



Dr. M.G.R.
EDUCATIONAL AND RESEARCH INSTITUTE
DEEMED TO BE UNIVERSITY

University with Graded Autonomy Status
(An ISO 21001 : 2018 Certified Institution)
Periyar E.V.R. High Road, Maduravoyal, Chennai-95. Tamilnadu, India.



FACULTY OF ENGINEERING AND TECHNOLOGY

OUTCOME BASED EDUCATION

Curriculum and Syllabus

MASTER OF TECHNOLOGY

CYBER FORENSICS AND INFORMATION SECURITY

REGULATION 2022

DEPARTMENT OF CSE

DEPARTMENT VISION

To become a Premier Institution of Excellence in Computer Science and Engineering that would develop self-sustaining and globally competent Computer Science and Information Technology Professionals.

DEPARTMENT MISSION

- M1. Enable students and faculty with the best of Technologies and Knowledge emerging in the domain of Computer Science and Engineering.
- M2. Equip the department laboratories with the power of in-demand Technologies and Software for the On-Demand Industry.
- M3. Share and Collaborate knowledge across the IT Industries for holistic development of skilled and talented students.
- M4. Impart the students with Ethical values, Critical thinking and Broad based computational skills, to enable students to become Entrepreneurs.
- M5. Motivate the students to comprehend problems across Inter Disciplinary Domains and offer innovative solution using ICT.

PROGRAMME OUTCOMES

- PO1.** An understanding of the theoretical foundations and the limits of computing.
- PO2.** An ability to adapt existing models, techniques, algorithms, data structures, etc. for efficiently solving problems.
- PO3.** An ability to design, develop and evaluate new computer based systems for novel applications which meet the desired needs of industry and society.
- PO4.** Understanding and ability to use advanced computing techniques and tools.
- PO5.** An ability to undertake original research at the cutting edge of computer science & its related areas.
- PO6.** An ability to function effectively individually or as a part of a team to accomplish a stated goal.
- PO7.** An understanding of professional and ethical responsibility.
- PO8.** An ability to communicate effectively with a wide range of audience.
- PO9.** An ability to learn independently and engage in lifelong learning.
- PO10.** An understanding of the impact of IT related solutions in an economic, social and environment context.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Analyze and Evaluate the Cyber Forensics and Information Security needs of an organization. Apply the concepts and theories of information security to various situations, classifying security, analyzing performance and implementing new technologies.

PSO2: Access the Cyber Security risk management policies in order to protect an organization's critical information and assets. Effectively communicate to conduct investigation through referring design models and research in the field of Cyber Forensics and Information security.

PSO3: Measure the performance of security systems within an enterprise-level information system. Troubleshoot, maintain and update an enterprise-level information system.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1: To pursue higher studies with profound knowledge enriched with academia and industrial skill sets.

PEO2: To excel in their professional career with expertise in providing solutions to Information Technology problems.

PEO3: Leadership and participation in teams that act as change agents and innovators in product design and manufacturing related organizations.

PEO4 : To exhibit adaptive and agile skills in the core area of Information Science & Engineering to meet the technical and managerial challenges.

Mapping of Mission with PEOs

Mission/ PEO	PEO1	PEO2	PEO3	PEO4
M1	3	3	3	2
M2	3	3	3	1
M3	2	3	3	3
M4	2	2	3	3
M5	2	2	3	2

Mapping of PEOs with POs

PEO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
PEO1	3	3	3	2	2	1	2	3	3	2
PEO2	3	3	3	2	2	3	2	2	3	1
PEO3	3	3	3	2	3	3	2	3	2	2
PEO4	3	3	3	2	1	3	3	2	1	3

Mapping of PEOs with PSOs

PEO/PSO	PSO1	PSO4	PSO3
PEO1	2	2	2
PEO2	3	1	1
PEO3	2	3	3
PEO4	3	2	2

Strength of Correlation 3-High 2-Medium 1-L

M.Tech – Cyber Forensics And Information Security (Full Time)
Curriculum and Syllabus 2022 Regulation
To be implemented from 2022-2023 Batch

I SEMESTER								
S.No	Course Code	Course Name	TY/LB/IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMMA22008	Mathematics For Information Security and Cyber Forensics	Ty	3	1/0	0/0	4	BS
2	EMCS22001	Advanced Data Structures and Algorithms	Ty	3	1/0	0/0	4	PC
3	EMCF22EXX	Program Elective I	Ty	3	0/0	0/0	3	PE
4	EMCF22EXX	Program Elective II	Ty	3	0/0	0/0	3	PE
5	EMCS22L01	Advanced Data Structures and Algorithms Lab	Lb	0	0/0	4/0	2	PC
6	EMCF22ELX	Program Elective Lab I	Lb	0	0/0	4/0	2	PE
7	EMCC22001	Research Methodology and IPR	Ty	3	0/0	0/0	3	BS
8	EMCC22IXX	Audit Course-I	IE	2	0/0	0/0	0	ID
Total				17	2	8	21	

II SEMESTER								
S.No	Course Code	Course Name	TY/LB/IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMCF22001	Digital Forensics and Cyber Crime Investigation	Ty	3	1/0	0/0	4	PC
2	EMCF22002	Cloud Computing Security	Ty	3	0/0	0/0	3	PC
3	EMCF22EXX	Program Elective III	Ty	3	0/0	0/0	3	PE
4	EMCF22EXX	Program Elective IV	Ty	3	0/0	0/0	3	PE
5	EMCF22L01	Digital Forensics and Cyber Crime Investigation Lab	Lb	0	0/0	4/0	2	PC
6	EMCF22ELX	Program Elective Lab II	Lb	0	0/0	4/0	2	PE
7	EMCC22IXX	Audit Course II	IE	2	0/0	0/0	0	ID
8	EMCF22I01	Term Paper	IE	0	0/0	0/4	2	PC
Total				14	1	12	19	

Ty/Lb/IE:Theory/Lab/Internal Evaluation.

L/T/SLr/P/R:Lecture/Tutorial/Supervised Learning/Practical/Research

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III SEMESTER								
S.No	Course Code	Course Name	TY/LB/IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMCF22003	Steganography and Digital Watermarking	Ty	3	0/0	0/0	3	PC
2	EMCF22EXX	Program Elective V	Ty	3	0/0	0/0	3	PE
3	EMOL22I01	Open Elective (NPTEL/ SWAYAM/Any MOOC online courses approved by AICTE & UGC)	IE	3	0/0	0/0	3	ID
4	EMCF22L02	Dissertation Phase I	Lb	0	0/0	0/10	5	P
5	EMCF22I02	Summer Internship	IE	0	0/0	4/0	2	PC
Total				9	0	14	16	

IV SEMESTER								
S.No	Course Code	Course Name	TY/LB/IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMCF22L03	Dissertation Phase II	Lb	0	0/0	10/10	10	P
2	EMCF22I03	Research publication	IE	0	0/0	2/2	2	PC
Total				0	0	24	12	

Summary of Credits:

Semester	Credits
I	21
II	19
III	16
IV	12
TOTAL	68

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Program Elective I								
S.No	Course Code	Course Name	TY/LB/IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMCF22E01	Vulnerability Assessment and Penetration Testing	Ty	3	0/0	0/0	3	PE
2	EMCF22E02	Network Security and Cryptography	Ty	3	0/0	0/0	3	PE
3	EMCF22E03	Secured programming	Ty	3	0/0	0/0	3	PE

Program Elective II								
S.No	Course Code	Course Name	TY/LB/IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMCF22E04	Basics of Forensics Psychology	Ty	3	0/0	0/0	3	PE
2	EMCF22E05	Operating System Security	Ty	3	0/0	0/0	3	PE
3	EMCF22E06/ EMCS22E06	IOT and its Applications	Ty	3	0/0	0/0	3	PE
4	EMCF22E07/ EMCS22E07	Ethical Hacking	Ty	3	0/0	0/0	3	PE

Program Elective III								
S.No	Course Code	Course Name	TY/LB/IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMCF22E08	Cyber Law	Ty	3	0/0	0/0	3	PE
2	EMCF22E09	Biometrics	Ty	3	0/0	0/0	3	PE
3	EMCF22E10	Web and Database Security	Ty	3	0/0	0/0	3	PE
4	EMCF22E11/ EMCS22E11	Edge Computing	Ty	3	0/0	0/0	3	PE

Program Elective IV								
S.No	Course Code	Course Name	TY/LB/IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMCF22E12	Information Security Audit	Ty	3	0/0	0/0	3	PE
2	EMCF22E13	Data Privacy	Ty	3	0/0	0/0	3	PE
3	EMCF22E14	Applied Cryptography	Ty	3	0/0	0/0	3	PE

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Program Elective V								
S.No	Course Code	Course Name	TY/LB/IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMCF22E15/ EMCS22E15	Malware Analysis	Ty	3	0/0	0/0	3	PE
2	EMCF22E16	Image Forensics and Security	Ty	3	0/0	0/0	3	PE
3	EMCF22E17	Data Analytics for Fraud Detection	Ty	3	0/0	0/0	3	PE
4	EMCF22E18/ EMCS22E18	Block Chain Technology	Ty	3	0/0	0/0	3	PE

Program Elective Lab I								
S.No	Course Code	Course Name	TY/LB/IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMCF22EL1	Vulnerability Assessment and Penetration Testing Lab	Lb	0	0/0	4/0	2	PE
2	EMCF22EL2	Network Security and Cryptography Lab	Lb	0	0/0	4/0	2	PE
3	EMCF22EL3	Secured programming lab	Lb	0	0/0	4/0	2	PE

Program Elective Lab II								
S.No	Course Code	Course Name	TY/LB/IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMCF22EL4	Information Security Audit Lab	Lb	0	0/0	4/0	2	PE
2	EMCF22EL5	Data Privacy Lab	Lb	0	0/0	4/0	2	PE
3	EMCF22EL6	Applied Cryptography Lab	Lb	0	0/0	4/0	2	PE

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Audit Course I & II								
S.No	Course Code	Course Name	TY/L B/ IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMCC22I01	English for Research paper Writing	IE	2	0/0	0/0	0	ID
2	EMCC22I02	Disaster Management	IE	2	0/0	0/0	0	ID
3	EMCC22I03	Sanskrit for Technical Knowledge	IE	2	0/0	0/0	0	ID
4	EMCC22I04	Value Education	IE	2	0/0	0/0	0	ID
5	EMCC22I05	Constitution of India	IE	2	0/0	0/0	0	ID
6	EMCC22I06	Pedagogy Studies	IE	2	0/0	0/0	0	ID
7	EMCC22I07	Stress Management by Yoga	IE	2	0/0	0/0	0	ID
8	EMCC22I08	Personality Development through Life Enlightenment Skills	IE	2	0/0	0/0	0	ID
9	EMCC22I09	Research Publication Ethics	IE	2	0/0	0/0	0	ID

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Components of Curriculum and Credit distribution for E&T Programmes

S. No	CATEGORY	Description	No. of Courses	Credits	Total	Credit Weightage	Contact hours
1	CORE COURSES	Core Theory	4	14	18	26.47	210
		Core Lab	2	4			60
2	ELECTIVE COURSES	Department Core Electives/ Skill enhancement electives	5	15	19	27.94	225
			2	4			60
3	OPEN ELECTIVES	Open Elective theory	1	3	3	4.411	45
		Open Elective Lab					
4	INTERDISCIPLINARY/ ALLIED COURSES	Theory	-	-	-	-	-
		Lab	-	-			-
5	HUMANITIES & SOCIAL SCIENCES , LIFE SKILLS &SOFT SKILLS	Language 1 & 2	-	-	-	-	-
		English 1 & 2	-	-			-
		Soft Skills	-	-			-
		Life Skill	-	-			-
		Foreign Language					-
		Environmental Studies	-	-			-
		Management Papers	-	-			-
		Entrepreneurship Development	-	-			-
6	PROJECTS/INTERNSHIP/ CORE SKILL	Project	2	15	21	30.88	225
		Core Skills	-	-			
		Internship / NSS / NCC/SI/TP/RP	3	6			12
7	ENGINEERING SCIENCES						
8	ANY OTHER	Mathematics RM&IPR	2	4	7	10.29	60
				3			45
Total			21	68	68	100	942

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Revision/modification done in the syllabus content:

S.No	Course(Subject) Code	Course (Subject) Name	Concept/ topic if any removed in current curriculum	Concept/topic added in the new curriculum	% of Revision/ Modification done
1	EMCF22E01	Vulnerability Assessment and Penetration Testing		Vulnerability Assessment- Understanding the Risks Posed by Vulnerabilities, Detecting Vulnerabilities via Security Technologies, Project Scoping-Assessing Vulnerability assessment timeline-NVAT-Prioritizing risks and threats, Assessment Methodology-Top down and Bottom Up Examination-Case study with assessment report	40
2	EMCF22E03	Secured programming		Using asynchronous safe functions and signal handlers: Shared objects and signal handlers, Using signal() within interruptible signal handlers, Returning computation exception signal handler. Using errno: check and set, Depending upon indeterminate values of errno, Handling standard library errors.	50
3	EMCF22E04	Basics of Forensics Psychology		Personality: Theories- Psychoanalytic approaches to personality, Trait approaches, learning approaches, biological approaches, and humanistic approaches. Assessing personality: Self report measures of personality, projective methods and behavioral assessment.	40
4	EMCF22E05	Operating System Security	Operating System concepts, Process Management and Scheduling, Memory Management: Partitioning, Paging, Segmentation, Virtual memory, Device and File management, Introduction to Operating System Security, Operating System Security	Introduction -Secure Operating Systems-Security Goals-Trust Model- Threat Model. Access Control Fundamentals-Protection System-Reference Monitor-Secure Operating Definition .Multics-Multics System-Multics Security-Multics Vulnerability Analysis Solaris Trusted Extensions-Trusted Extensions Access Control- Solaris Compatibility-Trusted Extensions Mediation-Process Rights Management-Role Based Access Control – Trusted Extensions	60

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			Mechanism, Case studies : Linux and Windows.	Networking-Multilevel Services-Administration-Linux Security Modules-Security Enhanced Linux.	
5	EMCF22E12	Information Security Audit	Auditing For Security: Approaches to Audits, Technology Based Audits Vulnerability Scanning And Penetration Testing, Resistance to Security Audits, Phase in security audit, Security audit Engagement Costs and other aspects, Budgeting for security audits, Selecting external Security Consultants, Key Success factors for security audits.	Information Security Assessments: Vulnerability Assessment, Classification, Types of Vulnerability Assessment, Vulnerability Assessment Phases, Vulnerability Analysis Stages, Characteristics of a Good Vulnerability Assessment Solutions & Considerations, Vulnerability Assessment Reports – Tools and choosing a right Tool, Information Security Risk Assessment, Risk Treatment, Residual Risk, Risk Acceptance, Risk Management Feedback Loops etc.	60
6	EMCF22E13	Data Privacy	Technology, Policy, Privacy and Freedom- Medical privacy legislation, policies and best practices, Examination of privacy matters specific to the World Wide Web, Protections provided by the Freedom of Information Act or the requirement for search warrants	Data Anonymization Threats- Threats to Anonymized Data, Threats to Data Structures, Threats by Anonymization Techniques, Randomization, k- Anonymization, l-Diversity, t-Closeness. Dynamic Data Protection: Tokenization, Understanding Tokenization, Use Cases for Dynamic Data Protection, Benefits of Tokenization Compared to Other Methods, Components for Tokenization.	50
7	EMCF22E14	Applied Cryptography	Fundamental concepts are removed	Fail-stop signatures-computing with encrypting data-bit commitment-Fair coin flips-one-way accumulators. Digital cash. Real World approach: IBM secret key management protocol-MITRENET,ISDN, SESAME.	60
8	EMCF22E15	Malware Analysis	Malware Behavior - Covert Malware Launching -Data Encoding – Malware-Focused Network Signatures Anti-Disassembly-Anti-Debugging - Anti-	Dependency Types, Environment Dependencies, Program Dependencies, Timing Dependencies, Event Dependencies, Malware Collection- Your Own Backyard, Scan for Malicious Files, Look for Active Rootkits, Inspect Startup Programs, Inspect Running Processes, Extract Suspicious Files,	60

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			<p>Virtual Machine Techniques- Packers and Unpacking.</p> <p>Shell code Analysis - C++ Analysis- 64-Bit Malware – Tools for Malware Analysis</p>	<p>The Portable Executable File-The Windows Portable Executable File, The PE File Format, Relative Virtual Address, PE Import Functions.</p> <p>Inspecting Static Malware-Static Analysis Techniques, ID Assignment-File Type Identification, Antivirus Detection, Protective Mechanisms Identification, PE Structure Verification, Dynamic Analysis-Analyzing Host Behavior, Analyzing Network Behavior.</p>	
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List of New courses/value added courses//life skills/Electives/interdisciplinary /courses focusing on employability/entrepreneurship/skill development.

