools.			
Unit - II	**Technologies, Hadoop and Map Reduce**	Periods	**9**
The big data technology landscape – NoSQL – Hadoop - Introduction to Hadoop - RDBMS versus Hadoop - Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop -Managing Resources and Application with Hadoop YARN - Hadoop Ecosystem – Introduction to Map reduce Programming			
Unit – III	**MongoDB**	Periods	**9**
Introduction to MongoDB - What is MongoDB? - Why MongoDB? - RDBMS and MongoDB - Data Types in MongoDB – MongoDB Query Language			
Unit - IV	**Cassandra and Hive**	Periods	**9**
Introduction to Cassandra - Features of Cassandra - CQL Data Types – CQLSH – Key spaces - CRUD – Collections – Alter - Import and Export – querying system tables Hive Architecture - Hive Data Types - Hive File Format - Hive Query Language- RCFILE Implementation –SERDE – User Defined Functions			
Unit – V	**Pig and Recent Trends**	Periods	**9**
Introduction to Pig - The Anatomy of Pig - Pig on Hadoop - Pig Latin Overview - Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational operators - Eval Function - Complex Data Type – User Defined Function - parameter Substitution - Diagnostic Operator - When to use Pig? -When NOT to use Pig? - Pig versus Hive - Reporting tool – Trends .			
		Total Periods	**45**
Text Books:			
1	Seema Acharya and Subhashini C, “Big Data and Analytics”, Wiley India, 2nd edition 2019.		
REFERENCE BOOKS			
1	Judith Hurwitz, Alan Nugent,Fern Halper, Marcia Kaufman, “Big data for dummies”, Wiley, 2013.		
2	Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.		
E-Resources			
1	https://www.w3schools.com/mongodb/		
2	https://www.techtarget.com/searchdatamanagement/definition/MongoDB		
3	https://www.tutorialspoint.com/cassandra/cassandra_introduction.htm		
4	https://hive.apache.org/		

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

Programme	**M.E. /M.Tech**	ProgrammeCode		Regulation	**2023**
Department	**CSE & IT**			Semester	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23ITE03	**Social Network Analysis***	3	0	0	3	40	60	100

Course Objective

The student should be made to,

- Understand the component of Social Networks.
- Model and Aggregate social Networks.
- Mine the users in Social Networks
- Understand human behavior in social web and related communities.
- Know the applications in real time systems

Course Outcome

At the end of the course, the student should be able to,	Knowledge Level
CO1:Distinguish WWW from semantic web	K2
CO2: Discover the knowledge , Model and Aggregate using ontology.	K2
CO3: Identify the mining communities in social networks.	K2
CO4:Predict human behavior in social web and related to Privacy Issues	K3
CO5:Apply representation techniques for visualizing social networks.	K2

Pre-requisites: Data Mining and Data Warehousing

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	PO11	PO12	PSO1	PSO 2
CO 1	2	2	1										2	2
CO 2	3	2	1	1		1							3	3
CO 3	2	2	3										3	3
CO 4	2	2	3										2	2
CO 5	3	2	2	1		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

Content of the syllabus

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

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

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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**
Aggregating and reasoning with social network data, advanced Representations -Extracting evolution of Web Community from a Series of Web Archive - 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			
Unit - IV	**PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES**	Periods	**9**
Understanding and predicting human behavior 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**
Visualizing online social networks – A Taxonomy of Visualization -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 – Random Walks and their applications- Community welfare.			
		Total Periods	**45**

Text Books:	
1.	GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
2.	Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
3.	BorkoFurht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.
REFERENCE BOOKS	
1.	Stanley Wasserman, "Social Network Analysis Methods and Applications", Cambridge University Press,June 2012.
2.	Max Chevalier, Christine Julien and Chantal Soule-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modeling", IGI Global Snippet, 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: An approach and technique for the study of information exchange - Science Direct

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Elayampalayam, Tiruchengode – 637 205

Programme	**M.Tech.**	Programme Code		**204**	Regulation	**2023**		
Department	**INFORMATION TECHNOLOGY**				Semester			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23ITE04	**Pattern Recognition**	3	0	0	3	40	60	100

Course Objective

The Main Objective of the course is to

- To learn about supervised and unsupervised pattern classifiers.
- To familiarize about different feature extraction techniques.
- To explore the role of Hidden Marko model and SVM in pattern recognition.
- To understand the application of Fuzzy logic and genetic algorithms for pattern classifier

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Differentiate between supervised and unsupervised classifiers	K2
	CO2: Classify the data and identify the patterns	K2
	CO3: Extract feature set and select the features from given data set	K3
	CO4: Apply fuzzy logic and genetic algorithms for classification problems	K2
	CO5: Apply pattern Classifiers and Recognition model using Recent advances	K3

Pre-requisites Machine Learning

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**	**P011**	**PO12**	**PSO1**	**PSO 2**
CO 1	3	3	1	1		1		1					3	2
CO 2	3	3	2	1		-							3	2
CO 3	3	2	1		3								3	2
CO 4	3	2	1		1								3	2
CO 5	3	2	1	1		2	1	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

Unit – I	**PATTERN CLASSIFIER**	Periods	**9**

Overview of Pattern recognition – Discriminant functions – Supervised learning – Parametric estimation –

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Maximum Likelihood Estimation – Bayesian parameter Estimation – Problems with Bayes approach– Pattern classification by distance functions – Minimum distance pattern classifier.			
Unit - II	**CLUSTERING**	Periods	**9**
Clustering for unsupervised learning and classification–Clustering concept – C Means algorithm – Hierarchical clustering – Graph theoretic approach to pattern Clustering – Validity of Clusters.			
Unit – III	**FEATURE EXTRACTION AND STRUCTURAL PATTERN**	Periods	**9**
Principle component analysis, Independent component analysis, Linear discriminant analysis, Feature selection through functional approximation – Elements of formal grammars, Syntactic description – Stochastic grammars – Structural Representation.			
Unit - IV	**HIDDEN MARKOV MODELS AND SUPPORT VECTOR MACHINE**	Periods	**9**
State Machines – Hidden Markov Models – Training – Classification – Support vector Machine – Feature Selection.			
Unit – V	**RECENT ADVANCES**	Periods	**9**
Fuzzy logic – Fuzzy Pattern Classifiers – Pattern Classification using Genetic Algorithms – Case Study Using Fuzzy Pattern Classifiers and Perception.			
		Total Periods	**45**

REFERENCE BOOKS

1.	Foundations of Machine Learning, by Mohri, Mehryar, Afshin Rostamizadeh, and Ameet Talwalkar (2018).
2.	Trevor H, Robert T,Jerome Friedman, The Elements of Statistical Learning, Springer Series,2017
3.	Jürgen Beyerer ,Pattern Recognition: Introduction, Features, Classifiers and Principles , 2017
4.	Christopher M Bishop, Pattern Recognition and Machine Learning. Springer. 2011
5.	M. Narasimha Murthy and V. Susheela Devi, “Pattern Recognition”, Springer 2011.
6.	Pattern Classification, 2nd Edition, by Richard O. Duda, Peter E. Hart, and David G. Stork (DHS)
7.	Understanding Machine Learning: from theory to algorithms, by Shai Shalev-Shwartz and Shai BenDavid

E-Resources

1.	https://www.v7labs.com/blog/pattern-recognition-guide
2.	https://onlinecourses.nptel.ac.in/noc21_ee79/preview

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.Tech.**	Programme Code			**204**	Regulation	**2023**	
Department	**INFORMATION TECHNOLOGY**					Semester		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23ITE05	**Cryptocurrency Fundamentals**	3	0	0	3	40	60	100