S.No	New courses (Subjects)	Value added courses	Life skill	Electives	Inter Disciplinary	Focus on employability/entrepreneurship/skill development.
1	Advanced Data Structures and Algorithms			Network Security and Cryptography	Open Elective (NPTEL/ SWAYAM/Any MOOC onlinecourses approved by AICTE & UGC)	
2	Digital Forensics and Cybercrime Investigation			Network Security and Cryptography Lab	Research Publication Ethics	
3	Cloud Computing Security			IoT and its Application		
4	Advanced Data Structures and Algorithms Lab			Ethical Hacking		
5	Digital Forensics and Cybercrime Investigation Lab			Cyber Law		
6	Steganography and Digital Watermarking			Web and Database Security		
7	Summer Internship			Edge Computing		
8	Term Paper			Image Forensics and Security		
9	Research Publication			Data Analytics for Fraud Detection		
10				Block Chain Technology		

SEMESTER I
I Year M.Tech Full Time 2022 Regulation Curriculum & Syllabus
DEPARTMENT OF COMPUTER SCIENCE

Subject Code	Subject Name :	Ty/ Lb/IE	L	T/ S.Lr	P/R	C				
EMMA22008	Mathematics for Information Security and Cyber Forensics	Ty	3	1/0	0/0	4				
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> ➤ To define algebra for constructing and writing mathematical proofs. ➤ To Illustrate the limitations of predicate logic. ➤ To recognize the patterns that arise in graph problems and use this knowledge for constructing the trees and spanning trees. 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	To understand the concepts of Algebraic Structures (L2)									
CO2	To understand the concepts of Combinatorics (L2)									
CO3	To understand the concepts associated with Mathematical Logic and Predicate calculus. (L2)									
CO4	To determine if a given graph is simple or a multi graph, directed or undirected, Eulerian and Hamiltonian Graphs, Shortest path algorithm and determine the connectivity of a graph (L4)									
CO5	To construct a minimal spanning tree by using Kruskal's and Prim's algorithm in order to obtain a solution for a real time problem. (L4)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3	2	2	3	1	1	2	2	2
CO2	3	2	1	2	2	2	2	2	3	1
CO3	3	3	1	2	2	3	1	1	2	2
CO4	3	2	2	2	1	2	2	2	1	1
CO5	3	3	1	2	1	1	2	1	2	2
COs/PSOs	PSO1			PSO2			PSO3			
CO1	1			3			2			
CO2	1			3			2			
CO3	2			3			2			
CO4	2			3			2			
CO5	2			3			2			
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
	✓									

Subject Code	Subject Name :	Ty/ Lb/ IE	L	T/ S.Lr	P/R	C
EMMA22008	Mathematics for Information Security and Cyber Forensics	Ty	3	1/0	0/0	4

UNIT I INTRODUCTION TO ABSTRACT ALGEBRA (12 hrs)

Groups (Definition and Examples) – Subgroups– Permutation groups – Homomorphism – Kernel – Cosets– Lagrange’s theorem – Rings – Fields (Definition and Examples).

UNIT II COMBINATORICS (12 hrs)

Mathematical Induction – Pigeon Hole Principle – Principle of Inclusion and Exclusion – Recurrence Relations – Generating Functions.

UNIT I MATHEMATICAL LOGIC (12 hrs)

Statements – Truth Table – Connectives – Normal Forms – Predicate Calculus – Inference Theory.

UNIT IV DISCRETE STRUCTURES I (12 hrs)

Basic concepts of Graphs – Subgraphs– Paths and Circuits – Matrix representation of Graphs – Graph Isomorphism – Connected graphs and Components – Euler and Hamiltonian paths – Travelling salesman problem.

UNIT V DISCRETE STRUCTURES II (12 hrs)

Basic concepts of Trees– Properties – Pendant vertices – Rooted and Binary trees – Spanning trees – Fundamental circuits – Finding all spanning trees of a graph – Spanning trees in a weighted graph.

Total Hours: 60

Reference Books:

- 1) Tremblay J.P., Manohar R., *Discrete Mathematical structures with applications to Computer science*, Tata McGraw Hill Publishing Co., (2004).
- 2) Kenneth Rosen, *Discrete Mathematics and its applications (SIE)*, Tata McGraw Hill Publishing Co.,(2007).
- 3) John C. Martin, *Introduction to languages and the theory of computation (3rd ed.)*, Mcgraw Hill, (2003).
- 4) Hopcroft J.E., Ullman J.D., *Introduction to Automata theory, Languages and Computation*, Narosa Publishing house, (2002).
- 5) NarsinghDeo, *Graph theory with applications to Engineering and Computer Science*, Prentice Hall of India, (2004).
- 6) Robin J. Wilson, *Introduction to Graph theory (4th ed.)*, Pearson, (2002).

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Subject Code: EMCS22001	Subject Name : Advanced Data Structures and Algorithms						Ty/ Lb/ IE	L	T/ S.Lr	P/R	C
	Prerequisite: NIL						Ty	3	1/0	0/0	4
L : Lecture T:Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab											
OBJECTIVES :											
<ul style="list-style-type: none"> • To learn the mathematical basics and various notations to analyze the complexities of Algorithms. • To understand the various sorting techniques and tree data structure. • To understand and analyze the various Text Processing operations and their performances. • To analyze and understand graph data structures and their applications. • To understand the performance of polynomial time and NP-Completeness. • 											
COURSE OUTCOMES (COs) : (3- 5)											
CO1	Demonstrate various algorithm notations and algorithm correctness. (L1)										
CO2	Construct various applications based on sorting and tree data structure.(L2)										
CO3	Experiment with the performance of various Text Processing operations.(L2)										
CO4	Apply graph data structures to the real time applications.(L3)										
CO5	Illustrate the performance of the polynomial time algorithm(L4)										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	2	2	2	1	2	2	2	2	1	2	
CO2	1	2	2	2	2	2	2	2	3	2	
CO3	2	3	3	1	3	3	3	2	3	1	
CO4	2	3	3	1	3	3	3	2	3	2	
CO5	3	3	3	1	3	3	3	3	2	1	
	2	2	2	1	2	2	2	2	1	2	
COs / PSO s	PSO1			PSO2				PSO3			
CO1	3			2				2			
CO2	3			2				2			
CO3	3			3				3			
CO4	3			3				3			
CO5	3			3				3			
3/2/1 indicates Strength of Correlation 3- High, 2- Medium, 1-Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills		
				✓							

Subject Code	Subject Name	Ty/Lb/IE	L	T/S Lr	P/ R	C
EMCS22001	Advanced Data Structures and Algorithms	Ty	3	1	0	4

UNIT I ALGORITHM NOTATIONS AND REPRESENTATION (12 Hrs)

Mathematical Induction - Asymptotic Notations – Algorithm Analysis - NP-Hard and Completeness – Recurrence Equations – Solving Recurrence Equations – Memory Representation of Multi-dimensional Arrays – Time-Space Tradeoffs.

UNIT II SORTING AND TREES (12 Hrs)

Heapsort – Quicksort – Topological sort - Sorting in Linear Time – Elementary Data Structures – Hash Tables – Hash Functions- Binary Search Trees – AVL Trees – Red Black trees – Multi-way Search Trees –B-Trees- Fibonacci Heaps – van Emde Boas Trees – Data Structures for Disjoint Sets.

UNIT III TEXT PROCESSING OPERATIONS (12 Hrs)

Text Processing: String Operations - Brute-Force Pattern Matching - The Boyer-Moore Algorithm - The Knuth-Morris-Pratt Algorithm - Standard Tries - Compressed Tries - Suffix Tries - The Huffman Coding Algorithm - The Longest Common Subsequence Problem (LCS) - Applying Dynamic Programming to the LCS Problem.

UNIT IV GRAPH ALGORITHMS (12 Hrs)

Elementary graph Algorithms – Minimum Spanning Trees – Single Source Shortest Paths- All Pairs Shortest Paths – Maximum Flow - Multithreaded Algorithms – Matrix Operations.

UNIT V LINEAR PROGRAMMING (12 Hrs)

Linear programming – Polynomials and Fast Fourier Transform – Number Theoretic Algorithms –Computational Geometry –NP-Completeness – Approximation Algorithms.

Text Books

Total Hours: 60

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, PHI, Third Edition, 2016.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education, Second Edition, 2004.
3. Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars, Computational Geometry: Algorithms and Applications, Springer, Third edition, 2008.

Reference Books

1. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, “Data Structures and Algorithms”, Addison Wesley, Fifth Edition, 2017.
2. Algorithms, Data Structures, and Problem Solving with C++”, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company, Sixth Edition, 2016.
3. Narasimha karumanchi, Data Structures and algorithms made easy, Fifth Edition, 2017.
4. E. Horowitz, S.Sahni and Dinesh Mehta, “Fundamentals of Data structures in C++”, University Press, Fourth Edition, 2007.
5. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, Second Edition, 2002.

Dr.M.G.R. Educational and Research Institute (Deemed to be University)
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Subject Code	Subject Name :		Ty/Lb/IE	L	T/SLr	P/R	C				
EMCS22L01	Advanced Data Structures and Algorithms Lab		Lb	0	0/0	4/0	2				
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab											
OBJECTIVES The Students should be made to											
<ul style="list-style-type: none"> To strengthen their problem-solving ability by applying the characteristics of an object-oriented approach. To introduce object-oriented concepts in Java. 											
COURSE OUTCOMES (Cos) after completing this course the student will be able to											
CO1	Demonstrate the usage of various data structures using simple applications(L2)										
CO2	Discuss non-linear data structure and its application(L1)										
CO3	Describe the basic operations on arrays, lists, stacks and queue data structures(L2)										
CO4	Analyze algorithms for operations on Binary Search Trees.(L4)										
CO5	Determine and analyze the complexity of given algorithms (L5)										
Mapping of Course Outcome with Program Outcome (POs)											
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	3	3	1	2	1	2	1	1	2	2	
CO2	3	3	1	2	1	2	3	1	2	1	
CO3	3	2	1	2	1	2	1	1	2	2	
CO4	3	3	2	2	1	1	3	1	2	1	
CO5	3	3	1	3	2	2	1	1	2	1	
COs/POs	PSO1			PSO2			PSO3				
CO1	1			2			3				
CO2	1			3			1				
CO3	2			1			2				
CO4	2			2			1				
CO5	2			2			1				
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills		
				√			√				

Subject Code	Subject Name	Ty/Lb/IE	L	T/S Lr	P/ R	C
EMCS22L01	Advanced Data Structures and Algorithms Lab	Lb	0	0/0	4/0	2

List of Experiments

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods: a) Linear search b) Binary search
2. Write Java programs to implement the following using arrays and linked lists
3. Write Java programs to implement the following using an array. a) Stack ADT b) Queue ADT
4. Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stack ADT).
5. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.
6. Write Java programs to implement the following using a singly linked list. a) Stack ADT b) Queue ADT
7. Write a Java program to perform the following operations: a) Construct a binary search tree of elements. b) Search for a key element in the above binary search tree. c) Delete an element from the above binary searchtree.
8. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
9. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in a)Preorder b) Inorder c) Postorder
10. Write Java programs for the implementation of bfs and dfs for a given graph.
11. Write Java programs for implementing the following sorting methods: a) Bubble sort b) Insertion sort c) Quick sort d) Merge sort e) Heap sort f) Radix sort g) Binary tree sort
12. Write a Java program to perform the following operations: a) Insertion into a B-tree b) Searching in a B-tree

Total Hours - 60

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Subject Code: EMCC22001	Subject Name : Research Methodology and IPR				Ty/Lb/ETL	L	T/SLr	P/R	C	
	Prerequisite: core subjects				Ty	3	0/0	0/0	3	
Ty/Lb/ : Theory/Lab L : Lecture T : Tutorial P : Practical/Project R : Research C: Credits T/L Theory/Lab										
OBJECTIVE: The goal is to emphasize the importance of innovation and creativity by understanding the research concepts and ethics which will aid to build the nation IPR status.										
COURSE OUTCOMES (COs) : By doing this course students will										
CO1	Understand research problem formulation by Analyzing research related information and its execution by following research ethics									
CO2	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.									
CO3	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.									
CO4	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.									
Mapping of Course Outcomes with Program Outcomes (POs)										
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3	3	3	3	2	3	3	2	2
CO2	2	3	3	3	3	2	3	3	2	2
CO3	2	3	3	3	3	2	3	3	2	2
CO4	2	3	3	3	3	2	3	3	2	2
COs / PSOs	PSO1				PSO2			PSO3		
CO1	3				3			3		
CO2	3				3			3		
CO3	3				3			3		
CO4	3				3			3		
3/2/1 indicates Strength of Correlation 3- High, 2- Medium, 1-Low										
Category	Basic Sciences	Engineering Sciences	Humanities and Social	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	
	✓									

Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCC22001	Research Methodology and IPR	Ty	3	0	0	3

UNIT 1:SELECTION, ANALYSIS AND STATEMENT OF THE RESEARCH PROBLEM; **9 hrs**
Literature Review and Formulation of Objectives – using the following Critical thinking Skills – Drawing a Concept map, Oral Communication, Debating, Questioning, Collaborating, Evaluation and Reasoning.

UNIT 2 :RESEARCH DESIGN **9 hrs**
Types of Study, Types of Data, Measures of Variability, Setting up the Hypotheses, data collection techniques and tools, sampling, Describing data – Charts and graphs ; Data processing – Categorization, coding, summarization.

UNIT 3: DATA ANALYSIS AND REPORT WRITING: **9 hrs**
Statistical measures, Regression and correlation, significance test; Report writing – Purpose, format, content, editing and evaluation. Using Citation tools; Report for specific purposes – Theses, Journals, Grant application. Oral presentation to an audience; use of project management digital tools and plagiarism checking.

UNIT 4 :INTRODUCTION TO INTELLECTUAL PROPERTY **9 hrs**
Types of intellectual property rights – Patent, Copyright, Trade Mark, Industrial Design, Geographical Indication, Trade Secrets - Traditional Knowledge. Elements of Patentability - Novelty, Non Obviousness (Inventive Steps), Industrial Application – Non patentable inventions – Process of patenting – National and International – Form and Fees for IP India

UNIT 5:PRIOR ART SEARCH, PATENT DRAFTING **9 hrs**
Drafting patent Claims – Types of claims - Registration Procedure, Rights and Duties of Patentee; Patent infringement; Licensing – Franchising - Joint ventures; Non-Disclosure Agreements (NDAs) - Material Transfer Agreements (MTAs).

Total Hours: 45

References:

- ❖ C. Vijayalakshmi and C. Sivapragasam (2011) Research Methods – Tips and Techniques, , MJP Publishers
- ❖ Deboraj Rumsey (2010) Statistics Essentials for Dummies, Wiley Publishing Incorporated
- ❖ Bouchoux (2013) Intellectual Property, DELMAR CENGAGE Learning, USA
- ❖ V K Ahuja (2017) Law Relating to Intellectual Property Rights, LexisNexis Butterworths India

IMPORTANT WEB LINKS

- ❖ <https://www.wipo.int/portal/en/index.html>
- ❖ <http://ipindia.nic.in/>
- ❖ <https://www.epo.org>
- ❖ <https://www.uspto.gov>

II SEMESTER

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2022 Regulation

Subject Code	Subject Name :		Ty/Lb/IE	L	T/SLr	P/R	C			
EMCF22001	Digital Forensics and Cybercrime Investigation		Ty	3	1/0	0/0	4			
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : CreditsT/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> Understand the languages of digital forensics ,and the investigation of digital crime scene Learn the basics of computer investigators Become knowledgeable in the digital forensics networks and OSI layers 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Understanding the Computer forensics (L2)									
CO2	Can conduct the investigate and recover the data in Computer forensics.(L2)									
CO3	Applying the knowledge in offending and secure the evidence (L3)									
CO4	Analyze the knowledge to investigate through the digital evidence (L4)									
CO5	To Apply network investigation. (L3)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	2	2	2	2	2	2
CO2	3	3	3	3	2	2	2	3	3	1
CO3	3	3	2	2	3	2	2	2	2	2
CO4	3	3	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3	3	2
COs/PSOs		PSO1			PSO2			PSO3		
CO1		3			2			2		
CO2		2			2			1		
CO3		2			2			2		
CO4		3			2			2		
CO5		2			3			2		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
				✓						

Subject Code	Subject Name :	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22001	Digital Forensics and Cybercrime Investigation	Ty	3	1/0	0/0	4

UNIT-I

12 hrs

Introduction: Computer Forensics Needs, Computer forensics fundamentals, Introduction to Steps of Digital Forensics, Computer Crimes, Types of Digital forensics evidences, Legal Aspects of Digital Forensics.

UNIT-II

12 hrs

Hardware and Software: Understanding Computer components- input and output devices, CPU, Digital Media, System software - Operating System Architecture, Application Software, File Systems, Memory organization concept, Data Storage concepts. Network: Topology, Devices, Protocols and Port, Communication media. IP Address: Types and classes.

UNIT-III

12 hrs

Foundations: Basic Principles and methodologies for digital forensics, Design systems with forensic needs in mind. Phases of Digital Forensics. Introduction to Digital Forensics Tools, Life of a Digital Forensic Investigator. **Data Acquisition:** Principles of Digital Forensic Acquisition, Evidence Handling and Processing Digital Forensic Data.

UNIT-IV

12 hrs

Evidence Collection: Rules of Evidence, Jurisdictions, Techniques and standards for Preservation of Data. **Evidence Analysis:** OS / File System Forensics, Application Forensics, Web Forensics, Network Forensics, Mobile Device Forensics.

UNIT-V

12 hrs

Investigation: Computer, Network, System attacks, Attack detection and investigation, Anti forensics. Case studies on File System, Network storage, Web and Mobile.

REFERENCE BOOKS

TOTAL HOURS: 60

1. Thomas J Holt , Adam M Bossler, Kathryn C Seigfried-Spellar, Cybercrime and Digital Forensics: An Introduction, Routledge, 2016
2. Eoghan Casey, Handbook of Digital Forensics and Investigation, Academic Press, 2017
3. Eoghan Casey, Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet, III Edition, 2016
4. Angus McKenzie Marshall, Digital Forensics: Digital Evidence in Criminal Investigations, Wiley-Blackwell, 2018

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2022 Regulation

Subject Code: EMCF22002	Subject Name : Cloud Computing Security					Ty/ Lb/IE	L	T/ S.Lr	P/R	C	
	Prerequisite: Database					Ty	3	0/0	0/0	3	
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab											
OBJECTIVES : The student should be made to: <ul style="list-style-type: none"> • Identify the technical foundations of cloud systems architectures. • Analyze the problems and solutions to cloud application problems. • Apply principles of best practice in cloud application design and management. • Identify and define technical challenges for cloud applications and assess their importance. 											
COURSE OUTCOMES (COs) :											
CO1	Understand the fundamental principles of cloud computing. (L2)										
CO2	Remember the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing.(L1)										
CO3	Analyze the performance of Cloud Computing. (L4)										
CO4	Apply the Concept of Cloud Infrastructure Model.(L3)										
CO5	Analyze the concept of Cloud Security.(L4)										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	3	3	3	2	3	2	2	2	3	2	
CO2	3	3	3	2	3	2	2	2	3	2	
CO3	3	2	3	2	3	2	2	3	2	3	
CO4	3	2	2	2	3	2	2	2	3	2	
CO5	3	3	2	2	3	2	2	2	3	2	
COs / PSOs	PSO1			PSO2				PSO3			
CO1	3			3				2			
CO2	3			3				2			
CO3	3			3				3			
CO4	3			2				3			
CO5	3			2				3			
3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills		
				✓							

SUBJECT CODE	SUBJECT NAME	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCF22002	Cloud Computing Security	Ty	3	0/0	0/0	3

UNIT I - Introduction 9 hrs

Cloud Computing Essentials, Overview of Cloud Computing, Cloud Security Baselines, Cloud Security, Privacy, and Trust Baselines, Infrastructure as a Service (IaaS).

UNIT II-Risk Analysis and Division of Responsibility 9 hrs

Risk and Trust Assessment: Schemes for Cloud Services, Managing Risk in the Cloud, Cloud Security Risk Management, Secure Cloud Risk Management: Risk Mitigation Methods, Specification and Enforcement of Access Policies in Emerging Scenarios, Cryptographic Key Management for Data Protection, Cloud Security Access Control: Distributed Access Control, Cloud Security Key Management: Cloud User Controls, Cloud Computing Security Essentials and Architecture, Cloud Computing Architecture and Security Concepts, Secure Cloud Architecture.

UNIT III-Operating System and Network Security 9 hrs

Locking Down Cloud Servers, Third-Party Providers Integrity Assurance for Data Outsourcing, Negotiating Cloud Security Requirements with Vendors, Managing Legal Compliance Risk in the Cloud and Negotiating Personal Data Protection Requirements with Vendors, Integrity Assurance for Data Outsourcing, Secure Computation outsourcing

UNIT IV-Meeting Compliance Requirements 9 hrs

Computation Over Encrypted Data, Trusted Computing Technology, Computing Technology for Trusted Cloud Security, Trusted Computing Technology and Proposals for Resolving Cloud Computing Security Problems, Assuring Compliance with Government Certification and Accreditation Regulations, Government Certification, Accreditation, Regulations, and Compliance Risks, Simplifying Secure Cloud Computing Environments with Cloud Data Center, Availability, Recovery, and Auditing across Data Centers

UNIT V-Advanced Cloud Computing Security 9hrs

Advanced Security Architectures for Cloud Computing, Side-Channel Attacks and Defenses on Cloud Traffic, Clouds Are Evil, Future Directions in Cloud Computing Security: Risks and Challenges

Total Hours: 45

TEXT BOOKS:

1. Cloud computing security foundations and challenges, by JOHN R . VACCA, CRC Press is an imprint of Taylor & Francis Group.

REFERENCE BOOKS:

1. Krutz, Ronald L., and Russell Dean Vines. *Cloud security: A comprehensive guide to secure cloud computing*. Wiley Publishing, 2010.

2. Carlin, Sean, and Kevin Curran. "Cloud computing security." *Pervasive and Ubiquitous Technology Innovations for Ambient Intelligence Environments*. IGI Global, 2013. 12-17.

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Subject Code	Subject Name :	Ty/Lb/IE	L	T/SLr	P/R	C				
EMCF22L01	Digital Forensics and Cybercrime Investigation Lab	Lb	0	0/0	4/0	2				
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> To introduce students to Scientific , philosophy, integrity, scene investigation procedures, criminalities, and the role of the criminalist as they relate to digital crime scene investigation Demonstrate use of digital forensics tools. Guide a digital forensics exercise. Recognize the state of the practice and the gaps in technology, policy, and legal issues 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Understand the basic knowledge about VMware and various file system.(L2)									
CO2	Understand the Open source forensics tools (L2)									
CO3	Applying the tracing concepts (L3)									
CO4	Understand the Investigation attacks (L2)									
CO5	Analyze the real time cyber security issues.(L4)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	1	3	1	1	2	2	2	3
CO2	2	1	2	3	1	1	2	2	2	3
CO3	2	1	2	3	2	2	1	2	3	3
CO4	2	2	3	3	2	1	2	1	3	3
CO5	2	2	3	3	2	1	2	1	3	3
COs/PSOs		PSO1			PSO2			PSO3		
CO1		1			2			1		
CO2		1			2			2		
CO3		1			2			2		
CO4		1			2			1		
CO5		1			2			1		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
				√			√			

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Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22L01	Digital Forensics and Cybercrime Investigation Lab	Lb	0	0/0	4/0	2

The students will learn many of the cardinal principles and techniques of digital crime scene investigation. The necessity of a rigorous scientific approach will be stressed. This lab uses an intensive, hands-on style to learn the basics of digital crime scene management and the recognition, evaluation, enhancement, documentation, control, and collection of evidence. Scenes will encompass criminal and non-criminal activities including Computer Intrusions, Cyber stalking, violent crime, and crime committed using Mobile devices and Network Related crimes

The primary aim of the course is to introduce students to scientific, philosophy, integrity, scene investigation procedures, criminalities, and the role of the criminalist as they relate to digital crime scene investigation

Students will be introduced to:

- Documentation with notes, sketches, and photography
- Specialized techniques for the recognition and enhancement of physical evidence
- Preparation and maintenance of case folders for records including notes, sketches, photographs, and Contacts/communications.
- Communication of results and preparation formal, typewritten reports
- Management of scenes and available resources including equipment and personnel Mock crime
- Scenes will be used for demonstrations and to assess knowledge, skills, and abilities of students.
- Conducting Digital Investigation and Investigative reconstruction with Digital Evidence. Modus Operandi, Motive and Technology.

Total Hours: 60

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Subject Code : EMCS22I01		Subject Name : TERM PAPER					Ty/Lb/IE	L	T	P	C
		Prerequisite : nil					IE	2	0/0	0/0	2
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab											
OBJECTIVES :											
<ul style="list-style-type: none"> To acquire hands-on experience in converting a novel idea / technique into a working model / prototype involving multi-disciplinary skills and / or knowledge and working in at team. 											
COURSE OUTCOMES (Cos) :											
Students completing the course were able to											
CO1	To conceptualize a novel idea / technique into a product										
CO2	To develop a multi-disciplinary thinking and enable teamwork										
CO3	Ideate and develop a prototype										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	3	1	1	3	3	3	1	2	3	3	
CO2	2	1	2	2	1	1	3	3	2	1	
CO3	2	2	2	1	1	2	1	3	3	2	
Mapping of Course Outcomes with Program Outcomes (PSOs)											
COs/PSOs		PSO1			PSO2			PSO3			
CO1		2			1			1			
CO2		1			2			1			
CO3		1			2			1			
Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills		
				√							

Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22I01	TERM PAPER	IE	0	0/0	0/4	2

Term Paper

A term paper is an elaborate research-based work on a particular topic in the domain of study. The student must choose a topic of his interest from the domain of study for a term paper. The term paper can be an original research article or review article. In case of review article, the student must refer atleast 50 research/review articles and critically review other researcher's work. The term paper may be 10 -20 pages in length. The general guidelines for writing the term paper as follows:

1. Abstract
2. Introduction to explain about the broad and general statement on the topic chosen.
3. Aim /Objective of the term paper.
4. Description of methodology, concepts and arguments.
5. Identify the research gap and suggest possible future works.
6. Conclusion

Three reviews will be conducted to monitor the progress of the work. At the end of the semester, presentation must be made by the student and Viva-Voce examination will be conducted by the internal Examiner duly appointed by the Head of the department and the students will be evaluated.

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Subject Code	Subject Name :		Ty/Lb/IE	L	T/SLr	P/R	C			
EMCF22003	Steganography and Digital Watermarking		Ty	3	0/0	0/0	3			
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> • To learn about steganography methods of hiding data • To learn about steganography Algorithm and Techniques • To learn about the watermarking models, applications and tools • To learn about watermark security and authentication 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Understand different type of steganography methods of hiding data(L2)									
CO2	Understand public key steganography and apply the steganography algorithm(L2)									
CO3	Make use of different steganography techniques(L3)									
CO4	Make use of different steganography techniques for embedding(L3)									
CO5	Apply different techniques and tools of watermarking (L3)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	2	2	2	2	2	1
CO2	3	3	2	2	2	2	2	1	1	1
CO3	3	2	2	1	1	1	2	1	2	1
CO4	3	2	2	1	1	1	2	2	2	1
CO5	3	2	2	1	2	1	2	1	1	1
COs/PSOs	PSO1			PSO2			PSO3			
CO1	3			2			2			
CO2	3			2			2			
CO3	3			2			2			
CO4	3			1			1			
CO5	3			1			1			
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
				√						

Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22003	Steganography and Digital Watermarking	Ty	3	0/0	0/0	3

UNIT I Introduction: 9 hrs

Steganography: Overview, History, Methods for hiding (text, images, audio, video, speech etc.), Issues: Security, Capacity and Imperceptibility. Steganalysis: Active and Malicious Attackers, Active and passive Steganalysis.

UNIT II 9 hrs

Frameworks for secret communication: pure steganography, secret key, public key steganography), Steganography algorithms: Adaptive and Non-Adaptive.

UNIT III 9 hrs

Steganography techniques: Substitution systems, Spatial Domain, Transform domain techniques, spread spectrum, Statistical steganography, Cover Generation and cover selection, Tools: EzStego, FFEncode, hide 4 PGP, Hide and Seek, S Toolsetc..

UNIT IV 9 hrs

Detection and Distortion Techniques: LSB Embedding, LSB Steganalysis using primary sets, Texture based.

UNIT V Steganography: 9 hrs

Digital Watermarking: Introduction, Difference between Watermarking and Steganography, History, Classification (Characteristics and Applications), Types and techniques (Spatialdomain, Frequency-domain, and Vector quantization-based watermarking), Attacks and Tools (Attacks by Filtering, Remodulation, Distortion, Geometric Compression, Linear Compression etc.), Watermark security & authentication. Recent trends in Steganography and digital watermarking techniques. Case study of LSB Embedding, LSB Steganalysis using primary sets.

Total Hours : 45

Text Book(s)

1. Peter Wayner, Disappearing Cryptography Information Hiding:Steganography&Watermarking, Morgan Kaufmann Publishers, New York,2002.
2. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker, Digital Watermarking and Steganography, Margan Kaufmann Publishers, New York,2008.
3. Neil F. Johnson, Zoran Duric, SushilJajodia, Information Hiding: Steganography and Watermarking - Attacks andCounter measures.
4. Stefan Katzenbeisser, Fabien A. P. Petitcolas, Information Hiding Techniques for Steganography and Digital Watermarking.

Subject Code	Subject Name	Ty/Lb /IE	L	T/SLr	P/R	C
EMOL22I01	Open Elective (NPTEL/ SWAYAM/Any MOOC online courses approvedby AICTE & UGC)	IE	3	0/0	0/0	3

Students should register for the online course with a minimum course duration of 8 weeks through the online portals such as NPTEL/SWAYAM/Any MOOC in the beginning of the semester. The course can be core/interdisciplinary in such a way that the same course is not repeated during the course of his study.

Students are expected to attend the online classes regularly and submit the weekly assignments before the due dates. Students should appear for the online examination and submit the certificate at the end of the semester. Internal examination will be conducted by the examiners duly appointed by the head of the department.

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Subject Code	Subject Name :	Ty/Lb/IE	L	T/SLr	P/R	C				
EMCF22L02	Dissertation Phase-I	Lb	0	0/0	0/10	5				
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory/ Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue , address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively. 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Apply the knowledge and skills acquired in the course of study addressing a specific problem or issue. (L3)									
CO2	To encourage students to think critically and creatively about societal issues and develop user friendly and reachable solutions (L4)									
CO3	To refine research skills and demonstrate their proficiency in communication skills. (L3)									
CO4	To take on the challenges of teamwork, prepare a presentation and demonstrate the innate talents.(L3)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	2	3	1	1	2	2	2	2
CO2	2	2	1	1	3	3	3	1	2	2
CO3	1	2	3	2	2	2	1	1	3	1
CO4	3	1	2	3	1	1	2	2	2	2
COs/PSOs		PSO1			PSO2			PSO3		
CO1		2			1			1		
CO2		1			2			1		
CO3		2			1			1		
CO4		2			1			1		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
				√			√			

Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22L02	Dissertation Phase-I	Lb	0	0/0	0/10	5

Students are expected to do the Project in individual. They should identify the area/topic of the Project and should collect the literatures related to the project. Students intending to do Industrial projects will approach the industries with the support of the university, identify the industrial problem and finalize the project. In case of Industrial projects apart from Industry guide, a guide has to be appointed by the department. At the end of the Semester the students should submit their Project Phase - I report to the Department and Viva -Voce examination will be conducted by the examiners duly appointed by the Head of the department.

- Find your domain of interest and perform an in depth study on the articles of the domain.
- Obtain updated knowledge through Literature Survey in reputed Journals
- Review and finalize the title by various approaches. The title should reflect problem identification, domain name, technology applied etc.
- Review and finalize the approach to the problem identified.
- Prepare a detailed action for conducting investigation including team work.
- Perform detailed Analysis / Modeling / Simulations / Design / Problem solving / Experiments as needed.
- Categorize executable project modules after considering risks and choose efficient tools for designing project modules.
- Elaborate the completed task and compile the work in PPT slides

Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22I02	Summer Internship	IE	0	0/0	4/0	2

OBJECTIVES :

- The main objective of the In-plant training is to provide a short-term work experience in an Industry/ Company/ Organization

DESCRIPTION:

- **MINI PROJECT:**

Students will have an opportunity to expose their knowledge and talent to make an innovative project. Students are supposed to do innovative projects useful to industries/society in the area of relevant Engineering, inter and multi-disciplinary areas, under the guidance of a staff member. They have to prepare a project report and submit to the department.

At the end of the semester Viva-Voce examination will be conducted by the internal Examiner duly appointed by the Head of the department and the students will be evaluated.

- **INTERNSHIP**

Students are supposed to undergo internship in related Industries for a minimum period of 30 days cumulatively during the semester. They have to prepare a report on the Internship with a certificate in proof from competent authority in the industry. At the end of the semester Viva-Voce examination will be conducted by the Examiners duly appointed by the Head of the department and the students will be evaluated.

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Subject Code	Subject Name :				Ty/Lb/IE	L	T/SLr	P/R	C	
EMCF22L03	Dissertation Phase-II				Lb	0	0/0	10/10	10	
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory/ Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue , address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively. 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Apply the knowledge and skills acquired in the course of study addressing a specific problem or issue. (L3)									
CO2	To encourage students to think critically and creatively about societal issues and develop user friendly and reachable solutions (L4)									
CO3	To refine research skills and demonstrate their proficiency in communication skills. (L3)									
CO4	To take on the challenges of teamwork, prepare a presentation and demonstrate the innate talents.(L3)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	2	3	1	1	2	2	2	2
CO2	2	2	1	1	3	3	3	1	2	2
CO3	1	2	3	2	2	2	1	1	3	1
CO4	3	1	2	3	1	1	2	2	2	2
COs/PSOs		PSO1			PSO2			PSO3		
CO1		2			1			1		
CO2		1			2			1		
CO3		2			1			1		
CO4		2			1			1		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
				√			√			

Semester 4

Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22L03	Dissertation Phase-II	Lb	0	0/0	10/10	10

To make the students to make use of the knowledge and skill developed during their Two years of study and to apply them for making an innovative product/process for the development of society and industries.

Students are expected to do a Project work in individual either in an Industry or at the University in the field of relevant Engineering /inter-disciplinary /multi-disciplinary area. The work to be carried out in Phase II should be continuation of Phase I. Each batch will be allotted a guide based on the area of Project work. In case of industrial Project external guide has to be allotted from Industry. Monthly reviews will be conducted during the semester to monitor the progress of the project by the project review committee. Students have to submit the Project thesis at the end of the semester and appear for the Project Viva-Voce examination conducted by the examiners duly appointed by the Controller of Examination. In case of industrial project certificate in proof has to be included in the report along with the bonafide certificate

- Review detailed Analysis / Modeling / Simulations / Design / Problem solving / Experiments as needed.
- Finalize executable project modules after considering risks and efficient tools for designing project modules.
- Combine all the modules through effective team work after efficient testing.
- Develop a final product / process, perform efficient Testing, arrive optimized results and conclusions and suggest future directions.
- Prepare a paper for Conference Presentation and Journal Publication and get review comments.
- Elaborate the completed task, compile the work in PPT slides and create a Project Report in the standard format.