Course Objective	The Main Objective of the course is to • Understand the technology components of blockchain-based digital currencies, cryptographic functions and hashes, the process of currency issuance and mining, proof-of-work, consensus and distributed ledger technology. • Understand alternatives to bitcoin, such as alt-coins, Ethereum and Bitcoin Cash. • Understand what parallels and differences cryptocurrencies have with the existing monetary and banking systems. • Understand likely frameworks for regulating cryptocurrencies, challenges with current regulatory landscape. • Be able to place cryptocurrencies in the context of disruptive innovations and understand their potential for growth or development.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Learn about Blockchain and explore the working of Blockchain technology	K2
	CO2: Understand the working of Bitcoin and cryptocurrency	K2
	CO3: Understand and analye the working of Hyperledger	K2, K4
	CO4: Apply the learning of solidity to build de-centralized apps on Ethereum and analyze the working of Smart Contracts	K3, K4
	CO5: Develop applications on Blockchain	K6
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	1			1							2	2
CO 2	3	2	1	1		-							2	2
CO 3	2	2	1		3								2	2
CO 4	2	2	3	2	1								2	2
CO 5	3	2	2	1		2	1		2				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	**Introduction of Cryptography and Blockchain**	Periods	**9**
Introduction to Blockchain- Blockchain Technology Mechanisms & Networks- Blockchain Origins- Objective of Blockchain- Blockchain Challenges- Transactions and Blocks- P2P Systems- Keys as Identity- Digital Signatures- Hashing, and public key cryptosystems- private vs. public Blockchain.			
Unit - II	**Bitcoin and Cryptocurrency**	Periods	**9**
Introduction to Bitcoin- The Bitcoin Network- The Bitcoin Mining Process- Mining Developments- Bitcoin Wallets- Decentralization and Hard Forks- Ethereum Virtual Machine (EVM)- Merkle Tree- Double-Spend Problem- Blockchain and Digital Currency- Transactional Blocks- Impact of Blockchain Technology on Cryptocurrency.			
Unit – III	**Introduction to Ethereum**	Periods	**9**
Introduction to Ethereum- Consensus Mechanisms- Meta mask Setup- Ethereum Accounts- Transactions- Receiving Ethers- Smart Contracts.			
Unit - IV	**Introduction to Hyperledger and Solidity Programming**	Periods	**10**
Introduction to Hyperledger - Distributed Ledger Technology & its Challenges - Hyperledger & Distributed Ledger Technology - Hyperledger Fabric - Hyperledger Composer- Solidity - Language of Smart Contracts - Installing Solidity & Ethereum Wallet - Basics of Solidity - Layout of a Solidity Source File & Structure of Smart Contracts- General Value Types.			
Unit – V	**Blockchain Applications**	Periods	**8**
Internet of Things- Medical Record Management System- Real estate-Financial and Banking-Supply chain and logistics- Voting machine and governance-Media and advertising-Domain Name Service and Future of Blockchain- Alt Coins.			
		Total Periods	**45**

Text Books:	
1.	Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.
2.	Antonopoulos and G. Wood, "Mastering Ethereum: Building Smart Contracts and Dapps", O'Reilly Publishing, 2018.
REFERENCE BOOKS	
1.	Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" Princeton University Press, 2016.
2.	Antonopoulos, Mastering Bitcoin, O'Reilly Publishing, 2014.
E-Resources	
1	https://www.slideshare.net/jesusmrv/fundamental-analysis-for-crypto-assets
2	https://www.google.co.in/books/edition/Mastering_Blockchain/3ZlUDwAAQBAJ?hl=en&gbpv1
3	https://www.slideteam.net/cryptocurrency-powerpoint-presentation-slides.html

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PROFESSIONAL ELECTIVE - II

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637205							
Programme	**M.E. M.Tech.**	Programme code		Regulation	**2023**			
Department	**CSE & IT**			Semester				
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23CSE16	**Deep Learning Techniques**	3	0	0	3	40	60	100

Course Objective	**The student should be made to,** • Understand the concepts of Neural Networks and Deep Learning • Understand Deep Neural network and layered learning approach • Study and understand CNN and RNN for deep learning • Learn and understand Autoencoders and its applications • Understand concept of transfer learning and its applications with keras	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Apply basic mathematical concepts in Deep Learning.	K1
	CO2: Work with powerful framework for supervised learning.	K2
	CO3: Deal with convolution Neural Networks.	K3
	CO4: Analyze various type efficient data encoders.	K3
	CO5: Apply various network models in deep learning.	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**	**PSO2**
CO 1	3	3	2	2	2	1	-	-	1	3	1		3	2
CO 2	3	2	3	2	2	2	-	-	1	2	1		3	2
CO 3	3	2	3	3	1	2	-	-	1	3	1		3	2
CO 4	3	3	3	2	1	2	-	-	-	2	1		2	1
CO 5	3	3	3	2	1	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

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Content of the syllabus			
Unit– I	**INTRODUCTION TO DEEPLEARNING**	Periods	**9**
Deep Learning Models – Single Layer Perceptron Model – Multilayer Perceptron Model – Convolutional Neural Networks – Recurrent Neural Network – Restricted Boltzmann Machines – Deep Belief Networks – FeatureSelection–AppliedMachineLearningandDeepLearning–HistoryofDeepLearning-StatisticalConcepts– Linear Algebra.			
Unit-II	**OPTIMIZATION AND MACHINE LEARNING**	Periods	**9**
Unconstrained Optimization–Neighborhoods–Supervised Learning–Regression Models–Learning rate–Test for Multicollinearity–Unsupervised Learning–Expectation Maximization Algorithm–Decision Tree Learning – Gradient Boosting –Random Forest –Bayesian Learning.			
Unit – III	**SINGLE AND MULTI LAYER PERCEPTRON MODELS**	Periods	**9**
Single Layer Perceptron Model–Training–Widrow Hoff Algorithm– Limitations – Statistics– Multilayer Perceptron Model–Converging upon a Global Optimum–Back propagation Algorithm for MLP Models– Limitation and consideration for MLP Models–Use of hidden layer and neurons.			
Unit–IV	**CNNs AND RNNs**	Periods	**9**
Convolutional Neural Networks: Structure & Properties–Components–Tuning parameters–CNN Architectures – Regularization – Recurrent Neural Networks: Fully Recurrent Networks – Training RNN with BPPT–Elman Neural Networks– History Compressor–Long Short Term Memory–Training LSTM–Structural Damping within RNNs.			
Unit–V	**OTHER DEEP LEARNING MODELS**	Periods	**9**
Autoencoders – Restricted Boltzmann Machine – Contrastive Divergence Learning –Momentum within RBMs – Weight Decay – Sparsity – Deep Belief Networks – Fast Learning Algorithm – Analysis of Variance – Fisher Principles–Feature/Variable Selection Techniques–Handling Categorical Data–Local Search Methods– Reactive Search Optimization.			
		Total Periods	**45**

References

1.	IanGood fellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MITPress, 2016.
2.	Taweh Beysolow II, “Introduction to Deep Learning using R ”,Apress,Springer,2017.
3.	Jason Brownlee, “Deep Learning with Python”,ebook,2016
4.	Nikhil Buduma, “Fundamentals of Deep Learning”,OReilly,2017
5.	Kevin P.Murphy, “Machine Learning: A Probabilistic Perspective”,MITPress,2012

E-Resources

1.	http://neuralnetworksanddeeplearning.com/chap1.html
2.	https://towardsdatascience.com/introducing-deep-learning-and-neural-networks-deep-learning-for-rookies-1-bd68f9cf5883
3.	https://www.sciencedirect.com/science/article/abs/pii/S0893608014002135

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	VIVEKANANDHACOLLEGEOF ENGINEERINGFOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode– 637205						
Programme	**M.E. / M.Tech.**	Programme code		Regulation	**2023**		
Department	**CSE & IT**			Semester			
Course Code	**Course Name**	Periods per week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
P23CSE19	**Information Security**	3	0	0	3	40	60	100

Course Objective	**The student should be made to,** • provide an understanding of principal concepts, major issues, technologies, and basic approaches in information security. • Master the key concepts of information security and how they "work." • Develop a "security mindset:" learn how to critically analyze situations of computer and network usage from a security perspective, identifying the salient issues, viewpoints, and trade-offs. • provide the ability to examine and analyze real-life security cases.	
Course Outcome	At the end of the course, the student should be able to,	**KL**
	CO1: Evaluate vulnerability of an information system and establish a plan for risk management.	K2
	CO2: Demonstrate basic principles of Web application security	K4
	CO3: Evaluate the authentication and encryption needs of an information system.	K2
	CO4: Demonstrate how to secure a network.	K3
	CO5: Evaluate a company's security policies and procedures	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**	**PO10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO 1	3	3	2	2	2	2	-	-	-	2	-		3	2
CO 2	3	3	2	2	2	2	-	-	-	2	-		3	2
CO 3	3	3	2	2	2	2	-	-	-	2	-		3	2
CO 4	3	3	2	2	2	2	-	-	-	2	-		3	2
CO 5	3	3	2	2	2	2	-	-	-	2	-		3	2