Subject Code	Subject Name	Ty/Lb /IE	L	T/S Lr	P/R	C
EMCF22I03	Research publication	IE	0	0/0	2/2	2

Students are supposed to prepare and publish the article based on either his term paper or area of research in peer reviewed referred journal. Code of research publication ethics should be followed. After publishing the article students should present a seminar in presence of department faculties and PG students. At the end of semester viva examination will be conducted by the examiners appointed by the Head of the department.

PROGRAM ELECTIVE THEORY

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Subject Code	Subject Name :		Ty/Lb/IE	L	T/SLr	P/R	C			
EMCF22E01	Vulnerability Assessment and Penetration Testing		Ty	3	0/0	0/0	3			
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> • Understand the Penetration Testing. • Analyze various attacks • Analyze data collection and reporting tools • Describe the coding for penetration • Analyze the test using various tools 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Describe the testing tools and extracting information (L3)									
CO2	Will have the knowledge to defend the attacks through password,(L3)									
CO3	Evaluate the data and testing through tools (L4)									
CO4	Examine the coding for penetration,(L4)									
CO5	Inspect the testing data with tools (L4)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	2	3	3	2	1
CO2	3	3	2	3	3	2	3	3	2	2
CO3	3	3	2	2	2	2	2	3	2	2
CO4	3	3	2	3	2	2	2	3	2	1
CO5	3	3	3	2	2	2	2	3	3	2
COs/PSOs	PSO1			PSO2			PSO3			
CO1	3			3			2			
CO2	3			3			3			
CO3	3			2			2			
CO4	3			3			3			
CO5	3			3			3			
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√					

Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22E01	Vulnerability Assessment and Penetration Testing	Ty	3	0/0	0/0	3

UNIT I- INTRODUCTION

9 Hrs

Vulnerability Assessment- Understanding the Risks Posed by Vulnerabilities, Detecting Vulnerabilities via Security Technologies, Penetration testing-Introduction to Kali and Backtrack-Linux tools – Attack Machine- Phases of penetration test- reconnaissance extracting information from DNS-scanning-pings and ping sweeps-port scanning- NMap-Vulnerability scanning

UNIT II EXPLOITATION AND VULNERABILITY ASSESSMENT

9 Hrs

Gaining access to remote services-metasploit-password crackers- local and remote passwordcracking-password resetting-Wire shark-social engineering-website attack vectors-web based exploitation-interrogating web servers – Spidering- code injection attacks- cross-sitescripting- post exploitation-maintaining access with backdoors, root kits and meterpreter, Project Scoping-Assessing Vulnerability assessment timeline-NVAT-Prioritizing risks and threats, Assessment Methodology-Top down and Bottom Up Examination-Case study with assessment report

UNIT III DATA COLLECTION REPORTING TOOLS

9 Hrs

Data gathering, Network analysis and pillaging – Bypassing firewalls and avoiding detection-Preparation – Stealth scanning through the firewall – Avoiding IDS – Cleaning up compromised hosts – Miscellaneous evasion technique - Data Collection tools and reporting Records now s or t later – The text editor method–Dradis framework for collaboration– Setting up virtual test lab–Putting it all together.

UNIT IV VULNERABILITY THREATS AND CODING FOR PENETRATION TESTERS

9 Hrs

Threats-attacks-Impersonation –Identification versus authentication-Biometrics counter measure, Recurring threads and Usability-Flaw in space craft software-Race condition-Time of check and time of use-Countermeasure-secure software elements. Penetration Testers - Command shell scripting –Python basics – File Manipulation – network communications – Introduction to Perl – Perl Basics- working with Perl- Introduction to Ruby- building classes with ruby- Introduction to Web scripting with PHP – Manipulating windows with Power shell – Scanner Scripting – Exploitation Scripting – Post Exploitation Scripting.

UNIT V TOOLS AND CASE STUDIES

9 Hrs

Penetration Testing Tools: information gathering, web application testing, infrastructure testing
 Vulnerability Assessment Tools: eEye Digital Security- Symantec (BindView)- Still Secure- Open Source and Free Vulnerability Management Tools- Configuration and Patch Scanning- Patch Management, Patch Distribution and Deployment- Configuration Management. Network security scanners and web security scanners- case studies

REFERENCES:

Total Hours: 45

1. *The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy* by Patrick Enebreton Elsevier Publication, 2nd Edition.
2. *Penetration Testing: Hacking and Penetration Testing, an Ultimate Security Guide (Python, Ethical Hacking, Basic Security) (Learning Hacking, Penetration Testing and Programming)* by D.

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James Smith, 2015.

3. *Penetration Tester's Open Source Toolkit, Third Edition by Jeremy Faircloth, 2011.*
4. *Coding for Penetration Testers: Building Better Tools by Jason Andress and Ryan Linn, 2011*
5. *Steve Manzuik, Andre Gold, Chris Gatford, "Network Security Assessment from Vulnerability to Patch", Syngress Publishing Incorporation, 2007.*
6. *Thomas R. Peltier, Justin Peltier ,john A.Blackeley, "Managing A Network Vulnerability Assessment", Auerbach Publications, CRC Press,2003.*
7. *Charles P. P fleeger, Shari Lawrence Pfleeger, "Analyzing Computer Security: A Threat / Vulnerability / Countermeasure Approach", First Edition, Kindle Edition, 2012.*

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Subject Code : EMCF22E02		Subject Name : Network Security and Cryptography				Ty/Lb/IE	L	T/SLr	P/R	C
		Prerequisite : Cryptography				Ty	3	0/0	0/0	3
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES :										
<ul style="list-style-type: none"> • Understand OSI security architecture and classical encryption techniques. Gain basic knowledge on the number theory. • Understand various block cipher modes. • Understands the principles of public key cryptosystems, and different message • Authentication and integrity techniques 										
COURSE OUTCOMES (Cos) - Students completing the course were able to										
CO1	To identify the major types of threats to Network security and the associated attacks -L2									
CO2	To develop strategies to protect organization information assets from common attacks, understand how security policies, standards and practices are developed, L3									
CO3	Analyze, design and implement different network security protocols, L4									
CO4	To understand Authentication and Hash function concepts. L2									
Mapping of Course Outcomes with Program Outcomes (POs)										
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	1	1	2	2	2	2	1
CO2	2	2	1	1	2	2	1	3	3	3
CO3	3	3	3	1	1	2	2	2	2	1
CO4	2	2	1	1	2	2	1	3	3	3
COs/PSOs	PSO1			PSO2			PSO3			
CO1	2			1			1			
CO2	2			1			1			
CO3	1			2			1			
CO4	1			2						
Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships /	Soft Skills	
					✓					

Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22E02	Network security and cryptography	Ty	3	0/0	0/0	3

Unit – I INTRODUCTION: 9 Hrs

Introduction: Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

Unit – II ENCRYPTION: 9 hrs

Triple DES, International Data Encryption algorithm, Blowfish, RC5, Characteristics of Advanced Symmetric block ciphers. Conventional Encryption: Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

Unit – III PUBLIC KEY CRYPTOGRAPHY 9 hrs

Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography. Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

Unit – IV MESSAGE AUTHENTICATION AND HASH FUNCTIONS 9hrs

Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs. Hash and Mac Algorithms: MD File, Message digest Algorithm, Secure Hash Algorithm. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards. Authentication Applications: Kerberos, Electronic Mail Security: Pretty Good Privacy, S/MIME.

Unit – V IP SECURITY: 9 hrs

Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

Total Hours:45

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education.
2. William Stallings, "Network Security Essentials (Applications and Standards)", Pearson Education.

REFERENCE BOOKS

1. Johannes A. Buchmann, *Introduction to Cryptography*, Springer-Verlag.
2. Charlie Kaufman, Radia Perlman, Mike Speciner, *Network Security: Private Communication in Public World*, 2nd Edition, Pearson Education.
3. AtulKahate, *Cryptography and Network Security*, TMH, 2018.

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Subject Code	Subject Name : SECURED PROGRAMMING					Ty/Lb/IE	L	T/ S.Lr	P/R	C	
EMCF22E03	Prerequisite: BES18ET2					Ty	3	0/0	0/0	3	
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab											
OBJECTIVES : The student should be made to:											
<ul style="list-style-type: none"> • Understand the security alerts and identify software issues • Analyze the security errors • To study the security testing and use. • Describe the new security models and tools • Understand the security issues in application. 											
COURSE OUTCOMES (COs) :											
CO1	How to respond to security alerts which identifies software issues (L2)										
CO2	Recognize possible security programming errors (L2)										
CO3	Describe methodology for security testing and use appropriate tools in its implementation (L4)										
CO4	Apply new security-enhanced programming models and tools (L3)										
CO5	Examine the security issues in applications using programming techniques (L5)										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	3	2	3	1	3	2	2	2	1	1	
CO2	3	3	3	2	3	2	2	2	1	1	
CO3	2	2	3	3	2	2	2	2	1	1	
CO4	2	2	3	3	2	2	2	2	1	1	
CO5	3	1	3	3	3	2	2	2	1	1	
COs / PSOs	PSO1			PSO2			PSO3				
CO1	3			1			1				
CO2	3			1			1				
CO3	3			2			1				
CO4	3			2			1				
CO5	3			2			1				
3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills		
					√						

SUBJECT CODE	SUBJECT NAME	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCF22E03	SECURED PROGRAMMING	Ty	3	0/0	0/0	3

UNIT I Validating all input & Designing secure programs:

9 Hrs

Command line and environment variables, File descriptors, names and contents, Web based application inputs, Locale selection and character encoding, Filtering representable URIs, preventing cross site malicious input content, Forbidding HTTP Input to perform non-queries. Good security design principles: Securing the interface, separation of data and control. Minimize privileges: Granted, time, modules, resources etc, Using chroot, careful use of setuid/setgid. Safe default value and load initializations, Avoid race conditions, Trustworthy channels and trusted path, Avoiding semantics and algorithmic complexity attacks.

UNIT II Declarations and Initializations and Expressions:

9 Hrs

Declare objects with appropriate storage durations, Identifier declaration with conflict linkage classifications, Using correct syntax for declaring flexible array member, Avoiding information leakage in structure padding, Incompatible declarations of same function or object. Dependence on evaluation order for side effects: Reading uninitialized memory and dereferencing null pointers, Modifying objects with temporary lifetime, Accessing variable through (pointer) incompatible type, Modifying constant objects and comparing padding data.

UNIT III Integers and Floating Points:

9 Hrs

Wrapping of unsigned integers, Integer conversions and misrepresented data, Integer overflow and divide by zero errors, Shifting of negative numbers, Using correct integer precisions, Pointer conversion to integer and vice versa. Floating point values for counters: Domain and range errors in math functions, Floating point conversions and preserving precision.

UNIT IV Arrays, Strings and Memory Management:

9 Hrs

Out of bounds subscripts and valid length arrays, Comparing array pointers, Pointer arithmetic for non-array object, scaled integer, Modifying string literals, Space allocation for strings (Null terminator), Casting large integers as unsigned chars, Narrow and wide character strings and functions. Accessing freed memory: Freeing dynamically allocated memory, Computing memory allocation for an object, Copying structures containing flexible array members, Modifying object alignment by using realloc.

UNIT V I/O, Signals and Error Handling:

9 Hrs

User input and format strings, Opening an pre-opened file, Performing device operations appropriate for files, Dealing with EOF, WEOF, Copying FILE object, Careful use of fgets, fgetws,getc, putc, putwc. Use of fsetops and fgetops, Accessing closed files. Using asynchronous safe functions and signal handlers: Shared objects and signal handlers, Using signal() within interruptible signal handlers, Returning computation exception signal handler. Using errno: check and set, Depending upon indeterminate values of errno, Handling standard library errors.

TOTAL HOURS:45

Text Book:

1. Robert C. Seacord The CERT @ C Coding Standard: 98 Rules for Developing Safe,Reliable, and Secure Systems, Second Edition, Addison Wesley Professional, April 2014.(Chapters 2to 9, 11 and 12)
2. David Wheeler Secure Programming for Linux and UnixHowTo, Linux Documentation Project, Aug 2004. (Chapters 5 and 7)

Reference book:

1. JohnViega and Matt Messier Secure Programming Cookbook for C and C++, O'Reilly Media, First Edition, July 2003.

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Subject Code	Subject Name :		Ty/Lb/IE	L	T/ S.Lr	P/R	C			
EMCF22E04	Basics of Forensics Psychology		Ty	3	0/0	0/0	3			
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> • To learn the basic psychology • Analyze the behavior of biology and its structure • Evaluate the learning process • Identify the concepts of Psychologists and investigation • To Discuss the Risks • To Identify the Interrogation and confessions 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Understanding the psychology of historical roots (L2)									
CO2	To know about the structure of biology and its behaviours (L2)									
CO3	Assess the investigation. (L5)									
CO4	To assess the Risks. (L3)									
CO5	Understanding the various Interrogations (L2)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	1	1	1	1	1	1	1	2
CO2	3	3	2	2	2	1	1	1	2	2
CO3	2	3	2	2	3	2	1	1	3	3
CO4	3	3	3	2	2	2	2	3	3	3
CO5	3	2	2	2	2	2	1	1	1	2
COs/PSOs		PSO1			PSO2			PSO3		
CO1		3			2			1		
CO2		3			3			1		
CO3		3			2			1		
CO4		3			2			1		
CO5		3			2			1		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg. Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√					

Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22E04	Basics of Forensics Psychology	Ty	3	0/0	0/0	3

UNIT I

9 Hrs

The Science of psychology: The history of psychology, issues of psychology, modern perspectives, the scientific methodology, issues in psychology, ethics of psychological research. The biological perspective: Neurons and nerves, an overview of the nervous system, distant connection, looking inside living brain, from the bottom up. Sensation and perception: The ABCs of sensation, the science of seeing, the hearing sense, chemical sense somesthetics sense, The ABCs perception. Conciousness : sleep, dreams effects o f hypnosis, influence of psychoactive drugs.

UNIT II

9 Hrs

Learning: Classical conditioning, operant conditioning, cognitive leaning theory, observational learning. Memory: three memory system, retrieval of long term memories, reconstructive nature of long term memory retrival, neuroscience of memory, health and memory.

UNIT III

9 Hrs

Forensic psychology, forensic psychologists, psychology and law enforcement, techniques of criminal investigation.

UNIT IV

9 Hrs

Insanity and competency, From dangerousness to risk assessment, Syndrome evidence, child sexual abuse, child custody and related decisions, improving eyewitness identification procedures.

UNIT V

9 Hrs

Interrogation and confessions, Train consultation, Discrimination, Sexual harassment, Death penalty trails and appeals, Influencing public policy.

TOTAL HOURS: 45

REFERENCES:

1. Psychology, by Sandra K. Ciccarelli Gulf Coast State College J. Noland White Georgia College 4th edition. (unit 1 &2)
2. Forensic Psychology, by Solomon M.Fulero & Lawrence S. Wrightsman 3rd edition. (unit 3,4,5)

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Subject Code : EMCF22E05	Subject Name : Operating System Security					Ty/Lb/IE	L	T/SLr	P/R	C
	Prerequisite : Operating System					Ty	3	0/0	0/0	3
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES :										
<ul style="list-style-type: none"> • Understanding the concepts of Operating System Security • Have depth knowledge about Security kernels • To Analyze the different types of commercial OS • To understand Secure Virtual Machine Systems 										
COURSE OUTCOMES (Cos) -										
Students completing the course were able to										
CO1	Understand and analyze operating systems Security (L2)									
CO2	Analyze Security Kernels (L4)									
CO3	Apply the concept of commercial OS (L3)									
CO4	Analyze secure Virtual Machine Systems(L4)									
CO5	Apply the functionalities in Solaris (L3)									
Mapping of Course Outcomes with Program Outcomes (POs)										
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	2	1	1	2	3	2
CO2	3	3	2	2	2	2	2	2	2	3
CO3	3	3	2	1	1	1	2	3	2	1
CO4	3	3	2	1	1	2	1	1	1	1
CO5	3	3	2	2	2	2	2	2	2	2
COs/PSOs	PSO1			PSO2				PSO3		
CO1	3			3				3		
CO2	3			3				3		
CO3	3			3				2		
CO4	3			3				2		
CO5	3			3				1		
Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical /	Internship s / Technical Skills	Soft Skills	
					✓					

Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22E05	Operating SystemSecurity	Ty	3	0/0	0/0	3

UNIT I

9 Hrs

Introduction-Secure Operating Systems-Security Goals-Trust Model- Threat Model. Access Control Fundamentals-Protection System-Reference Monitor-Secure Operating Definition .Multics-Multics System-Multics Security- Multics Vulnerability Analysis

UNIT II

9 Hrs

Security in OS & Goals System Histories-UNIX Security- Windows Security-Information Flow-Information Flow Secrecy Models, Information flow integrity models- Covert Channels.

UNIT III

9 Hrs

Security Kernels & Securing Commercial OS Secure Communications Processor- Architecture, Hardware, Trusted Operating Program, Kernel Interface Package, Applications, Gemini Secure Operating System-Retrofitting Security into a Commercial OS- History of Retrofitting Commercial OS-Commercial Era-Microkernel Era- Unix Era

UNIT IV

9 Hrs

Secure Virtual Machine Systems Separation Kernels-VAX VMM Security Kernel- VAX VMM Design - VAX VMM Evaluation - VAX VMM Result- Security in other virtual Machine Systems- System Assurance.

UNIT V

9 Hrs

CASE STUDY : Solaris Trusted Extensions-Trusted Extensions Access Control- Solaris Compatibility-Trusted Extensions Mediation-Process Rights Management-Role Based Access Control – Trusted Extensions Networking-Multilevel Services-Administration-Linux Security Modules-Security Enhanced Linux.

Total Hours :45

TEXT BOOK

1. “Operating System Security” Morgan & Claypool Publishers 2008 By Trent Jaeger

Reference Book

1. Mukesh Singhal, Niranjana G Shivratri , “Advanced Concepts in Operating Systems”, McGraw Hill International, 1994.
2. Pradeep Kumar Sinha, “Distributed Operating Systems: Concepts and Design“, PHI, 2002.

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Subject Code EMCF22E06/ EMCS22E06	Subject Name : IoT and its Applications					Ty/Lb/IE	L	T/ S.Lr	P/R	C	
	Prerequisite: Networks					Ty	3	0/0	0/0	3	
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab											
OBJECTIVES : The student should be made to: <ul style="list-style-type: none"> • To study fundamental concepts of IoT. • To understand roles of sensors in IoT • To learn different protocols used for IoT design • To be familiar with IoT and M2M • To understand the role of IoT in various domains of Industry. 											
COURSE OUTCOMES (COs) :											
CO1	Understand the various concepts, terminologies and architecture of IoT systems.(L2)										
CO2	Use sensors and actuators for design of IoT. (L3)										
CO3	Apply various protocols for design of IoT systems (L3)										
CO4	Differentiate between IoT and M2M. (L3)										
CO5	Apply various design methodologies for IoT applications s. ,(L4)										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	3	2	2	2	1	2	1	1	2	2	
CO2	3	2	3	2	1	2	1	3	3	2	
CO3	3	2	3	2	3	3	2	2	3	3	
CO4	3	2	3	2	2	3	3	2	3	3	
CO5	3	2	2	2	2	3	2	2	3	3	
COs / PSOs	PSO1			PSO2				PSO3			
CO1	2			2				2			
CO2	3			3				2			
CO3	3			3				3			
CO4	3			3				2			
CO5	3			3				3			
3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills		
					✓						

SUBJECT CODE	SUBJECT NAME	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCF22E06/ EMCS22E06	IoT and its Applications	Ty	3	0/0	0/0	3

UNIT : Introduction of IoT

9 HRS

Introduction- Characteristics of IoT- Physical & Logical Design of IoT-Enabling Technologies in IoT-IoT Levels and Deployment Templates.

UNIT II: Sensors Networks

9 HRS

Definition-Types of Sensors-Types of Actuators, Examples and Working-IoT Development Boards: Arduino IDE and Board Types-RaspberryPi Development Kit-RFID Principles and components-Wireless Sensor Networks.

UNIT III: Wireless Technologies for IoT

9 HRS

WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet, Modbus-IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT-Edge connectivity and protocols.

UNIT IV: IoT and M2M

9 HRS

Introduction- M2M-Difference between IoT and M2M-SDN and NFV for IoT.

UNIT V: Applications

9 HRS

Home Automation-Smart Cities- Energy- Retail Management- Logistics-Agriculture-Health and Lifestyle- Environment- Energy.

Total Hours : 45

TEXT BOOK :

1. Vijay Madiseti and ArshdeepBahga, — “Internet of Things (A Hands-on-Approach)”, 1 st Edition, VPT, 2014.
2. Hakima Chaouchi, — “The Internet of Things Connecting Objects to the Web” ISBN : 978-1- 84821-140-7, Wiley Publications
3. Olivier Hersent, David Boswarthick, and Omar Elloumi, — “The Internet of Things: Key Applications and Protocols”, WileyPublications
4. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016.

REFERENCE BOOK:

1. Daniel Minoli, — “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press

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Subject Code	Subject Name:		Ty/Lb/IE	L	T/ S.Lr	P/R	C				
EMCF22E07/ EMCS22E07	Ethical Hacking										
	Prerequisite: Network Security		Ty	3	0/0	0/0	3				
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab											
OBJECTIVES :											
The student should be made to:											
<ul style="list-style-type: none"> • Understand issues relating to ethical hacking • Employ network defense measures 											
COURSE OUTCOMES (COs) :											
CO1	Collect information using network scanning (L1)										
CO2	Execute a penetration test using standard hacking tools in an ethical manner(L3)										
CO3	Identify legal and ethical issues related to vulnerability and penetration testing.(L1)										
CO4	Plan a vulnerability assessment and penetration test for a network. (L2)										
CO5	Identify methods to gain access to systems (L1)										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	3	3	3	2	3	2	2	2	3	2	
CO2	3	3	3	2	3	2	2	2	3	2	
CO3	3	2	3	2	3	2	2	3	2	3	
CO4	3	2	2	2	3	2	2	2	3	2	
CO5	3	3	2	2	3	2	2	2	3	2	
COs / PSOs	PSO1			PSO2			PSO3				
CO1	3			3			2				
CO2	3			3			2				
CO3	3			3			3				
CO4	3			2			3				
CO5	3			2			3				
3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills		
					√						

SUBJECT CODE	SUBJECT NAME	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCF22E07/ EMCS22E07	Ethical Hacking	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION TO ETHICAL HACKING

9 hrs

Essential Terminologies –Importance of security- Threat- Attack- Vulnerabilities Penetration Test – Vulnerability Assessments versus Penetration Test –Penetration Testing Methodologies – OSSTMM – NIST – OWASP – Categories of Penetration Test – Types of Penetration Tests

UNIT II FOOTPRINTING & PORT SCANNING

9 hrs

Foot printing - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS

UNIT III SYSTEM HACKING

9 hrs

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

9 hrs

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

9 hrs

Introduction to 802.11-Role of WEP- Cracking WEP Keys- Sniffing Traffic Wireless DOS attacks-WLAN Scanners-WLAN Sniffers-Hacking Tools-Securing Wireless Networks

Text Books:

Total Hours 45

1. Rafay Baloch, “Ethical Hacking and Penetration Testing Guide”, CRC Press, 2014.

References:

1. Kevin Beaver, “Ethical Hacking for Dummies”, Sixth Edition, Wiley, 2018.
2. Jon Erickson, “Hacking: The Art of Exploitation”, Second Edition, Rogunix, 2007.

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Subject Code	Subject Name : Cyber Law	Ty/Lb/IE	L	T/ S.Lr	P/R	C				
EMCF22E08	Prerequisite: Nil	Ty	3	0/0	0/0	3				
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
The student should be made to: <ul style="list-style-type: none"> To enable learner to understand, explore, and acquire a critical understanding cyber law. Develop competencies for dealing with frauds and deceptions (confidence tricks, scams) and other cyber crimes for example, child pornography etc. 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Make Learner Conversant With The Social And Intellectual Property Issues Emerging (L2)									
CO2	Explore The Legal And Policy Developments In Various Countries To Regulate ,(L2)									
CO3	Develop The Understanding Of Relationship Between Commerce And Cyberspace, (L3)									
CO4	Give Learners In Depth Knowledge Of Information Technology Act And Legal Frame, (L3)									
CO5	Make Study On Various Case Studies On Real Time Crimes.(L4)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	2	2	2	2
CO2	3	3	3	3	3	3	2	2	2	3
CO3	2	3	3	2	3	2	2	2	2	3
CO4	3	3	2	3	3	2	2	2	2	2
CO5	3	2	3	2	2	2	2	2	3	3
COs/PSOs		PSO1			PSO2			PSO3		
CO1		3			3			3		
CO2		3			2			3		
CO3		2			3			2		
CO4		3			3			3		
CO5		3			2			2		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√					

Subject Code	Subject Name	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCF22E08	Cyber Law	Ty	3	0/0	0/0	3

UNIT- I

9Hrs

Emergence of Cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

UNIT-II

9Hrs

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

UNIT- III

9Hrs

Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act,

UNIT-IV

9Hrs

Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security.

UNIT-V

9Hrs

Application area: Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends. Case Study On Cyber Crimes: Harassment Via E-Mails, Email Spoofing (Online A Method Of Sending E-Mail Using A False Name Or E-Mail Address To Make It Appear That The E-Mail Comes From Somebody Other Than The True Sender, Cyber Pornography (Exm.MMS),Cyber-Stalking.

TEXT BOOKS:

Total Hrs : 45

1. K.Kumar,” Cyber Laws: Intellectual property & E Commerce, Security”,1st Edition, Dominant Publisher,2011.
2. Rodney D. Ryder, “ Guide To Cyber Laws”, Second Edition, Wadhwa And Company, New Delhi, 2007.

3. Information Security policy & implementation Issues, NIIT, PHI.
4. Vakul Sharma, "Handbook Of Cyber Laws" Macmillan India Ltd, 2nd Edition, PHI, 2003.
5. Justice Yatindra Singh, " Cyber Laws", Universal Law Publishing, 1st Edition, New Delhi, 2003.
6. Sharma, S.R., "Dimensions Of Cyber Crime", Annual Publications Pvt. Ltd., 1st Edition, 2004.
7. Augustine, Paul T., "Cyber Crimes And Legal Issues", Crecent Publishing Corporation, 2007.

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Subject Code	Subject Name : Biometrics	Ty/Lb/IE	L	T/ S.Lr	P/R	C				
EMCF22E09	Prerequisite: Nil	Ty	3	0/0	0/0	3				
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> • To understand the biometric equipment and standards applied to security. • To interpretation the context of Biometric Applications • To study the various authentication with passwords • To study the various biometrics systems 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Express knowledge of the basic physical and biological science and engineering principles underlying biometric systems (L3)									
CO2	Understand and analyze biometric systems at the component level and be able to analyze and design basic biometric system applications. (L2)									
CO3	Develop team work effectively and express their work and ideas orally and in writing.(L4)									
CO4	Discover the sociological and acceptance issues associated with the design and implementation of biometric systems.(L4)									
CO5	Understand various Biometric security issues.(L2)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	1	1	3	1	1
CO2	3	3	3	2	3	1	1	2	1	1
CO3	3	3	2	2	2	1	1	1	1	1
CO4	3	3	1	1	3	3	2	1	2	1
CO5	3	3	3	1	3	3	1	2	1	1
COs/PSOs		PSO1			PSO2			PSO3		
CO1		3			2			2		
CO2		3			1			1		
CO3		3			1			1		
CO4		3			2			2		
CO5		3			2			1		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√					

Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCF22E09	Biometrics	Ty	3	0/0	0/0	3

Unit – I: Biometrics

9 Hrs

Introduction, Benefits of Biometrics over traditional authentication systems and identification systems, Selecting a Biometric for a system, Biometric Applications, Key Biometric terms and processes, Matching process of Biometrics, Limitations and Accuracy measures in Biometric systems.

Unit – II: Physiological Biometric Technologies

9 Hrs

Fingerprints - Technical description –characteristics - Competing technologies - strengths – weaknesses – deployment - Facial scan - Technical description, Characteristics, Strengths, Weaknesses, Deployment, Iris Scan - Technical description, Characteristics, Strengths, Weaknesses, Deployment, R - Retina vascular pattern Technology - characteristics - strengths – weaknesses –deployment - Hand scan - characteristics - strengths – weaknesses deployment – DNA biometrics.

Unit – III: Behavioral Biometric Technologies

9 Hrs

Behavioral Biometric Technologies: Handprint Biometrics - DNA Biometrics - signature and handwriting technology - Technical description – classification - keyboard / keystroke dynamics - Voice – data acquisition - Feature Selection and Extraction, Characteristics, Strengths, Weaknesses, Deployment.

Unit – IV: Multi Biometrics

9 Hrs

Multi biometrics: Multi biometrics and multi factor biometrics - two-factor authentication with passwords - tickets and tokens – executive decision - implementation Plan.

Unit – V: Case Studies

9 Hrs

Case studies on Physiological, Behavioral and multifactor biometrics in identification systems.

REFERENCES:

TOTAL HOURS : 45

1. Samir Nanavathi, Michel Thieme, and Raj Nanavathi, “Biometrics -Identity verification in a network”, Wiley Eastern
2. John Chirillo and Scott Blaul,” Implementing Biometric Security”, Wiley Eastern Publications
3. John Berger,” Biometrics for Network Security”, Prentice Hall

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Subject Code	Subject Name :	Ty/Lb/IE	L	T/ S.Lr	P/R	C				
EMCF22E10	Web and Database Security Prerequisite: DBMS	Ty	3	0/0	0/0	3				
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
To give an Overview of information security To Give an overview of Access control of relational databases To reveal the underlying in web application To identify future trends in database publishing. To understand the security re-engineering for databases										
COURSE OUTCOMES (Cos) Students completing this course were able to										
CO1	Identify common application vulnerabilities (L1)									
CO2	Analyze the concepts of quantum cryptography (L3)									
CO3	Analyze the Web architecture and applications (L3)									
CO4	Examine, how common mistakes can be bypassed and exploit the application (L5)									
CO5	Apply client side and service side programming (L4)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	3	2	2
CO2	3	3	3	3	3	2	3	1	1	1
CO3	3	3	3	3	3	3	3	2	1	1
CO4	3	3	3	3	3	2	2	1	1	1
CO5	3	3	3	2	2	2	2	1	1	1
COs/PSOs	PSO1			PSO2			PSO3			
CO1	3			3			3			
CO2	3			3			2			
CO3	3			3			2			
CO4	3			3			2			
CO5	3			2			2			
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√					

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Subject Code	Subject Name	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCF22E10	Web and Database Security	Ty	3	0/0	0/0	3

UNIT - I

9 HRS

The Web Security, The Web Security Problem ,Risk Analysis and Best Practices Cryptography and the Web : Cryptography and Web Security, Working Cryptographic Systems and Protocols , Legal Restrictions on Cryptography ,Digital Identification

UNIT - II

9 HRS

The Web's War on Your Privacy, Privacy-Protecting Techniques , Backups and Antitheft, Web Server Security, Physical Security for Servers, Host Security for Servers, Securing Web Applications

UNIT - III

9 HRS

Database Security : Recent Advances in Access Control, Access Control Models for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems

UNIT - IV

9 HRS

Security Re-engineering for Databases: Concepts and Techniques , Database Watermarking for Copyright Protection , Trustworthy Records Retention , Damage Quarantine and Recovery in Data Processing Systems , Hippocratic Databases: Current Capabilities

UNIT - V

9 HRS

Future Trends Privacy in Database Publishing: A Bayesian Perspective, Privacy-enhanced Location-based Access Control , Efficiently Enforcing the Security and Privacy Policies in a Mobile Environment

Textbook

Total hrs : 45

1.Web Security ,Privacy and Commerce Simson GArfinkel, Gene Spafford,O'Reilly .

2.Handbook on Database security applications and trends Michael Gertz, Sushil Jajodia

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Subject Code: EMCF22E11/ EMCS22E11	Subject Name : Edge Computing					Ty/Lb/IE	L	T/ S.Lr	P/R	C			
	Prerequisite: Distributed Systems and Algorithms					Ty	3	0/0	0/0	3			
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T / L/ ETL: Theory/Lab/Embedded Theory and Lab													
OBJECTIVE : Introduction to Edge Computing is for beginners to gain a quick understanding of the edge computing technology. The course covers various topics such as the evolution of computing industry, cloud computing basics and edge computing.													
COURSE OUTCOMES (COs) : (3- 5)													
CO1	This course will explore research, frameworks, and applications in Edge Computing, (L2)												
CO2	The class will begin with a review of current IoT Applications(L2)												
CO3	Explore frameworks for computing using RaspberryPi(L4)												
CO4	Apply the Interfacing edge to cloud applications (L3)												
CO5	Analyze edge computing with others (L3)												
Mapping of Course Outcomes with Program Outcomes (POs)													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10			
CO1	3	3	2	1	1	1	1	2	2	1			
CO2	3	3	2	1	1	1	1	2	2	1			
CO3	3	2	2	1	1	1	1	2	2	1			
CO4	3	2	2	1	1	1	1	1	2	2			
CO5	3	2	3	2	2	2	1	2	2	3			
COs / PSOs	PSO1			PSO2				PSO3					
CO1	3			3				1					
CO2	3			3				1					
CO3	3			2				1					
CO4	3			3				1					
CO5	3			3				2					
3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low													
Category	Basic Sciences	Engineering Sciences	Humanities and Social	Program Core	Program Electives	Open Electives	Practical / Project	Internships /	Soft Skills				
					✓								

SUBJECT CODE	SUBJECT NAME	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCF22E11/ EMCS22E11	Edge Computing	Ty	3	0/0	0/0	3

UNIT I Edge Computing Definition and Use Cases 9Hrs

Introduction to Edge Computing Scenario's and Use cases - Edge computing purpose and definition, Edge computing use cases, Edge computing hardware architectures, Edge platforms, Edge vs Fog Computing, Communication Models - Edge, Fog and M2M

UNIT II IoT Architecture and Core IoT Modules 9Hrs

A connected ecosystem, IoT versus machine-to-machine versus, SCADA, The value of a network and Metcalfe's and Beckstrom's laws, IoT and edge architecture, Role of an architect, Understanding Implementations with examples-Example use case and deployment,

UNIT III RaspberryPi 9Hrs

Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout and Pinouts, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi, Connecting Raspberry Pi via SSH, Remote access tools, Interfacing DHT Sensor with Pi, Pi as Webserver, Pi Camera, Image & Video Processing using Pi.