Course Assessment Methods

Direct

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

Indirect

1.Course - end survey

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Content of the syllabus			
Unit -I	**INTRODUCTION TO SOFTWARE SECURITY**	Periods	**9**
Introduction: Security mindset, Computer Security Concepts (CIA), Threats, Attacks, and Assets. Vulnerabilities and protections, malware, program analysis			
Unit–II	**PRACTICAL CRYPTOGRAPHY**	Periods	**9**
Encryption, authentication, hashing, symmetric and asymmetric cryptography, Digital Signatures and Certificates			
Unit – III	**NETWORK SECURITY**	Periods	**9**
Network security issues, Sniffing, IP spoofing, Common threats, E-Mail security, IPSec, SSL, PGP, Intruders, Virus, Worms, Firewalls-need and features of firewall, Types of firewall, Intruder Detection Systems.			
Unit– IV	**CYBER SECURITY**	Periods	**9**
Cyber Crime and security, Security tools, Introduction to Digital Forensic, OS fingerprinting, TCP/IP stack masking, Social Engineering			
Unit-V	**APPLICATIONS AND SPECIAL TOPICS**	Periods	**9**
Web application Security, Privacy and Anonymity, public policy			
		Total Periods	**45**

References	
1.	Computer Security: Principles and Practice, William Stallings; Lawrie Brown
2.	Cryptography and Network Security: Principles and Practice, 7th Edition, by William Stallings published by Pearson Education 2017.

E-Resources	
1.	https://www.cryptomathic.com/
2.	https://www.tutorialspoint.com/
3.	onlinecourses.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	**M.E. / M.Tech.**	Programme code			Regulation	**2023**		
Department	**CSE & IT**				Semester			
Course code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23CSE24	**Mining Massive Datasets***	3	0	0	3	40	60	100
Course Objective	The student should be made to, • Managing immense amounts of data quickly using MapReduce. • Examining data for similar items. • Efficient mining of data streams. • Analyzing large-scale data derived from social-networks. • Online advertising and Recommender systems							
Course Outcome	At the end of the course, the student should be able to,							**KL**
	CO1: Use Map Reduce to handle large amount of data.							K2
	CO2: Analyze similarity problem as finding sets with large intersection and also to test the degree of similarity among data.							K4
	CO3: Summarize data streams, filter it and efficiently store it for future use.							K3
	CO4: Identify communities, similarity among nodes of a graph, measure the connectedness of community, and measure the neighborhood size of nodes in a graph.							K2
	CO5: Use algorithms to address issues like matching problems and ad words problem.							K2
Pre-requisites	Data Warehousing and Data Mining							

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

Course Assessment Methods

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

Content of the syllabus

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Unit - I	INTRODUCTION TO DATA WAREHOUSING	Periods	9
Introduction to Data Mining - Statistical limits on data mining - Introduction to Distributed File Systems- MapReduce - Algorithms using MapReduce - Communication cost model - Complexity Theory for MapReduce.			
Unit - II	**SIMILARITY SEARCH**	Periods	**9**
Similarity Search - Applications of nearest - neighbour search - Shingling of Documents – Similarity - preserving summaries of sets - Locality - Sensitivity hashing for documents - Distance measures - Theory of locality-Sensitive functions - Applications - Methods for high degrees of similarity.			
Unit - III	**MINING DATA STREAMS AND LINK ANALYSIS**	Periods	**9**
Mining Data streams - Stream data model - Sampling data in a Stream - Filtering streams - Counting distinct elements in a stream- Estimating moments - Link analysis – Page rank - Efficient computation of Page rank - Topic-sensitive page rank - Link spam - Hubs and Authorities.			
Unit - IV	**MINING SOCIAL NETWORKS**	Periods	**9**
Social networks as graphs - Clustering of social-network graphs - Direct discovery of communities - Partitioning of graphs - Finding overlapping communities - Simrank – Counting triangles - Neighborhood properties of graphs.			
Unit - V	**ONLINE ADVERTISING AND RECOMMENDATION SYSTEMS**	Periods	**9**
Advertising on Web: Issues- Online Algorithms- Matching Problems - Adwords Problem - Implementation – Recommendation Systems: Model – Content based Recommendation- Collaborative Filtering-Dimensionality Reduction.			
		Total Periods	**45**

References

1.	Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, "Mining of massive Datasets", Cambridge University Press, 2014.
2.	Jimmy Lin, Chris Dyer, “Data-Intensive Text Processing with Map Reduce”, Cambridge University Press, 2013.
3.	James Abello, Panos M. Pardalos, Mauricio G. C. Resende (editors), “Handbook of Massive Data Sets”, Kluwer Academic Publishers, 2002.
4.	Lei Tang, Huan Liu, “Community Detection and Mining in Social Media”, Morgan & Claypool Publishers, 2010.

E-Resources

1.	https://en.wikipedia.org/wiki/Data_stream_mining
2.	https://www.digitalvidya.com/blog/introduction-to-data-warehousing/
3.	http://infolab.stanford.edu/~ullman/mmds/book.pdf

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

Programme	**M.E./M.Tech.**	Programme Code			Regulation	**2023**		
Department	**CSE & IT**				Semester			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23ITE06	**GPU Computing***	3	0	0	3	40	60	100

Course Objective

The Main Objective of the course is to
- Study architecture and capabilities of modern GPUs
- Learn programming techniques for the GPU such as CUDA programming model.
- Develop solutions for problems in various fields.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand GPU computing architecture.	K1
	CO2: Develop programs using CUDA programming	K3
	CO3: Understand the CUDA memories.	K2
	CO4: Implement algorithms efficiently for common application kernels.	K4
	CO5: Develop solutions to solve computationally intensive problems in various fields	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**	**PO11**	**PO12**	**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

Unit – I	**History of GPU Computing**	Periods	**11**

Evolution of Graphics Pipelines, The Era of Fixed-Function Graphics Pipelines, Evolution of Programmable Real-Time Graphics, Unified Graphics and Computing Processors, GPGPU, Scalable GPUs, Recent Developments, Future Trends.

Unit – II	**Introduction to Data Parallelism and CUDA C**	Periods	**9**

Data Parallelism, CUDA Program Structure, A Vector Addition Kernel, Device Global Memory and Data Transfer,

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Kernel Functions and Threading. **Data-Parallel Execution Model:** CUDA Thread Organization, Mapping Threads to Multidimensional Data, Matrix-Matrix Multiplication—A More Complex Kernel, Synchronization and Transparent Scalability, Assigning Resources to Blocks, Thread Scheduling and Latency Tolerance.			
Unit – III	**CUDA Memories**	Periods	**11**
Importance of Memory Access Efficiency, CUDA Device Memory Types, A Tiled Matrix – À Matrix Multiplication Kernel, Memory as a Limiting Factor to Parallelism.			
Unit - IV	**Streams**	Periods	**9**
Support: Debugging GPU Programs. Profiling, Profile tools, Performance aspects Streams: Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based-Synchronization - Overlapping data transfer and kernel execution, pitfalls.			
Unit – V	**OpenCL & Case Studies**	Periods	**5**
An Introduction to OpenCL: Data Parallelism Model, Device Architecture, Kernel Functions, Device Management and Kernel Launch, Electrostatic Potential Map in OpenCL. **Case Studies:** Image Processing, Graph algorithms, Simulations, Deep Learning			
		Total Periods	**45**

Text Books:	
1.	Programming Massively Parallel Processors: A Hands-on Approach; David Kirk, Wen-mei Hwu; Morgan Kaufman; 2010 (ISBN: 978-0123814722)
2.	CUDA Programming: A Developer's Guide to Parallel Computing with GPUs; Shane Cook; Morgan Kaufman; 2012 (ISBN: 978-0124159334)
REFERENCE BOOKS	
1.	Nicholas Wilt, CUDA Handbook: A Comprehensive Guide to GPU Programming, Addison – Wesley, 2013
2.	Edward Kandrot, CUDA by Example: An Introduction to General Purpose GPU Programming, Addison – Wesley, 2010.
E-Resources	
1.	https://www.intechopen.com/chapters/54968

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

Programme	**M.Tech.**	Programme code	**204**	Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**			Semester	

Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23ITE07	**Ethical Hacking**	3	0	0	3	40	60	100

Course Objective

- To understand and analyze security threats & countermeasures related to ethical hacking.
- To learn the different levels of vulnerabilities at a system level.
- To learn the different levels of vulnerabilities at a system level.
- To gain knowledge on the different hacking methods for web services and session hijacking.
- To understand the hacking mechanisms on how a wireless network is hacked.

Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1:Understand vulnerabilities, mechanisms to identify vulnerabilities/threats/attacks	K1
	CO2: Use tools to identify vulnerable entry points	K2
	CO3: Identify vulnerabilities using sniffers at different layers	K3
	CO4: Handle web application vulnerabilities	K3
	CO5: Identify attacks in wireless networks	K3

Pre-requisites: Networks, Operating Systems, Database and Web Technology

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**	**PO11**	**PO12**	**PSO1**	**PSO 2**
CO 1	3	2	3	3	3	3						1	2	2
CO 2	2	2	-	3	3	3						1	2	2
CO 3	3	2	2	3	3	3						1	2	2
CO 4	3	-	2	2	2	2						1	2	2
CO 5	3	2	2	3	3	3						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	**ETHICAL HACKING OVERVIEW & VULNERABILITIES**	Periods	**9**
Understanding the importance of security, Concept of ethical hacking and essential TerminologiesThreat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking			
Unit – II	**FOOTPRINTING & PORT SCANNING**	Periods	**9**
Footprinting - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase, Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS			
Unit – III	**SYSTEM HACKING**	Periods	**9**
Aspect of remote password guessing, Role of eavesdropping ,Various methods of password cracking, Keystroke Loggers, Understanding Sniffers ,Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing.			
Unit – IV	**HACKING WEB SERVICES & SESSION HIJACKING**	Periods	**9**
Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers. Understanding Session Hijacking, Phases involved in Session Hijacking,Types of Session Hijacking, Session Hijacking Tools			
Unit – V	**HACKING WIRELESS NETWORKS**	Periods	**9**
Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLANScanners, WLANSniffers,HackingTools,Securing Wireless Network			
		Total Periods	**45**
Text Books			
1.	Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010		
2.	Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010		
References			
1.	RajatKhare, "Network Security and Ethical Hacking", Luniver Press, 2006		
2.	Ramachandran V, "BackTrack 5 Wireless Penetration Testing Beginner's Guide (3rd ed.)." Packt Publishing, 2011		
3	Thomas Mathew, "Ethical Hacking", OSB publishers, 2003		
4	Matthew Hickey, Jennifer Arcuri, "Hands on Hacking: Become an Expert at Next Gen Penetration Testing and Purple Teaming", 1st Edition, Wiley, 2020		
5	Jon Ericson, Hacking: The Art of Exploitation, 2nd Edition, NoStarch Press, 2008.		
E-Resources			
1.	https://github.com/Samsar4/Ethical-Hacking-Labs/blob/master/3-Enumeration/3-Enum4linux-Win-and-Samba-Enumeration.md		
2.	https://www.techtarget.com/searchsecurity/definition/password-cracker		
3.	https://www.cisa.gov/news-events/news/securing-wireless-networks		

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PROFESSIONAL ELECTIVE – III

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.Tech.**	Programme code	**204**	Regulation	**2023**			
Department	**INFORMATION TECHNOLOGY**	Semester						
Course Code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23ITE08	**Data Science**	3	0	0	3	4 0	60	100

Course Objective	The student should be made to, • Building the fundamentals of data science. • Imparting design thinking capability to build big-data • Developing design skills of models for big data problems • Gaining practical experience in programming tools for data sciences • Empowering students with tools and techniques used in data science	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Make use of data science principles when developing applications	K2
	CO2: Apply machine learning methods to solve problems with large data	K2
	CO3: Experiment with Hadoop ,Spark platform and data streams for data science applications	K2
	CO4: Apply the data science process to solve real world problem Using NoSQL database and Graph database	K3
	CO5: Make use of text analytics and data visualization techniques for building solutions for Text mining and visualization problem.	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**	**PO11**	**PO12**	**PSO1**	**PSO 2**
CO 1	3	2	1										3	2
CO 2	3	2	1										3	2
CO 3	3	2	1										3	2
CO 4	3	2	1										3	2
CO 5	3	2	1										3	2

Course Assessment Methods

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

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1. Course - end survey			
Content of the syllabus			
UNIT I	**INTRODUCTION TO DATA SCIENCE**	Periods	**9**
Benefits of Data Science – Facets of Data – Data Science Process –Big Data Ecosystem and Data Science– Example using Hadoop. The Data Science Process: Overview – Defining Research Goals – Retrieving Data– Data Preparation–Exploratory Data Analysis–Building Models–Building Applications.			
Unit - II	**MACHINE LEARNING AND HANDLING BIG DATA**	Periods	**9**
Applications for Machine Learning in Data Science – Machine Learning in Data Science Process – The Modeling Process. Handling Large Data: Problems in Handling Large Data–General Techniques–Programming Tips – Case Studies: Predicting malicious URLs - Buliding a recommender system inside a database.			
Unit – III	**DATA STORAGE, PROCESSING AND DATA STREAMS**	Periods	**9**
Distributing Data Storage and Processing with Frameworks: Hadoop –Spark–CaseStudy:Assessing Risk with Loaning Money. **Data Streams:** Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream.			
Unit – IV	**NoSQL and GRAPH DATABASES**	Periods	**9**
NoSQL: Introduction: ACID–CAP Theorem–The BASE Principles of NoSQL Databases NoSQL Database Types–Case Study: What disease is that? **Graph Database:** Introducing Connected Data and Graph Databases – Connected Data Example: A recipe recommendation engine –Case Study : Real Time Sentiment Analysis.			
Unit – V	**TEXT MINING AND DATA VISUALIZATION**	Periods	**9**
Test Mining in Real World–Text Mining Techniques: Bag of Words–Stemming and Lemmatization – Decision Tree Classifier – Case Study: Classifying Reddit Posts. **Data visualization:** Data visualization options - Cross filter, the JavaScript Map Reduce library - Creating an interactive dashboard with dc.js - Dashboard development tools.			
		Total Periods	**45**
Text Books			
1.	Davy Cielen, Arno D. B. Meysman, Mohamed Ali,"Introducing Data Science – Big Data, MachineLearning and more, Using PythonTools", Firstedition,Manning Publications,2016		
2.	Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets" , Cambridge University Press,2012.		
References			
1.	"Data Science and Big data Analytics: Discovering, Analyzing, Visualizing and Presenting Data"-http://education.EMC.com/academicalliance. Kindle, EMC Education Services,2015.		
2	JoelGrus,"Data Science from the Scratch", Second edition, O"Reilly,2019		
E-Resources			
1.	https://www.datacamp.com/		
2.	https://www.udacity.com/		
3.	https://owasp.org/		

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.E. / M.Tech.**	Programme code			Regulation	**2023**		
Department	**CSE & IT**			Semester				
Course Code	Course name	Periods per week			Credit	Maximum Marks		
P23ITE09	**Computer Vision***	L	T	P	C	CA	ESE	Total
		3	0	0	3	40	60	100

Course Objective	The Main Objective of the course is to • To review image processing techniques for computer vision. • To understand shape and region analysis. • To understand Hough Transform and its applications to detect lines, circles, ellipses. • To understand three-dimensional image analysis techniques. • To understand motion analysis.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Implement fundamental image processing techniques required for computer vision	K2
	CO2: Perform shape analysis and Implement boundary tracking techniques	K2
	CO3: Apply Hough Transform for line, circle, and ellipse detections.	K3
	CO4: Apply 3D vision techniques.	K3
	CO5: Develop applications using computer vision techniques.	K3
Pre-requisites	Programming Knowledge	