UNIT IV Implementation 9Hrs

Implementation of Microcomputer RaspberryPi and device Interfacing, Edge to Cloud Protocols, MQTT, MQTT publish-subscribe, MQTT architecture details, MQTT state transitions, MQTT packet structure, MQTT data types, MQTT communication formats, MQTT 3.1.1 working example

UNIT V Edge Computing 9Hrs

Edge computing with RaspberryPi, Industrial and Commercial IoT and Edge, Edge computing and solutions, Case study – Telemedicine palliative care, Requirements, Implementation, Use case retrospective.

Total Hours: 45

TEXT BOOK:

1. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packt Publishing, 2020, ISBN: 9781839214806
2. Raspberry Pi Cookbook, 3rd Edition, by Simon Monk, Publisher: O'Reilly Media, Inc., 2019, ISBN: 978149204322.

REFERENCE BOOK:

1. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, Satish Narayana Srirama, wiley publication, 2019, ISBN: 9781119524984.
2. David Jensen, "Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge, MICROSOFT AZURE

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Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C				
EMCF22E12	Information Security Audit	Ty	3	0/0	0/0	3				
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : CreditsT/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> To introduce the fundamental concepts and techniques in computer and network security, giving students an overview of information security and auditing. To expose students to the latest trend of computer attack and defense. Other advanced topics on information security such as mobile computing security, security and privacy of cloud computing, as well as secure information system development will also be discussed. 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Discussed various algorithms and Distributions.(L3)									
CO2	Understanding the approaches of message authentication (L2)									
CO3	Analyze the security principles and its requirements(L4)									
CO4	Apply the roles and procedures for audit(L3)									
CO5	Analyze the approaches to audits during the system development(L4)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	1	1	3	1	1
CO2	3	3	3	2	3	1	1	3	1	1
CO3	3	3	2	2	2	1	1	1	1	1
CO4	3	3	1	1	3	3	3	1	2	1
CO5	3	3	3	1	3	3	1	3	1	1
COs/PSOs		PSO1			PSO2			PSO3		
CO1		3			2			2		
CO2		3			1			1		
CO3		3			1			2		
CO4		3			2			2		
CO5		3			2			2		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√					

Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCF22E12	Information Security Audit	Ty	3	0/0	0/0	3

UNIT – I : 9 Hrs

A model for Internetwork security, Conventional Encryption Principles & Algorithms (DES, AES, RC4, Blowfish), Block Cipher Modes of Operation, Location of Encryption Devices, Key Distribution. Public key cryptography principles, public key cryptography algorithms (RSA, Diffie-Hellman, ECC), public Key Distribution.

UNIT – II : 9 Hrs

Approaches of Message Authentication - Secure Hash Functions (SHA-512, MD5) and HMAC, Digital Signatures, Kerberos, X.509 Directory Authentication Service, Email Security: Pretty Good Privacy (PGP) IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT – III : 9 Hrs

Web Security: Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Firewalls: Firewall Design principles, Trusted Systems, Intrusion Detection Systems

UNIT – IV : 9 Hrs

Auditing For Security: Introduction, Basic Terms Related to Audits, Security audits, The Need for Security Audits in Organization, Organizational Roles and Responsibilities for Security Audit, Auditors Responsibility In Security Audits, Types Of Security Audits.

UNIT – V : 9 Hrs

Information Security Assessments: Vulnerability Assessment, Classification, Types of Vulnerability Assessment, Vulnerability Assessment Phases, Vulnerability Analysis Stages, Characteristics of a Good Vulnerability Assessment Solutions & Considerations, Vulnerability Assessment Reports – Tools and choosing a right Tool, Information Security Risk Assessment, Risk Treatment, Residual Risk, Risk Acceptance, Risk Management Feedback Loops etc.

TEXT BOOKS TOTAL HOURS: 45

1. Cryptography and Network Security by William Stallings, Fourth Edition, Pearson Education 2007.
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education, 2008.
3. Cryptography & Network Security by Behrouz A. Forouzan, TMH 2007.
4. Information Systems Security by Nina Godbole, WILEY 2008.
5. Assessing Information Security (strategies, tactics, logic and framework) by A Vladimirov, K.Gavrilenko, and A.Michajlowski
6. “The Art of Computer Virus Research and Defense by Peter Szor.”

REFERENCE BOOKS:

1. Information Security by Mark Stamp, Wiley – INDIA, 2006.
2. Fundamentals of Computer Security, Springer.
3. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
4. Computer Security Basics by Rick Lehtinen, Deborah Russell & G. T. Gangemi Sr., SPD O'REILLY 2006.
5. Modern Cryptography by Wenbo Mao, Pearson Education 2007.
6. Principles of Information Security, Whitman, Thomson.

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Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C				
EMCF22E13	Data Privacy	Ty	3	0/0	0/0	3				
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> • To introduce the fundamentals of statistics ,data privacy & polices. • To Study the mathematical model and computing practices • To learn the protection models and surveys • To study the computation system • Aware of policies and practices of technology 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Learning and applying the concepts of statistics and policies (L3)									
CO2	Describe the mathematical models and computations. (L3)									
CO3	Capable to protect the models through techniques (L3)									
CO4	To protect the system through computation. (L4)									
CO5	Implement the policies and practices in the system (L4)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	2	2	2	2
CO3	3	3	3	3	2	2	2	2	2	2
CO4	3	3	3	2	2	2	2	1	1	1
CO5	3	3	3	2	2	1	1	1	1	1
COs/PSOs	PSO1			PSO2				PSO3		
CO1	3			2				2		
CO2	3			1				1		
CO3	3			1				2		
CO4	3			2				2		
CO5	3			2				2		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√					

Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCF22E13	Data Privacy	Ty	3	0/0	0/0	3

Unit I :

9 Hrs

Data Privacy and its Importance - Need for Sharing Data, Methods of Protecting Data, Importance of Balancing Data Privacy and Utility, Disclosure, Tabular Data, Micro data, Approaches to Statistical disclosure control, Ethics, principles, guidelines and regulations.

Unit II :

9 Hrs

Microdata- Disclosure, Disclosure risk, Estimating re-identification risk, Non-perturbative microdata masking, Perturbative microdata masking, Information loss in microdata.

Unit III :

9 Hrs

Static Data Anonymization on Multidimensional Data - Privacy Preserving Methods, Classification of Data in a Multidimensional Data Set, Group- Based Anonymization, k- Anonymity, l-Diversity, t-closeness.

Unit IV :

9 Hrs

Static Data Anonymization on Complex Data Structures - Privacy Preserving Graph Data, Privacy Preserving Time Series Data, Time Series Data Protection Methods, Privacy Preservation of Longitudinal Data, Privacy Preservation of Trans- action Data.

Unit V :

9 Hrs

Data Anonymization Threats-Threats to Anonymized Data, Threats to Data Structures, Threats by Anonymization Techniques, Randomization, k- Anonymization, l-Diversity, t-Closeness. Dynamic Data Protection: Tokenization, Understanding Tokenization, Use Cases for Dynamic Data Protection, Benefits of Tokenization Compared to Other Methods, Components for Tokenization.

Total Hours: 45

Text books and References:

1. Nataraj Venkataramanan, AshwinShriram, Data Privacy: Principles and Practice, Taylor Fran- cis, 2016. (ISBN No.: 978-1-49-872104-2).
2. Anco Hundepool, Josep Domingo-Ferrer, Luisa Franconi, Sarah Giessing, Eric Schulte Nordholt, Keith Spicer, Peter-Paul de Wolf, Statistical Disclosure Control, Wiley, 2012. (ISBN No.: 978- 1-11-997815-2)

Reference Books :

1. George T. Duncan. Mark Elliot, Juan-Jose Salazar-Gonzalez, Statistical Confidentiality: Principle and Practice. Springer, 2011. (ISBN No.: 978-1-44-197801-1).
2. Aggarwal, Charu C., Yu, Philip S., Privacy-Preserving Data Mining : Models and Algorithms, Springer, 2010. (ISBN No.: 978-0-38-770991-8). Mode of Evaluation: CAT / Assignment / Quiz / FAT / Project / Seminar

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Subject Code	Subject Name :	Ty/Lb/IE	L	T/ S.Lr	P/R	C				
EMCF22E14	Applied Cryptography Prerequisite : Network Security	T y	3	0/0	0/0	3				
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> • Acquire fundamental knowledge on the concepts of finite fields and number theory • Identify the various cryptographic protocols • Identify the intermediate protocols • Describe the principles of public key cryptosystems, hash functions and digital signature. • Understand various block cipher and stream cipher models 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Understand the fundamentals of number theory and algorithms (L2)									
CO2	Analyze , design, and implement different cryptography protocols (L4)									
CO3	Apply the intermediate protocols for linking and distributing (L3)									
CO4	Understand various Security practices and System security standards (L2)									
CO5	Apply the various Authentication schemes to simulate different applications (L3)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	2	2	1	2	2	1
CO2	3	3	3	2	2	1	2	1	2	1
CO3	3	3	3	2	3	2	2	2	2	1
CO4	3	3	3	2	3	2	2	2	2	1
CO5	3	2	3	2	3	2	2	2	2	1
COs/PSOs		PSO1			PSO2			PSO3		
CO1		3			2			2		
CO2		3			1			2		
CO3		3			2			2		
CO4		3			2			2		
CO5		3			2			2		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√					

Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCF22E14	Applied Cryptography	Ty	3	0/0	0/0	3

UNIT I MATHEMATICAL FOUNDATION 9 Hrs

Number theory: Fermat's and Euler's theorem-Chinese remainder theorem-Euclidean algorithm-Test for primality-Discrete logarithms, Information theory: entropy, Uncertainty-Complexity theory: pseudo random number generation and generators.

UNIT II CRYPTOGRAPHIC PROTOCOLS 9 Hrs

Protocol Building Blocks-Basic Protocols: key Exchange-Authentication-Authentication and Key exchange: Wide-mouth frog, Yahalom, Kerberos-Formal Analysis of Authentication and Key Exchange Protocols-Multiple Key Public Key Cryptography-Secret Splitting-Secret Sharing: Secret Sharing with Cheaters-Cryptographic protection of Databases.

UNIT III INTERMEDIATE PROTOCOLS: 9 Hrs

Time stamping services, Linking protocol, Distributed Protocol-Undeniable digital signatures-Proxy Signatures-Group Signatures-Fail-stop signatures-computing with encrypting data-bit commitment- Fair coin flips-one-way accumulators.

UNIT IV ADVANCED PROTOCOLS 9 Hrs

Zero knowledge proof, Parallel Zero Knowledge Proof, Zero Knowledge proof of identity: Chess Grandmaster Problem-Blind Signatures-Simultaneous Contract Signing-Digital certified Mail-Simultaneous Exchange of Secrets-Esoteric protocols: Secure Elections-Secure Multiparty Computation.- Digital cash

UNIT V CRYPTOGRAPHIC TECHNIQUES AND ALGORITHMS 9 Hrs

Key Length: Symmetric key Length, Public Key length-Algorithm types and Modes: Electronic Code Book Mode, Block Replay, Cipher Block Chaining Mode-Using Algorithms: Choosing an Algorithm, Public Key Cryptography vs Symmetric Cryptography, Encrypting Communication Channels- Public Key Algorithms: RSA, Pohlig-Hellman, Rabin, Elliptic Curve Cryptosystems - Public Key Digital Signature Algorithms: Ghost Digital Signature Algorithm, Discrete Logarithm Signature schemes. Real World approach: IBM secret key management protocol-MITRENET,ISDN, SESAME.

Total Hours: 45

REFERENCES:

1. Applied Cryptography: Protocols, Algorithms and source code in C, Wiley, Second Edition- Bruce Schneier (OCT 18, 1996)
2. Cryptography and Network Security Principles and practices-William Stallings (Jan 24, 2010)
3. **Foundations of Cryptography: Volume 1, Basic Tools by OdedGoldreich (Jan 18, 2007)**
4. Encryption: High-impact Strategies - What You Need to Know: Definitions, Adoptions, Impact, Benefits, Maturity... by Kevin Roebuck, Emerepty Limited, 2011.
5. **Foundations of Cryptography: Volume 2, Basic Applications by OdedGoldreich (Sep 17, 2009)**

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Subject Code	Subject Name : Malware Analysis	Ty/Lb/IE	L	T/ S.Lr	P/R	C				
EMCF22E15/ EMCS22E15	Prerequisite : Network Security	Ty	3	0/0	0/0	3				
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization Practice with an expertise in academics to design and implement security solutions Understand key terms and concepts in Cryptography, Governance and Compliance. Understand principles of web security and to guarantee a secure network by monitoring and analyzing the nature of attacks through cyber/computer forensics software/tools. 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Understand the purpose of malware analysis L2									
CO2	Analyze various malwares and understand the behavior of malwares in real world applications L4									
CO3	Implement different malware analysis techniques L3									
CO4	Identify the various tools for malware analysis. L1									
CO5	Analyze the malware behavior in windows and android L4									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	2	2	3	2	2
CO2	3	3	3	2	3	2	2	3	2	1
CO3	3	3	3	2	2	1	1	2	1	1
CO4	3	3	3	2	3	2	3	2	2	1
CO5	3	3	3	2	2	2	1	2	2	1
COs/PSOs	PSO1			PSO2			PSO3			
CO1	3			2			3			
CO2	3			2			2			
CO3	3			2			2			
CO4	3			3			2			
CO5	3			2			2			
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√					

Elective IV

Subject Code	Subject Name	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCF22E15/ EMCS22E15	Malware Analysis	Ty	3	0/0	0/0	3

UNIT – I : **9 Hrs**

Malware Analysis

Malware Analysis and Reverse Engineering, Types of Malware Analysis, Purpose of Malware Analysis Limitations of Malware Analysis, The Malware Analysis Process , Malware Classes Infectors, Network Worms, Trojan Horse Backdoors, Remote-Access Trojan, Information Stealers

UNIT – II : **9 Hrs**

Malware Deployment

Malware Infection Vectors, Speed, Stealth, Coverage, Shelf Life, Types of Malware Infection Vectors, Physical Media, E-mails. Instant Messaging and Chat, Social Networking, URL Links, File Shares, Software Vulnerabilities- **Protective Mechanisms-** The Two States of Malware, Static Malware, Dynamic Malware, Protective Mechanisms, Static Malware Protective Mechanisms, Dynamic Malware Protective Mechanisms

UNIT – III : **9 Hrs**

Malware Dependencies

Dependency Types, Environment Dependencies, Program Dependencies, Timing Dependencies, Event Dependencies, **Malware Collection-** Your Own Backyard, Scan for Malicious Files, Look for Active Rootkits, Inspect Startup Programs, Inspect Running Processes, Extract Suspicious Files, **The Portable Executable File-**The Windows Portable Executable File, The PE File Format, Relative Virtual Address, PE Import Functions.

UNIT – IV : **9 Hrs**

The Proper Way to Handle Files- File’s Analysis Life Cycle, Transfer, Analysis, Storage, **Inspecting Static Malware-** Static Analysis Techniques, File Type Identification, Antivirus Detection, Protective Mechanisms Identification, PE Structure Verification

UNIT – V : **9 Hrs**

Static Malware

Inspecting Static Malware-Static Analysis Techniques, ID Assignment-File Type Identification, Antivirus Detection, Protective Mechanisms Identification, PE Structure Verification, Dynamic Analysis-Analyzing Host Behavior, Analyzing Network Behavior

TEXT BOOKS

TOTAL HOURS: 45

- 1.Christopher C. Elisan “Advance Malware Analysis”, Mc Craw Hill Education

REFERENCE BOOKS:

1. Cameron H. Malin, Eoghan Casey, James M. Aquilina and Curtis W. Rose, Malware Forensics Field Guide for Windows Systems, Syngress, Elsevier, 2014
2. Ken Dunham, Saeed Abu-Nimeh, Michael Becher and Seth Fogie, Mobile Malware Attacks and Defense, Syngress, Elsevier, 2009
3. Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides by Cameron H. Malin, Eoghan Casey, James M. Aquilina 1st Edition.
4. The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and MacMemory by Michael Hale Ligh, Kindle Edition

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Subject Code	Subject Name :		Ty/Lb/IE	L	T/ S.Lr	P/R	C			
EMCF22E16	Image Forensics and Security		Ty	3	0/0	0/0	3			
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
This course <ul style="list-style-type: none"> To understand the concepts of Image Forensics and Security Emphasize the fundamentals and importance of image security techniques Presents the Digital Image Processing, Digital Image Formation, Image Forensics, Pixel Based, Statistical-Based, Camera-Based, Video Forensics, Image Hiding, Image Coding, Image security techniques: visual cryptography, stenography, water marking 										
COURSE OUTCOMES (Cos) Students completing this course were able to										
CO1	Upon successful completion of this course, the students will get an in-depth knowledge in image and video forensics and its security techniques L2									
CO2	Helps students to learn various types of image formation Techniques L3									
CO3	Students will learn the Fourier Transform and Forensic image analysis L2									
CO4	Students will gain the knowledge of statistical based forensics L2									
CO5	Students learn to conduct a Video Forensics & Image Security Techniques in an organized and systematic way L2									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	2	2	2	2	2	2	2
CO2	3	3	3	3	2	2	2	3	3	1
CO3	3	3	2	2	3	2	2	2	2	2
CO4	3	3	3	3	3	3	3	3	3	2
CO5	3	3	3	3	3	3	3	3	3	2
COs/PSOs		PSO1			PSO2			PSO3		
CO1		3			2			2		
CO2		2			2			1		
CO3		2			2			2		
CO4		3			2			2		
CO5		2			3			2		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
				✓						

SUBJECT CODE	SUBJECT NAME	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCF22E16	Image Forensics and Security	Ty	3	0/0	0/0	3

UNIT I: INTRODUCTION

9 Hrs

Introduction to Image Processing, Background, Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing- Image Acquisition, Storage, Processing, Communication, Display.