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	3										2	2
CO 2	2	2	2										2	2
CO 3	3	2	2										2	2
CO 4	3	2	2										2	2
CO 5	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	**IMAGE PROCESSING FOUNDATIONS**	Periods	**9**
Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture			
Unit – II	**SHAPES AND REGIONS**	Periods	**9**
Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments			
Unit – III	**HOUGH TRANSFORM**	Periods	**9**
Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform			
Unit – IV	**3D VISION AND MOTION**	Periods	**9**
Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.			
Unit – V	**APPLICATIONS**	Periods	**9**
Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.			
		Total Periods	**45**
Text Books			
1.	"Computer Vision: Algorithms and Applications", Richard Szeliski, Second Edition, 2021		
2.	D. L. Baggio et al., Mastering OpenCV with Practical Computer Vision Projects‖, Packt Publishing, 2012.		
References			
1	E. R. Davies, Computer & Machine Vision‖, Fourth Edition, Academic Press,2012.		
2	Jan Erik Solem, Programming Computer Vision with Python: Tools and algorithms for analyzing images‖, O'Reilly Media, 2012.		
E-Resources			
1.	https://www.slideshare.net/mohamedrajah/computer-vision-11687562		
2.	https://slideplayer.com/slide/6218949/		

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205						
Programme	**M.Tech.**	Programme code	**204**	Regulation	**2023**		
Department	**INFORMATION TECHNOLOGY**	Semester					
Course Code	Course name	Periods per week			Credit	Maximum Marks	
P23ITE10	**Digital Image Processing and Applications**	L	T	P	C	CA	ESE	Total
		3	0	0	3	40	60	100

Course Objective	The student should be made to, • Understand the image fundamentals and mathematical transforms necessary for image processing and to study the image enhancementtechniques. • Understand the image segmentation and representation techniques. • Understand how image are analyzed to extract features of interest. • Learn the concepts of image registration and image fusion. • Analyze the constraints in image processing when dealing with 3D datasets.	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Understand the image fundamentals and mathematical transforms necessary for image processing and to study the image enhancement techniques.	K2
	CO2: Understand the image segmentation and representation techniques.	K2
	CO3: Design and implement how image are analyzed to extract featuresof interest.	K3
	CO4: Understand the concepts of image registration and image fusion.	K2
	CO5: Analyze the constraints in image processing when dealing with 3Ddata sets.	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	-	1	2			1	2			2	1
CO 2	2	1	-	3	1	1			1	1			2	-
CO 3	2	2	1	2	-	1		2	-	1			1	2
CO 4	1	-	2	-	2	3			1	-			-	1
CO 5	3	2	1	2	-	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	**9**
Need for DIP- Fundamental steps in DIP – Elements of visual perception -Image sensing and Acquisition – Image Sampling and Quantization – Imaging geometry, discrete image mathematical characterization.			
Unit - II	**IMAGE TRANSFORMS, ENHANCEMENT AND RESTORATION**	Periods	**9**
Two dimensional Fourier Transform- Properties – Fast Fourier Transform – Inverse FFT,Discrete cosine transform and KL transform.-Discrete Short time Fourier Transform- Wavelet Transform- Discrete wavelet Transform- and its application in Compression. Spatial Domain: Basic relationship between pixels- Basic Gray level Transformations – Histogram Processing – Smoothing spatial filters. Frequency Domain: Smoothing frequency domain filters- sharpening frequency domain filters Homomorphic filtering.			
Unit – III	**FEATURE EXTRACTION**	Periods	**9**
Detection of discontinuities – Edge linking and Boundary detection- Thresholding- -Edge based segmentation- Region based Segmentation- matching-Advanced optimal border and surface detection- Use of motion in segmentation. Image Morphology – Boundary descriptors- Regional descriptors.			
Unit – IV	**REGISTRATION**	Periods	**9**
Registration – Preprocessing – Feature selection – Points – Lines – Regions and templates Feature correspondence – Point pattern matching – Line matching – Region matching Template matching – Transformation functions – Similarity transformation and Affine Transformation – Resampling – Nearest Neighbour and Cubic Splines Image Fusion			
Unit – V	**3D IMAGE VISUALIZATION AND DIP APPLICATIONS**	Periods	**9**
Sources of 3D Data sets – Slicing the Data set – Arbitrary section planes – The use of color – Volumetric display – Stereo Viewing – Ray tracing – Reflection – Surfaces – Multiply connected surfaces – Image processing in 3D. **Medical Image Processing:** a.X-ray computed tomography (CT) Image formation model, Radon transform, Fourier slice theorem, image reconstruction techniques. b. MRI (Magnetic Resonance Imaging): image formation model, aliasing and unaliasing in parallel MRI.			
		Total Periods	**45**
Text Books			
1.	Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Pearsoneducation, 3rd Edition,2010.		
2.	A. K. Jain, “Fundamentals of digital image processing”, Prentice Hall of India,2002.		
References			
1.	John C.Russ, “The Image Processing Handbook”, CRC Press, 2007.		
2.	Mark Nixon, Alberto Aguado, “Feature Extraction and Image Processing”, Academic Press,2008.		
3.	ArdeshirGoshtasby, “ 2D and 3D Image registration for Medical, RemoteSensing and Industrial Applications”, John Wiley and Sons,2005.		
E-Resources			
1.	http://www.eie.polyu.edu.hk/~enyhchan/imagef.pdf		
2.	http://www.cs.bgu.ac.il/~klara/ATCS111/gonzales_10.1_10.2.pdf		
3.	http://www.lsv.uni-saarland.de/dsp_ss05_chap8.pdf		

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205						
Programme	**M.Tech.**	Programme code	**204**	Regulation	**2023**		
Department	**INFORMATION TECHNOLOGY**		Semester				
Course Code	Course name	Periods per week	Credit	Maximum Marks			
P23ITE11	**Information Theory and Coding Techniques**	L	T	P	C	CA	ESE	Total
		3	0	0	3	40	60	100

Course Objective	The Main Objective of the course is to • understand the role of information theory for an efficient, error-free and secure delivery of information using binary data streams • have a complete understanding of error-control coding. • understand encoding and decoding of digital data streams • introduce methods for the generation of these codes and their decoding techniques. • have a detailed knowledge of compression and decompression techniques	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: To be able to understand the principles behind an efficient, correct and secure transmission of digital data stream	K2
	CO2: To be familiar with the basics of error-coding techniques	K2
	CO3: To have knowledge about the encoding and decoding of digital data streams	K3
	CO4: Generation of codes and knowledge about compression and decompression techniques.	K2
	CO5: To be able to understand the performance requirements of various coding 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	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