UNIT 2: DIGITAL IMAGE FORMATION

9 Hrs

Image formation, image compression, point processing, neighbourhood operations, image analysis. Morphological Image Processing : Dilation and Erosion, Opening and Closing, Extensions to gray level images, hit or miss transformation, basic morphologic algorithms

UNIT 3: IMAGE FORENSICS

9 Hrs

Format-Based Forensics- Fourier Transform-Smoothing and Sharpening, frequency domain filters- Ideal, Butterworth and Gaussian Filters, Homomorphic filtering, JPEG, Camera-Based Forensics. Pixel-Based Forensics: Resampling, Cloning, Thumbnails.

UNIT 4: STATISTICAL-BASED FORENSICS

9 Hrs

Principal Component Analysis, Linear Discriminant Analysis, Quadratic Discriminant Analysis and Logistic Regression, Computer Generated or Photographic: Perception.

UNIT 5: VIDEO FORENSICS & IMAGE SECURITY TECHNIQUES

9 Hrs

Motion, Re-Projected, Projectile, Enhancement Physics-Based Forensics: 2-D Lighting, Lee Harvey Oswald (case study). Image Hiding, Image Coding. Image file Forensics, Video Surveillance, RFID and Vehicular tracking (GPS) devices, Image security techniques: visual cryptography, Stenography, water marking.

Total Hours : 45

Text Book

1. Gonzales/ Woods/ Eddins, Digital Image Processing using MATLAB, 2nd edition, Gatesmark Publishing, ISBN 9780982085400

References

1. N.Efford, Digital Image Processing, Addison Wesley 2000, ISBN 0-201-59623-7
2. 3. M Sonka, V Hlavac and R Boyle, Image Processing, Analysis and Machine Vision, PWS 1999, ISBN 0-534-95393
3. Pratt.W.K., Digital Image Processing, John Wiley and Sons, New York, 1978

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Subject Code	Subject Name :		Ty/Lb/IE	L	T/S.Lr	P/R	C			
EMCF22E17	Data Analytics for Fraud Detection		Ty	3	0/0	0/0	3			
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> Discuss the overall process of how data analytics is applied Discuss how data analytics can be used to better address and identify risks Help mitigate risks from fraud and waste for our clients and organizations 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Formulate reasons for using data analysis to detect fraud. (L6)									
CO2	Clarify characteristics and components of the data and assess its completeness (L3)									
CO3	Identify known fraud symptoms and use digital analysis to identify unknown fraud symptoms. (L1)									
CO4	Automate the detection process (L5)									
CO5	Prove results and understand how to prosecute fraud (L5)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	2	2	3	2	2
CO2	3	3	3	2	3	2	2	3	2	1
CO3	3	3	3	2	2	1	1	2	1	1
CO4	3	3	3	2	3	2	3	2	2	1
CO5	3	3	3	2	2	2	1	2	2	1
COs/PSOs	PSO1			PSO2			PSO3			
CO1	3			2			3			
CO2	3			2			2			
CO3	3			2			2			
CO4	3			3			2			
CO5	3			2			2			
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√					

Subject Code	Subject Name	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCF22E17	Data Analytics for Fraud Detection	Ty	3	0/0	0/0	3

UNIT - I **9hrs**

Introduction: Defining Fraud, Anomalies versus ,Fraud, Types of Fraud, Assess the Risk of Fraud, Fraud Detection : Recognizing Fraud, Data Mining versus Data Analysis and Analytics, Data Analytical Software, Anomalies versus Fraud within Data, Fraudulent Data Inclusions and Deletions

UNIT - II **9hrs**

The Data Analysis Cycle : Evaluation and Analysis, Obtaining Data Files, Performing the Audit, File Format Types, Preparation for Data Analysis, Arranging and Organizing Data, Statistics and Sampling: Descriptive Statistics, Inferential Statistics , Measure of Centre, Dispersion, Variability, Sampling.

UNIT - III **9hrs**

Data Analytical Tests : Benford’s Law, Number Duplication Test , Z-Score, Relative Size Factor Test, Same-Same-Same Test , Same-Same-Different Test

UNIT – IV **9hrs**

Advanced Data Analytical Tests: Correlation, Trend Analysis, , GEL-1 and GEL-2 , Skimming and Cash Larceny, Billing schemes : and Data Familiarization, Benford’s Law Tests, Relative Size Factor Test , Match Employee Address to Supplier data,Gap Detection of Check Number Sequences

UNIT - V **9hrs**

Payroll Fraud: Data and Data Familiarization, Analysis , The Payroll Register, Expense Reimbursement Schemes , Register disbursement schemes , Nocash Misappropriations .

Total Hours : 45

Textbook

1. Fraud and Fraud Detection: A Data Analytics Approach by Sunder Gee , Wiley

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Subject Code:	Subject Name : Block Chain Technology		Ty/Lb/IE	L	T/ S.Lr	P/R	C						
EMCF22E18/ EMCS22E18	Prerequisite: Cryptography		Ty	3	0/0	0/0	3						
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab													
OBJECTIVES : The student should be made to: <ul style="list-style-type: none"> • Know the concepts of block chain technologies • understand primary objective of this course is to cover the technical aspects of crypto currencies, block chain technologies, and distributed consensus. • familiarize potential applications for Bit coin-like crypto currencies 													
COURSE OUTCOMES (COs) :													
CO1	Understand emerging abstract models for Block chain Technology L2												
CO2	Analyse the concept of bit coin and mathematical background behind it L4												
CO3	Apply the tools for understanding the background of crypto currencies L3												
CO4	Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain L1												
CO5	Understanding of latest advances and its applications in Block Chain Technology L1												
Mapping of Course Outcomes with Program Outcomes (POs)													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10			
CO1	3	3	1	1	1	1	1	1	1	3			
CO2	3	3	2	3	3	2	3	2	2	3			
CO3	3	3	3	3	3	2	3	2	2	2			
CO4	3	3	3	3	3	2	3	2	2	2			
CO5	3	3	3	3	3	2	3	2	2	2			
COs / PSOs	PSO1			PSO2				PSO3					
CO1	2			1				3					
CO2	3			2				2					
CO3	3			2				3					
CO4	3			3				3					
CO5	3			3				3					
3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low													
Category	Basic Sciences	Engineering Sciences	Humanities and Social	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills				
					√								

SUBJECT CODE	SUBJECT NAME	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCF22E18/ EMCS22E18	Block Chain Technology	Ty	3	0/0	0/0	3

UNIT I- INTRODUCTION

9hrs

Basic of Blockchain Architecture – Challenges – Applications – Block chain Design Principles -The Blockchain Ecosystem - The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS).

UNIT II- CRYPTOGRAPHIC FUNDAMENTALS

9hrs

Cryptographic basics for crypto currency - a short overview of Hashing, cryptographic algorithm – SHA 256, signature schemes, encryption schemes and elliptic curve cryptography- Introduction to Hyperledger- Hyperledger framework - Public and Private Ledgers.

UNIT III-BIT COIN

9hrs

Bit coin - Wallet - Blocks - Merkle Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin.Bitcoinblockchain,thechallenges, and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their uses.

UNIT IV-ETHEREUM

9hrs

Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity -Smart Contracts - some attacks on smart contracts. Ethereum and Smart Contracts- The Turing Completeness of Smart Contract Languages and verification challenges- comparing Bitcoin scripting vs. Ethereum Smart Contracts

UNIT V- HYPERLEDGER

9hrs

Understanding Hyperledger Fabric, Overview of Open source Hyperledger project, Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric.

Case studies/ Enabling Technologies and applications- Application of blockchain in privacy and security, IoT and smart cities, Business and Industry, Data management, e-Governance

Total Hours: 45

Text Books:

1. Melanie Swan, “Block Chain: Blueprint for a New Economy”, O’Reilly, first edition – 2015.
2. Daniel Drescher, “Block Chain Basics”, Apress; 1st edition, 2017
3. Anshul Kaushik, “Block Chain and Crypto Currencies”, Khanna Publishing House, Delhi.
4. Imran Bashir, “Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Packt Publishing, first edition – 2012

Reference Books:

1. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Block Chain”, Packt Publishing

PROGRAM ELECTIVE LAB

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2022 Regulation

Subject Code	Subject Name :		Ty/Lb/IE	L	T/SLr	P/R	C			
EMCF22EL1	Vulnerability Assessment and Penetration Testing lab		Lb	0	0/0	4/0	2			
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> • To Learn the n/w mapping& Identification • To understand the different Sweeping technique • To understand the packet crafting & fingerprinting using remote OS • To Understand various problems in File systems • To Understand the web testing techniques . • 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Guide to map the N/W (L2)									
CO2	Will have the knowledge to sweeping techniques (L3)									
CO3	Explain packet crafting & interpreting through tools (L4)									
CO4	Analyze and explain file system (L4)									
CO5	Use the web testing techniques (L3)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	2	3	3	2	1
CO2	3	3	2	3	3	2	3	3	2	2
CO3	3	3	2	2	2	2	2	3	2	2
CO4	3	3	2	3	2	2	2	3	2	1
CO5	3	3	3	2	2	2	2	3	3	2
COs/PSOs		PSO1			PSO2			PSO3		
CO1		3			3			2		
CO2		3			3			1		
CO3		2			2			2		
CO4		2			3			2		
CO5		3			3			1		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√		√			

Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22EL1	Vulnerability Assessment and Penetration Testing lab	Lb	0	0/0	4/0	2

OBJECTIVES:

To implement the following list of programs

1. Network Mapping & Target Identification
 - a. Analysis of output from tools used to map the route between the engagement point and a number of targets.
 - b. Network sweeping techniques to prioritize a target list and the potential for false negatives.
2. Interpreting Tool Output - Interpreting output from port scanners, network sniffers and other network enumeration tools.
3. Filtering Avoidance Techniques - The importance of egress and ingress filtering, including the Risks associated with outbound connections.
4. Packet Crafting - Packet crafting to meet a particular requirement:
 - modifying source ports
 - Spoofing IP addresses
 - Manipulating TTL's
 - Fragmentation
 - Generating ICMP packets
5. OS Fingerprinting - Remote operating system fingerprinting; active and passive techniques.
6. Network Access Control Analysis - Reviewing firewall rule bases and network access control lists.
7. File System Permissions
 - a. File permission attributes within UNIX and Windows file systems and their security implications.
 - b. Analyzing registry ACLs
8. Configuration Analysis - Analyzing configuration files from the following types of Cisco equipment:
 - Routers
 - Switches
9. Unix Security Assessment
 - a. User enumeration- Discovery of valid usernames from network services commonly running by default:
 - rusers
 - rwho
 - SMTP
 - finger
 - b. Unix vulnerabilities - Common post-exploitation activities:
 - exfiltrate password hashes
 - crack password hashes
 - check patch levels

- derive list of missing security patches
- reversion to previous state
- c. FTP - FTP access control

Anonymous access to FTP servers

Risks of allowing write access to anonymous users

- d. Send mail / SMTP - Valid username discovery via EXPN and VRFY

Awareness of recent Send mail vulnerabilities; ability to exploit them if possible.

Mail relaying

10. Web Testing Techniques

a. Web Site Structure Discovery-

- Spidering tools and their relevance in a web application test for discovering linked content.
- Forced browsing techniques to discover default or unlinked content

b. Cross Site Scripting Attacks

- Arbitrary JavaScript execution.
- Using Cross Site Scripting techniques to obtain sensitive information from other users.
- Phishing techniques.

c. SQL Injection

- Determine the existence of an SQL injection condition in a web application.
- Determine the existence of a blind SQL injection condition in a web application.
- Exploit SQL injection to enumerate the database and its structure.
- Exploit SQL injection to execute commands on the target server.

d. Session ID Attacks

- Investigate session handling within a web application.
- Harvest and analyze a number of session identifiers for weaknesses.

e. Data Confidentiality & Integrity

- Identifying weak (or missing) encryption.
- Identifying insecure SSL configurations.

f. Directory Traversal

- Identifying directory traversal vulnerabilities within applications.

g. Code Injection

- Investigate and exploitation of code injection vulnerabilities within web applications

h. Application Logic Flaws

- Assessing the logic flow within an application and the potential for subverting the logic

Total Hours : 60

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Subject Code : EMCF22EL2		Subject Name : Network Security and Cryptography lab				Ty/Lb/IE	L	T/SLr	P/R	C	
		Prerequisite : Networks				Lb	0	0/0	4/0	2	
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab											
OBJECTIVES :											
<ul style="list-style-type: none"> Demonstrate various network security applications, IPSec, Firewall, IDS, Web Security, Email Security and Malicious software etc., 											
COURSE OUTCOMES (Cos) :											
Students completing the course were able to											
CO1	Identify the security issues in the network and resolve it. (L1,L2)										
CO2	Analyse the vulnerabilities in any computing system and hence be able to design a security solution. (L2,L3,L4)										
CO3	Evaluate security mechanisms using rigorous approaches by key ciphers and Hash functions.(L2,L3,L4)										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	3	2	3	2	1	3	2	1	3	3	
CO2	2	2	1	1	2	2	1	3	3	3	
CO3	3	2	2	2	3	2	2	3	3	3	
COs/PSOs	PSO1			PSO2				PSO3			
CO1	2			1				1			
CO2	2			1				1			
CO3	3			2							
Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills		
					✓		✓				

Subject Code	Subject Name	Ty/Lb/IE	L	T/SLr	P/R	C
EMCF22EL2	Network Security and Cryptography lab	Lb	0	0/0	4/0	2

1. Implement the following Substitution & Transposition Techniques concepts:
 - a) Caesar Cipher b) Playfair Cipher c) Hill Cipher d) Vignere Cipher e) Rail fence – row & Column Transformation
2. Implement the following algorithms a) DES b) RSA Algorithm c) Diffie-Hellman d) MD5 e) SHA-1
3. Implement the SIGNATURE SCHEME - Digital Signature Standard
4. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).
5. Setup a honey pot and monitor the honeypot on network (KF Sensor)
6. Installation of rootkits and study about the variety of options
7. Perform wireless audit on an access point or a router and decrypt WEP and WPA.
 (Net Stumbler) Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w).
8. Implement the Blowfish algorithm logic.

Total Hours : 60

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Subject Code	Subject Name :		Ty/Lb/IE	L	T	P	C			
EMCF22EL3	SECURED PROGRAMMING LAB		Lb	3	0/0	0/0	3			
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> • Understand the files and data types using programs • To Study the unsafe programming • To Learn the various problems using file concepts. • Understand the Shell script techniques . 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Use the file concepts in programming (L1)									
CO2	Exhibit dangers of unsafe programming (L3)									
CO3	Demonstrate the dependence on evaluation order (L5)									
CO4	Exhibit the file concepts using programs (L5)									
CO5	Demonstrate the shell script to create file (L5)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	1	3	2	2	2	-	-
CO2	2	2	2	2	3	2	2	2	-	-
CO3	1	1	1	3	2	2	2	2	-	-
CO4	1	2	1	3	2	2	2	2	1	1
CO5	3	1	3	3	3	2	2	2	1	1
COs/PSOs	PSO1			PSO2			PSO3			
CO1	2			1			-			
CO2	2			1			-			
CO3	3			2			-			
CO4	2			1			-			
CO5	1			2			-			
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√		√			

SUBJECT CODE	SUBJECT NAME	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCF22EL3	Secured Programming Lab	Lb	0	0/0	4/0	2

Laboratory Experiments:

1. Write a program to validate filenames. The filenames should allow alphanumeric and underscore. Eliminate the special characters in the filename.
2. Write a program to ensure the floating point conversion is within the range of the new (Integer) type.
3. Write a program to remove illegal characters from a file name but leave spaces.
4. Demonstrate dangers of unsafe programming e.g. use of strlen, strcpy, strcat, printf, gets, and scanf family of functions etc.
5. Demonstrate buffer overflow using different sizes of integers especially between 64bits and 32 bits integers.
6. Demonstrate the dependence on evaluation order for side effects.
7. Write a program to manipulate filenames having spaces and special characters.
8. Demonstrate use of chroot to limit the files visible to programs.
9. Write a program to create secure temporary files using mkstemp().
10. Write a program to demonstrate dangers of referencing freed memory.
11. Write a shell script to mask the permissions of newly created file using umask().