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	**Source Coding**	Periods	**9**
Source Coding: Introduction to Information Theory, Uncertainty and Information, Average Mutual Information and Entropy, Information Measure for Continuous Random Variables, Source coding theorem, Huffman Coding, Shannon- Fano -Elias Coding, Arithmetic Coding, The Lempel-Ziv Algorithm, Run Length Encoding, and the PCX Format, Rate Distribution Function, Optimum Quantizer Design, Entropy Rate of a Stochastic Process			
Unit – II	**Channel Capacity and Coding**	Periods	**9**
Channel Capacity and Coding: Introduction, Channel Model, Channel Capacity, Channel Coding, Information Capacity Theorem, the Shannon Limit, Channel Capacity for MIMO System, Random Selection of Code. Error Control Coding (Channel Coding).			
Unit – III	**Linear Block Codes for Error Correction**	Periods	**9**
Linear Block Codes for Error Correction: Introduction to Error Correction Codes, Basic Definitions, Matrix Description of Linear Block Codes, Equivalent Codes, Parity Check Matrix, Decoding of Linear Block Code, Syndrome Decoding, Error Probability after Coding (Probability of Error Correction), Perfect Codes, Hamming Codes, Low Density Parity Check (LDPC) Codes, Optimal Linear Codes, Maximum Distance Separable (MDS) Codes, Bound on Minimum Distance, Space Time Block Codes.			
Unit – IV	**Cyclic Codes**	Periods	**9**
Cyclic Codes: Introduction to the Cyclic Codes, Polynomials, The Division Algorithm for Polynomials, A Method for Generating Cyclic Codes, Matrix Description of Cyclic Codes, Burst Error Correction, Fire Codes, Golay Codes, Cyclic Redundancy Check(CRC) Codes, Circuit Implementation of Cyclic Codes.			
Unit – V	**Bose Chaudhuri Hocquenghem (BCH) Codes**	Periods	**9**
Bose Chaudhuri Hocquenghem (BCH) Codes: introduction to the Codes, Primitive Elements, Minimal Polynomials, Generator Polynomials, in Terms of Minimal Polynomials, Some Examples if BCH Codes, Reed –Solomon Codes, Implementation of Reed –Solomon Encoders and Decoders, Performance of RS Codes Over Real Channels, Nested Codes.			
		Total Periods	**45**
Text Books			
1.	R. Bose, “Information theory Coding and Cryptography,” 2nd Edition, McGraw-Hill, 2008.		
References			
1.	Arijit Saha, Nilotpal Manna, Surajit Mandal, Information Theory, Coding and cryptography, Pearson India, 2013.		
2.	Cover Thomas and Joy Thomas, Elements of Information Theory, Wiley India Pvt. Ltd. 2nd Edition, 2006		
3.	Salvatore Gravano, Introduction to error Control Codes, Oxford Univ. Press, 2017		
E-Resources			
1.	https://kanchiuniv.ac.in/coursematerials/Information_coding_theory.pdf		
2.	http://staff.ustc.edu.cn/~cgong821/Wiley.Interscience.Elements.of.Information.Theory.Jul.2006.eBook-DDU.pdf		

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution Affiliated to Anna University, Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.Tech.**	Programme code	**204**		Regulation	**2023**		
Department	**INFORMATION TECHNOLOGY**				Semester			
Course Code	Course name	Periods per week	Credit		Maximum Marks			
P23ITE12	**Digital and Cyber Forensics**	L	T	P	C	CA	ESE	Total
		3	0	0	3	40	60	100

Course Objective	The student should be made to, • Understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices. • Understand how to examine digital evidences such as the data acquisition, identification analysis. • Understand the tactics of military and terrorists. • Study the tools of identifying the hackers and theft. • Know about how to searching and seizing the computer related evidence	
Course Outcome	At the end of the course, the student should be able to,	Knowledge level
	CO1: Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.	K3
	CO2: Train as next-generation computer crime investigators.	K2
	CO3: Analyze how to reconstruct the past events an know the tactics of military, terrorist and company	K3
	CO4: Know how to apply Surveillance tools to identify the hackers and theft.	K3
	CO5: Identify searching and seizing the computer related evidence.	K4
Pre-requisites	Computer Networks	

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**	**PO12**	**PSO1**	**PSO 2**
CO 1	2	2			1	2		2					3	3
CO 2	2	1											2	1
CO 3	2	3	1			2	1						2	2
CO 4	3	2			1								3	3
CO 5		3	2										1	1

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	**FUNDAMENTALS OF COMPUTER FORENSICS**	Periods	**9**
Computer forensics fundamentals-Benefits of forensics-Types of Computer Forensics Technology – Types of Computer Forensics Systems – computer crimes- Vendor and Computer Forensics Services-computer forensics evidence and courts, legal concerns and private issues.			
Unit – II	**COMPUTER FORENSICS EVIDENCE AND CAPTURE**	Periods	**9**
Computer forensics evidence and capture: Data Recovery – Evidence Collection and Data Seizure-Duplication and Preservation of Digital Evidence-Computer Image Verification and Authentication. Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.			
Unit – III	**COMPUTER FORENSICS ANALYSIS**	Periods	**9**
Computer forensic analysis: Discover of Electronic Evidence Identification of Data – Reconstructing Past Events – Fighting against Macro Threats – Information Warfare Arsenal – Tactics of the Military – Tactics of Terrorist and Rogues – Tactics of Private Companies.			
Unit – IV	**INFORMATION WAREFARE**	Periods	**9**
Information warfare: Arsenal – Surveillance Tools – Hackers and Theft of Components – Contemporary Computer Crime-Identity Theft and Identity Fraud – Organized Crime &Terrorism – Avenues Prosecution and Government Efforts – Applying the First Amendment to Computer Related Crime-The Fourth Amendment and other Legal Issues.			
Unit – V	**COMPUTER FORENSICS CASES**	Periods	**9**
Computer forensic cases: Developing Forensic Capabilities – Searching and Seizing Computer Related Evidence Processing Evidence and Report Preparation – Future Issues-Case study			
		Total Periods	**45**
Text Books			
1.	John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Cengage Learning, 2nd Edition, 2005.		
2.	Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley,2002.		
3.	Marjie T Britz, "Computer Forensics and Cyber Crime: An Introduction", Pearson Education, 2nd Edition, 2008.		
References			
1.	Marie-Helen Maras, "Computer Forensics: Cybercriminals, Laws, and Evidence", Jones & Bartlett Learning; 2nd Edition, 2014.		
2.	Majid Yar, "Cybercrime and Society", SAGE Publications Ltd, Hardcover, 2nd Edition, 2013.		
E-Resources			
1.	https://www.geeksforgeeks.org/introduction-of-computer-forensics/		
2.	https://www.studocu.com/in/document/kannur-university/master-of-computer application/computer-forensic-complete-study-material/36741530		
3.	https://www.techtarget.com/searchsecurity/definition/computer-forensics		
4.	https://www.controlrisks.com/campaigns/compliance-and-investigations/five-case-studies-of-interest-to-corporate-investigators		
5.	https://eclipseforensics.com/3-famous-cases-solved-through-digital-forensics/		

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AUDIT COURSES

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

Programme	**M.E. / M.Tech.**	Programme Code		Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**			Semester	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC001	**Research Process and Methodologies**	2	0	0	0	100	-	100

Course Objective

The main objective of the course is

- To understand the importance of Research
- To acquire knowledge in Data Collection and Analysis
- To effectively write reports

Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1: Understand research problem types and data collection methods.	K2
	CO2: Understand research design methodologies	K2
	CO3: Analyze research related information	K4
	CO4: Follow research ethics	K2
	CO5: Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.	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	3	2									2	2
CO 2	3	3	3	2					2				2	2
CO 3	3	3	3	2					2				2	2
CO 4	3	3	3	2					2				2	2
CO 5	3	3	3	2									2	2

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

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Content of the syllabus			
Unit - I	**INTRODUCTION TO RESEARCH**	Periods	**9**
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research Meaning of Research - Types of Research - Research Process - Problem definition - Objectives of Research - Research design - Approaches to Research - Quantitative vs. Qualitative Approach - Research Methods versus Methodology - Research and Scientific Method - Research Process - Criteria of Good Research.			
Unit – II	**RESEARCH DESIGN**	Periods	**9**
Meaning of Research Design - Need for Research Design - Features of a Good Design - Important Concepts Relating to Research Design - Different Research Designs - Basic Principles of Experimental Designs.			
Unit – III	**DATA COLLECTION**	Periods	**9**
Data Collection: Collection of Primary Data - Observation Method - Interview Method - Collection of Data through Questionnaires - Collection of Data through Schedules - Difference between Questionnaires and Schedules - Collection of Secondary Data - Processing Operations - Elements/Types of Analysis - Statistics in Research.			
Unit – IV	**DATA ANALYSIS AND INTERPRETATION**	Periods	**9**
Data analysis - Statistical techniques and choosing an appropriate statistical technique - Hypothesis, Hypothesis testing - Data processing software (e.g. SPSS etc.) - statistical inference - Interpretation of results.			
Unit - V	**REPORT WRITING**	Periods	**9**
Types of research report: Dissertation and Thesis, research paper, review article, short communication, conference presentation etc., Referencing and referencing styles, Research Journals, Indexing and citation of Journals, Intellectual property, Plagiarism.			
		Total Periods	**45**

References	
1.	C. R. Kothari, "Research Methodology – Methods and Techniques", 2nd Edition, New Age International Publishers
2.	Bordens, K. S. and Abbott, B. B., "Research Design and Methods – A Process Approach", 8th Edition, McGraw-Hill, 2011
3.	Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
4.	Davis, M., Davis K., and Dunagan M., "Scientific Papers and Presentations", 3rd Edition, Elsevier Inc.

E-Resources	
1.	https://www.oreilly.com/library/view/research-methodology/9789353067090/
2.	https://bbamantra.com/research-methodology/

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

Programme	**M.E. / M.Tech .**	Programme Code		Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**			Semester	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC002	**Pedagogy Studies**	2	0	0	0	100	-	100

Course Objective

The main objective of the course is

- Understand the concept of programme design through evidences.
- Illustrate the practice of innovative teaching methodology.
- Analyze the method of teacher education.
- Enhance the infrastructure in the class room.
- Elaborate the directions of future research

Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1: Describe about the concept of programme design through evidences	K2
	CO2: Demonstrate the practice of innovative teaching methodology	K2
	CO3: Evaluate the method of teacher education	K4
	CO4: Examine the infrastructure in the class room	K3
	CO5: Define the directions of future research	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								1	3	2
CO 2	3	3	3	2								1	3	2
CO 3	3	3	3	2						2	2	1	3	2
CO 4	3	3	2	2						2	2	1	3	2
CO 5	3	3	2	2								1	3	2

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

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Content of the syllabus			
Unit - I	**INTRODUCTION**	Periods	**9**
Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.			
Unit – II	**THEMATIC OVERVIEW**	Periods	**9**
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.			
Unit – III	**PEDAGOGICAL PRACTICES**	Periods	**9**
Evidence on the effectiveness of pedagogical practices Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.			
Unit – IV	**PROFESSIONAL DEVELOPMENT**	Periods	**9**
Professional development: alignment with classroom practices and follow-up support -Peer support from the head teacher and the community. Curriculum and assessment Barriers to learning: limited resources and large class sizes.			
Unit - V	**RESEARCH GAPS AND FUTURE DIRECTIONS**	Periods	**9**
Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.			
		Total Periods	**45**

References

1.	Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2.	Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3.	Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.

E-Resources

1.	https://nptel.ac.in/courses/121/105/121105010/ CO-ORDINATED BY : IIT KHARAGPUR
2.	https://nptel.ac.in/courses/109/105/109105122/ CO-ORDINATED BY : IIT KHARAGPUR

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Programme	**M.E. /M.Tech.**	Programme Code		Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**			Semester	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC003	**Disaster Management**	2	0	0	0	100	-	100

Course Objective

The main objective of the course is

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work.
- Categorize the Risk Assessment in national level and global level.

Course Outcome

At the end of the course, the student should be able to	Knowledge Level
CO1: Understand the effects of disaster	K2
CO2: Analyze differences between disasters and hazards	K2
CO3: Disaster management techniques	K3
CO4: Risk management techniques	K3
CO5: Elaborate the Risk assessment in world level	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	1	2	1
CO 2	3	2			2	2	2				2	1	2	1
CO 3	3	2			2	2	2				2	1	2	1
CO 4	3	2			2	2	2				2	1	2	1
CO 5	3	2			2	2	2				2	1	2	1

Course Assessment Methods

Direct

1. Continuous Assessment Test I, II & III
2. Assignment and Seminar

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Indirect
1. Course - end survey

Content of the syllabus			
Unit - I	**INTRODUCTION**	Periods	**9**
Introduction Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.			
Unit – II	**REPERCUSSIONS OF DISASTERS AND HAZARDS**	Periods	**9**
Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.			
Unit – III	**DISASTER PRONE AREAS IN INDIA**	Periods	**9**
Disaster Prone Areas in India Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics			
Unit – IV	**DISASTER PREPAREDNESS AND MANAGEMENT PREPAREDNESS**	Periods	**9**
Disaster Preparedness and Management Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.			
Unit – IV	**RISK ASSESSMENT**	Periods	**9**
Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival. Disaster Mitigation Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.			
		Total Periods	**45**

References	
1.	R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2.	Sahni, Pardeep et.al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.
3.	Goel S. L., Disaster Administration and Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

E-Resources	
1.	https://www.digimat.in/nptel/courses/video/124107010/L36.html
2.	https://media.ifrc.org/ifrc/what-we-do/disaster-and-crisis-management/disaster-preparedness/

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.E. /M.Tech.**	Programme Code			Regulation	**2023**		
Department	**INFORMATION TECHNOLOGY**				Semester			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC004	**Value Education**	2	0	0	0	100	-	100

Course Objective	The main objective of the course is • To introduce the value of education and self- development. • To interpret good values in students. • To elaborate the importance of character. • To distinguish the relationship and their cooperation. • To interpret the religions and equality.	
Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1: Understand education values	K2
	CO2: Analyze importance of cultivation values	K2
	CO3: Importance of personality development	K3
	CO4: Character maintenance	K3
	CO5: Examine the religions and honesty.	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	2
CO 4	3	3	3	2								2	3	2
CO 5	3	3	3	2								2	3	2

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

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Content of the syllabus			
Unit - I	**INTRODUCTION**	Periods	**9**
Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation, Standards and principles, Value judgments.			
Unit – II	**IMPORTANCE OF CULTIVATION OF VALUES**	Periods	**9**
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline.			
Unit – III	**PERSONALITY AND BEHAVIOR DEVELOPMENT**	Periods	**9**
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour.			
Unit – IV	**RELATIONSHIP MANAGEMENT**	Periods	**9**
Universal brotherhood and religious tolerance True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature.			
Unit - V	**CHARACTER AND COMPETENCE**	Periods	**9**
Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.			
		Total Periods	**45**
References			
1.	Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi 2011.		
E-Resources			
1.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5132380/		
2.	https://www.examrace.com/Study-Material/Education/Value-Education-YouTube-Lecture-Handouts.html		

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

Programme	**M.E. /M.Tech.**	Programme Code		Regulation	**2023**
Department	**INFORMATION TECHNOLOGY**			Semester	

Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC005	**Constitution of India**	2	0	0	0	100	-	100

Course Objective

The main objective of the course is

- To understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To identify the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To illustrate the role of socialism in India after the commencement of the Bolshevik Revolution and its impact on the initial drafting of the Indian Constitution.
- To categorize the governance bodies in the organization.
- To interpret the various administration in states.

Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1: Define the history of Indian Constitution	K2
	CO2: Categorize the importance of constitutional rights and duties.	K3
	CO3:Understand the functions of Local administration	K2
	CO4:Demonstratethegovernance bodies in the organization.	K4
	CO5:Prioritize the local and district administration in states.	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	3	2	2								1	3	2	
CO 2	3	3	2	2								1	3	2	
CO 3	3	3	2	2								1	3	2	
CO 4	3	3	2	2								1	3	2	
CO 5	3	3	2	2								1	3	2	

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III

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2. Assignment and Seminar	
Indirect	
1. Course - end survey	

Content of the syllabus

Unit - I	**INTRODUCTION**	Periods	**9**
History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)			
Unit – II	**PHILOSOPHY OF THE INDIAN CONSTITUTION**	Periods	**9**
Philosophy of the Indian Constitution: Preamble, Salient Features			
Unit – III	**CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES**	Periods	**9**
Contours of Constitutional Rights& Duties: Fundamental Rights- Right to Equality- Right to Freedom Right against Exploitation- Right to Freedom of Religion ,Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties			
Unit – IV	**ORGANS OF GOVERNANCE**	Periods	**9**
Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.			
Unit - V	**LOCAL ADMINISTRATION**	Periods	**9**
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments) Village level: Role of Elected and Appointed officials, Importance of grass root democracy			
		Total Periods	**45**

References	
1.	The Constitution of India, 1950 (Bare Act), Government Publication.
2.	Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3.	M. P. Jain, Indian Constitution Law, 7th Edition., Lexis Nexis, 2014.
E-Resources	
1.	https://nptel.ac.in/courses/129/106/129106002/ CO-ORDINATED BY : IIT MADRAS
2.	https://niti.gov.in/niti-lecture

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205						
Programme	**M.E. /M.Tech.**	Programme Code		Regulation	**2023**		
Department	**INFORMATION TECHNOLOGY**			Semester			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks	
		L	T	P	C	CA	ESE	Total
P23AC006	**English for Research Paper Writing**	2	0	0	0	100	-	100

Course Objective	The main objective of the course is • Illustrate the improve your writing skills and level of readability • Categorize to write in each section. • Understand the skills needed when writing a Title • Ensure the good quality of paper at very first-time submission. • Elaborate the concept of writing skills for submission of paper.	
Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1: Understand forming and brake up sentences.	K2
	CO2: Importance of finding plagiarism.	K4
	CO3: Summarize the concept of literature reviews.	K2
	CO4: Extend the focus on skill development activities.	K2
	CO5: Develop the writing skills in the paper.	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	2									3	2
CO 2	3	3	3	2									3	2
CO 3	3	3	3	2									3	2
CO 4	3	3	3	2									3	2
CO 5	3	3	2	2									3	2

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

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Content of the syllabus			
Unit - I	**PLANNING AND PREPARATION**	Periods	**9**
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.			
Unit – II	**CLARIFICATIONS**	Periods	**9**
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.			
Unit – III	**LITERATURE REVIEW**	Periods	**9**
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.			
Unit – IV	**SKILL DEVELOPMENT - I**	Periods	**9**
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.			
Unit - V	**SKILL DEVELOPMENT - II**	Periods	**9**
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first- time submission			
		Total Periods	**45**
References			
1.	Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)		
2.	Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press		
3.	Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011		
E-Resources			
1.	https://nptel.ac.in/courses/110/105/110105091/ CO-ORDINATED BY : IIT KHARAGPUR		
2.	https://www.udemy.com/topic/research-paper-writing		

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Programme	**M.E. / M.Tech.**	Programme Code			Regulation	**2023**		
Department	**INFORMATION TECHNOLOGY**				Semester			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC007	**Personality Development through Life Enlightenment Skills**	2	0	0	0	100	-	100
Course Objective	The main objective of the course is • Learn to achieve the highest goal happily. • Identify a person with stable mind, pleasing personality and determination. • Determine wisdom in students. • Interpret managing others effectively. • Extend the increasing productivity.							
Course Outcome	At the end of the course, the student should be able to					Knowledge Level		
	CO1: Identify goals					K2		
	CO2: Analyze Personality development					K2		
	CO3: Make use of appropriate life and career goals					K3		
	CO4: Developing relationships with others					K3		
	CO5: Understand the value of diversity					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	3	3	2					2			2	3	2
CO 2	3	3	3	2					2			2	3	2
CO 3	3	3	3	2					2	2		2	3	2
CO 4	3	3	3	2						2		2	3	2
CO 5	3	3	3	2								2	3	2

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

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Content of the syllabus			
Unit - I	**NEETISATAKAM – I**	Periods	**9**
Neetisatakam-Holistic development of personality Verses- 19,20,21,22 (wisdom) Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue)			
Unit – II	**NEETISATAKAM – II**	Periods	**9**
Neetisatakam-Holistic development of personality Verses- 52,53,59 (dont's) Verses- 71,73,75,78 (do's)			
Unit – III	**APPROACH TO DAY TO DAY WORK AND DUTIES**	Periods	**9**
Approach to day to day work and duties. Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.			
Unit – IV	**STATEMENTS OF BASIC KNOWLEDGE**	Periods	**9**
Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18			
Unit - V	**PERSONALITY OF ROLE MODEL**	Periods	**9**
Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63			
		Total Periods	**45**

References	
1.	"Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2.	Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath,
3.	Rashtriya Sanskrit Sansthanam, New Delhi.
E-Resources	
1.	https://library.um.edu.mo/ebooks/b17771201.pdf
2.	https://www.staticcontents.youth4work.com/university/Documents/Colleges/CollegeSummaryAttach/29f57018-6412-4dee-b24b-ac29e54a0f9e.pdf

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.E./M.Tech.**	Programme Code			Regulation	**2023**		
Department	**INFORMATION TECHNOLOGY**				Semester	--		
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC008	**UNIVERSAL HUMAN VALUES**	2	0	0	0	100	-	100

Course Objective	The student should be made to, • To assist students in understanding the differences between values and skills, and in understanding the need, basic guidelines, content and the process of value education. • To help students initiate a process of dialog within themselves to understand what they 'really want to be' in their lives and professions • To help students understand the meaning of happiness and prosperity for human beings. • To help students understand harmony at all the levels of human living and to lead an ethical life	
Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1: Evaluate the significance of value inputs in formal education and start applying them in their life and profession	K4
	CO2: Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	K2
	CO3: Analyze the value of harmonious relationship based on trust and respect in their life and profession	K2
	CO4: Examine the role of a human being in ensuring harmony in society and nature.	K3
	CO5: Understand the harmony at all the levels of human living and to lead an ethical life	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	1		3	3	1	2	3	3	2	3	1	3	2
CO 2	2	1	2	3	2	2	2	2	1	1	3	1	3	1
CO 3	3	1	2	3	3	1	3	2	2	1	2	3	2	1
CO4	1	2	3	1	3	2	2	2	3	1	2	1	2	3
CO5	2	1	2	1	2	1	3	3	2	2	1		2	-

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III 2. Assignment and Seminar
Indirect
1. Course - end survey

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Content of the syllabus			
Unit - I	**Introduction-Basic Human Aspiration**	Periods	**9**
The basic human aspirations and their fulfillment through Right understanding and Resolution, Right understanding and Resolution as the activities of the Self, Self being central to Human Existence; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.			
Unit – II	**Right Understanding (Knowing)**	Periods	**9**
The domain of right understanding starting from understanding the human being (the knower, the experiencer and the doer) and extending up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).			
Unit – III	**Understanding Human Being**	Periods	**9**
Understanding the human being comprehensively as the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Basis for harmony/contradiction in the self			
Unit – IV	**Understanding Nature and Existence**	Periods	**9**
A comprehensive understanding (knowledge) about the existence, Nature being included; the need and process of inner evolution (through self-exploration, self awareness and self-evaluation), particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the self.			
Unit - V	**Understanding Human Conduct**	Periods	**9**
Understanding Human Conduct, different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with Allen compassing Resolution covering all four dimensions of human endeavor viz., realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from Self to Nature and entire Existence			
		Total Periods	**45**
Text Books			
1.	R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.		
2.	Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.		
References E-Resources			
1.	Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA		
2.	E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain		
E-Resources			
1.	https://nptel.ac.in/courses/109104068		
2.	https://fdp-si.aicte-india.org/UHV-I		

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	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University ,Chennai) Elayampalayam, Tiruchengode – 637 205							
Programme	**M.E./ M.Tech.**	Programme Code		**204**	Regulation		**2023**	
Department	**INFORMATION TECHNOLOGY**				Semester			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
P23AC009	**Online Course**	2	0	0	0	100	-	100

Course Objective	The main objective of the course is • Illustrate about various online certification courses. • Understand the importance of online certification courses. • Distinguish about job opportunities. • Make use of this course can prepare the competitive examination. • Classify the online tools for course.	
Course Outcome	At the end of the course, the student should be able to	Knowledge Level
	CO1: Evaluatethe programming skills.	K3
	CO2: Identify online certifications.	K2
	CO3: Appraise the value of the courses and job opportunities	K5
	CO4: Categorize in Quantitative Reasoning and Technological Literacy.	K4
	CO5: Develop the ICT tools for the specific course.	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	3	2	2						2			3	2	
CO 2	3	3	2	2						2			3	2	
CO 3	3	3	2	2						2	2		3	2	
CO 4	3	3	2	2						2	2		3	2	
CO 5	3	3	2	2							2		3	2	

Course Assessment Methods

Direct
1. Online Assignments and Assessments
Indirect
1. Course - end survey

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LIST OF COURSES
Online Courses such as : 1. NPTEL Courses 2. SWAYAM Courses 3. IIT-B Spoken Tutorials 4. UDEMY Courses 5. CCNA Courses 6. MOOC Courses 7. Microsoft Virtual Academy Certification courses etc.,

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