Total Hours : 60

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Subject Code	Subject Name :		Ty/Lb/IE	L	T/ S.Lr	P/R	C			
EMCF22EL4	Information Security Audit Lab		Lb	0	0/0	4/0	2			
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> • To study the nature of network security fundamentals • To Study the attacks and capturing techniques • To Learn about virus, anti-intrusion techniques • Understand the implementation of DES and RSA algorithm • Analyze the IP based authentication 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	How to remove the virus (L2)									
CO2	How to Eliminate the attacks through security system (L3)									
CO3	Develop the web based password capturing (L4)									
CO4	Implementing the Algorithm for data encryption (L3)									
CO5	Will make the program through IP based authentication (L4)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	1	1	3	1	1
CO2	3	2	3	2	3	1	1	3	1	1
CO3	3	3	2	2	2	1	1	1	1	1
CO4	3	2	1	1	3	3	3	1	2	1
CO5	3	3	3	1	3	3	1	3	1	1
COs/PSOs		PSO1			PSO2			PSO3		
CO1		3			2			2		
CO2		2			1			1		
CO3		2			1			1		
CO4		2			2			1		
CO5		2			2			2		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√		√			

Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCF22EL4	Information Security Audit Lab	Lb	0	0/0	4/0	2

1. Study of Network Security fundamentals - Ethical Hacking, Social Engineering practices.
2. Dumping Windows Password Hashes Using Metasploit, Cracking Windows Password Hashes Using Cain, Cracking Windows Password Hashes Using John the Ripper, Keylogging Using Metasploit, Taking Screen Shots Using Metasploit
3. Command-Line File Searching Using a Windows Command Shell, Erasing Windows Logs Using elsave, Hiding Files Using attrib, Hiding Files Using Alternate Data Streams, ARP Poison Routing Using Cain
5. Study of System threat attacks - Denial of Services.
6. Study of Sniffing and Spoofing attacks.
7. Study of Techniques uses for Web Based Password Capturing.
8. Study of Different attacks causes by Virus and Trojans.
9. Study of Anti-Intrusion Technique – Honey pot.
10. Study of Symmetric Encryption Scheme – RC4.
11. Implementation of Asymmetric Encryption Scheme – RSA.

Total Hours : 60

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Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C				
EMCF22EL5	Data Privacy lab	Lb	0	0/0	4/0	2				
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> • The student will know the fundamentals concepts of data privacy\ • Analyze implementation of DES ,RSA algorithms • Study about the digital signature standard • Learn the installation of root kits and options • Understand the wireless audit and detection system 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Learning and applying the concepts of data privacy (L3)									
CO2	Implementing DES and other algorithms. (L3)									
CO3	Capable to implement the signature scheme (L3)									
CO4	Installing the root kits (L2,L3)									
CO5	Execute the wireless audit and decrypt WEP and WPA. (L4)									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	2	2	2	2
CO3	3	3	3	3	2	2	2	2	2	2
CO4	3	3	3	2	2	2	2	1	1	1
CO5	3	3	3	2	2	1	1	1	1	1
COs/PSOs	PSO1			PSO2				PSO3		
CO1	3			2				2		
CO2	3			1				1		
CO3	3			1				2		
CO4	3			2				2		
CO5	3			2				2		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√		√			

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Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCF22EL5	Data Privacy lab	Lb	0	0/0	4/0	2

1. Implement the following Substitution & Transposition Techniques concepts:
 - a) Caesar Cipher
 - b) Playfair Cipher
2. Implement the following Substitution & Transposition Techniques concepts:
 - a) Vignere Cipher
 - b) Rail fence – row & Column Transformation
 - c) Hill Cipher
3. Implement the following algorithms
 - a) DES
 - b) RSA Algorithm
 - c) Diffie-Hellman
4. Implement the following algorithms
 - a) MD5
 - b) SHA-1
5. Implement the SIGNATURE SCHEME - Digital Signature Standard
6. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).
7. Setup a honey pot and monitor the honeypot on network (KF Sensor)
8. Installation of root kits and study about the variety of options
9. Perform wireless audit on an access point or a router and decrypt WEP and WPA.(Net Stumbler)
10. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w).

Total Hours : 60

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Subject Code	Subject Name :		Ty/Lb/IE	L	T/ S.Lr	P/R	C			
EMCF22EL6	Applied Cryptography Lab		Lb	0	0/0	4/0	2			
L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab										
OBJECTIVES										
<ul style="list-style-type: none"> Demonstrate various security applications, IPSec, Firewall, IDS, Web Security, Email Security and Malicious software etc., 										
COURSE OUTCOMES (Cos)										
Students completing this course were able to										
CO1	Identify the security issues in the network and resolve it. L1									
CO2	Analyze the vulnerabilities in any computing system and hence be able to design a security solution. L3									
CO3	Evaluate security mechanisms using rigorous approaches by key ciphers and Hash functions. L4									
CO4	Utilize the various Security like web, email firewall L3									
CO5	Understand the real world approach L2									
Mapping of Course Outcome with Program Outcome (POs)										
Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	2	2	1	2	2	1
CO2	3	3	2	2	2	1	2	1	2	1
CO3	2	3	2	2	3	2	2	2	2	1
CO4	2	3	2	2	3	2	2	2	2	1
CO5	2	2	2	1	2	1	1	1	1	1
COs/PSOs		PSO1			PSO2			PSO3		
CO1		3			2			2		
CO2		3			1			2		
CO3		3			2			2		
CO4		3			2			2		
CO5		2			1			1		
3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low										
Category	Basic Sciences	Engg.Science	Humanities & social Science	Program Core	Program Elective	Open Elective	Practical/Project	Internships/Technical Skills	Soft Skills	
					√		√			

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Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCF22EL6	Applied Cryptography Lab	Lb	0	0/0	4/0	2

OBJECTIVES:

To implement the following list of programs

1. Implementation of S-DES algorithm for data encryption
2. Implementation of AES algorithm for encryption and decryption
3. Implementation of Triple - DES algorithm for data encryption
4. Implement RSA asymmetric (public key and private key)-Encryption.
5. Histogram analysis of Caesar Cipher and DES
6. Generate Digital Signature using Hash code & MAC code
7. Create a Hash Code using MD5 / SHA-1
8. Diffie-Hellman Key Exchange Protocol
9. Breaking of Mono-alphabetic and Poly-alphabetic ciphers
10. Implementation of Linear Cryptanalysis of DES
11. Implementation of Interpolation attack and related key attack.
12. Write the RC4 logic using cryptography, encrypt the text “Hello World” using Blowfish.
13. Implementation of Digital Signature Scheme

Total Hours : 60

Audit Course I & II

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Audit Course I & II								
S.No	Course Code	Course Name	TY/L B/ IE	Teaching Scheme				Category
				L	T/S.Lr	P/R	C	
1	EMCC22I01	English for Research paper Writing	IE	2	0/0	0/0	0	ID
2	EMCC22I02	Disaster Management	IE	2	0/0	0/0	0	ID
3	EMCC22I03	Sanskrit for Technical Knowledge	IE	2	0/0	0/0	0	ID
4	EMCC22I04	Value Education	IE	2	0/0	0/0	0	ID
5	EMCC22I05	Constitution of India	IE	2	0/0	0/0	0	ID
6	EMCC22I06	Pedagogy Studies	IE	2	0/0	0/0	0	ID
7	EMCC22I07	Stress Management by Yoga	IE	2	0/0	0/0	0	ID
8	EMCC22I08	Personality Development through Life Enlightenment Skills	IE	2	0/0	0/0	0	ID
9	EMCC22I09	Research Publication Ethics	IE	2	0/0	0/0	0	ID

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Subject Code: EMCC22101	Subject Name : ENGLISH FOR RESEARCH PAPER WRITING					Ty/Lb/ IE	L	T/ S. Lr	P/R	C	
	Prerequisite: Nil					IE	2	0/0	0/0	0	
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab											
Objectives To know the art of writing the research paper and thesis To Ensure the good quality of paper at very first-time submission .											
COURSE OUTCOMES (COs) : At the end of this course the students would be able to											
CO1	Understand that how to improve your writing skills and level of readability										
CO2	Learn about what to write in each section										
CO3	Understand the skills needed when writing a Title										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	1	1	1	1	1	3	1	1	1	3	
CO2	1	1	1	1	1	3	1	1	1	3	
CO3	1	1	1	1	1	3	1	1	1	3	
COs / PSOs	PSO1				PSO2			PSO3			
CO1	1				1			1			
CO2	1				1			1			
CO3	1				1			1			
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social	Program Core	Program Electives	Open Electives	Internships / Technical Skill	Soft Skills	Audit course		
									✓		

Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCC22I01	English for Research Paper Writing	IE	2	0/0	0/0	0

Unit I **5 Hrs**
 Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit II **5 Hrs**
 Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts .Introduction

Unit III **5 Hrs**
 Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

Unit IV **5 Hrs**
 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 **5 Hrs**
 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

Unit VI **5 Hrs**
 Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Reference Books:

TOTAL HOURS: 30

1. Goldbort R (2016) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2016) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (2018), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2017

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Subject Code: EMCC22I02	Subject Name DISASTER MANAGEMENT		Ty/Lb/IE	L	T/ S. Lr	P/R	C				
	Prerequisite: Nil		IE	2	0/0	0/0	0				
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab											
Objectives Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.											
COURSE OUTCOMES (COs) : At the end of this course the students would be able to											
CO1	Evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.										
CO2	Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.										
CO3	Understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	1	1	1	1	1	3	1	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	1	
CO3	1	1	1	1	1	3	1	1	1	1	
COs / PSOs	PSO1		PSO2				PSO3				
CO1	1		1				1				
CO2	1		1				1				
CO3	1		1				1				
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course	
										✓	

Audit course I&II

Subject Code	Subject Name	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCC22102	Disaster Management	IE	2	0/0	0/0	0

Unit I

5 Hrs

Introduction

Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude..

Unit II

5 Hrs

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

5 Hrs

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

5 Hrs

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 V

5 Hrs

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.

Unit VI

5 Hrs

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 HOURS: 30

SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "NewRoyal 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.

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Subject Code: EMCC22I03	Subject Name SANSKRIT FOR TECHNICAL KNOWLEDGE					Ty/Lb /IE	L	T/S. Lr	P/R	C	
	Prerequisite: Nil					IE	2	0/0	0/0	0	
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab											
Objectives To get a working knowledge in illustrious Sanskrit, the scientific language in the world Learning of Sanskrit to improve brain functioning , to develop the logic in mathematics, science & other subjects enhancing the memory power. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature											
COURSE OUTCOMES (COs) : At the end of this course the students would be able to											
CO1	Understanding basic Sanskrit language										
CO2	Ancient Sanskrit literature about science & technology can be understood										
CO3	Being a logical language will help to develop logic in students										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	1	1	1	1	1	3	1	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	1	
CO3	1	1	1	1	1	3	1	1	1	1	
COs / PSO3	PSO1			PSO2				PSO3			
CO1	1			1				1			
CO2	1			1				1			
CO3	1			1				1			
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course	
										✓	

Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCC22I03	Sanskrit for Technical Knowledge	IE	2	0/0	0/0	0

Unit I **10 hrs**

Alphabets in Sanskrit,Past/Present/Future Tense,Simple Sentences

Unit II **10 hrs**

Order, Introduction of roots, Technical information about Sanskrit Literature

Unit III **10 hrs**

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TOTAL HOURS : 30

Reference Books:

1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

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Subject Code: EMCC22I04	Subject Name VALUE EDUCATION					Ty/Lb/IE	L	T/ S.L r	P/R	C	
	Prerequisite: Nil					IE	2	0/0	0/0	0	
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab											
Objectives .											
<ul style="list-style-type: none"> • Students will be able to • Understand value of education and self- development • Imbibe good values in students • Let the should know about the importance of character 											
COURSE OUTCOMES (COs) : At the end of this course the students would be able to											
CO1	Knowledge of self-development										
CO2	Learn the importance of Human values										
CO3	Developing the overall personality										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	1	1	1	1	1	3	1	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	1	
CO3	1	1	1	1	1	3	1	1	1	1	
COs / PSOs	PSO1				PSO2				PSO3		
CO1	1				1				1		
CO2	1				1				1		
CO3	1				1				1		
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course	
										✓	

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Subject Code	Subject Name	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCC22I04	Value Education	IE	2	0/0	0/0	0

Unit 1:

6 Hrs

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 2:

8 Hrs

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 3:

8 Hrs

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. 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 4:

8 Hrs

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 HOURS : 30 hrs

Reference:

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

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Subject Code: EMCC22105	Subject Name : CONSTITUTION OF INDIA				Ty/Lb/I E	L	T/ S.Lr	P/R	C	
	Prerequisite: Nil				IE	2	0/0	0/0	0	
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab										
Objectives Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective. To address 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 address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.										
COURSE OUTCOMES (COs) : At the end of this course the students would be able to know										
CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.									
CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.									
CO3	. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.									
CO4	Discuss the passage of the Hindu Code Bill of 1956.									
Mapping of Course Outcomes with Program Outcomes (POs)										
COs/POs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	1	1	1	1	3	1	1	1	1
CO2	1	1	1	1	1	3	1	1	1	1
CO3	1	1	1	1	1	3	1	1	1	1
CO4	1	1	1	1	1	3	1	1	1	1
COs / PSOs	PSO1		PSO2		PSO3					
CO1	1		1		1					
CO2	1		1		1					
CO3	1		1		1					
CO4	1		1		1					
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low										
Category	Basic Sciences	Engineering Sciences	Humanities and Social	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course
										✓

Audit course I&II

Subject Code	Subject Name	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCC22I05	Constitution of India	IE	2	0/0	0/0	0

Unit 1: **6 hrs**

History of Making of the Indian Constitution:

History Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution: Preamble Salient Features

Unit 2: **6 hrs**

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 and Fundamental Duties.

Unit 3: **6 hrs**

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 4: **6 hrs**

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

Unit 4: **6 hrs**

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL HOURS: 30 hrs

Reference Books:

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 Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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Subject Code: EMCC22106	Subject Name : PEDAGOGY STUDIES				Ty/L b/IE	L	T/ S.Lr	P/R	C	
	Prerequisite: Nil				IE	2	0/0	0/0	0	
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab										
Objectives Students will be able to: 4. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers. 5. Identify critical evidence gaps to guide the development.										
COURSE OUTCOMES (COs) : At the end of this course the students would be able to know										
CO1	What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?									
CO2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?									
CO3	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?									
Mapping of Course Outcomes with Program Outcomes (POs)										
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	1	1	1	1	3	1	1	1	1
CO2	1	1	1	1	1	3	1	1	1	1
CO3	1	1	1	1	1	3	1	1	1	1
COs / PSO s	PSO1		PSO2			PSO3				
CO1	1		1			1				
CO2	1		1			1				
CO3	1		1			1				
H/M/L indicates Strength of Correlation H- High, M-Medium, L-Low										
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course
										✓

Audit course I&II

Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCC22I06	Pedagogy Studies	IE	2	0/0	0/0	0

Unit I: Introduction and Methodology:

6 hrs

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:

6 hrs

Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit III: Evidence on the effectiveness of pedagogical practices

6 hrs

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:

6 hrs

Alignment with classroom practices and follow-up support, Peer support, 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:

6 hrs

Research design, Contexts, Pedagogy, Teacher education, Curriculum and Assessment, Dissemination and research impact.

TOTAL HOURS: 30

Reference Books:

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.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.

- www.pratham.org/images/resource%20working%20paper%202.pdf

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Subject Code: EMCC22I07	Subject Name: STRESS MANAGEMENT BY YOGA		Ty/Lb /IE	L	T/ S.Lr	P/R	C				
	Prerequisite : Basic Knowledge of Yoga		IE	2	0/0	0/0	0				
To Understand the Basic Concepts of Yoga To Gain knowledge on Ashtanga yoga To Acquire knowledge of Techniques and Practice of Yogasanas To Understand stress and the causes. To Attain the knowledge about stress busting through yoga											
CO1	Understand the Basic Concepts of Yoga										
CO2	Gain knowledge on Ashtanga yoga										
CO3	To Understand stress and the causes										
CO4	Acquire knowledge of Techniques and Practice of Yogasanas										
CO5	Attain the knowledge about stress busting through yoga										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	1	1	1	1	1	3	1	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	1	
CO3	1	1	1	1	1	1	1	1	1	1	
CO4	1	1	1	1	1	3	1	1	1	1	
CO5	1	1	1	1	1						
COs/ PSOs	PSO1			PSO2			PSO3				
CO1	1			1			1				
CO2	1			1			1				
CO3	1			1			1				
CO4	1			1			1				
CO5	1			1			1				
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low											
Category	Basic Sciences	Engineering Sciences	Humanities and	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit course	
										✓	

Audit course I&II

Subject Code	Subject Name	Ty/Lb/IE	L	T/S.Lr	P/R	C
EMCC22I07	Stress Management by Yoga	IE	2	0/0	0/0	0

Unit 1: **6 hrs**

What is stress - Symptoms of stress - Why is stress helpful - Why is stress harmful - Stress versus burnout - Main types of stress - Know your stressors - Tips to Manage Stress

Unit 2: **6 hrs**

Strength, Weaknesses, Opportunities and Threats (SWOT) Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem. Emotional Intelligence, What is Emotional Intelligence, emotional quotient why Emotional Intelligence matters, Emotion Scales. Managing Emotions

Unit 3: **6 hrs**

What is Yoga – Definition and Its Branches - Hatha Yoga – Kundalini Yoga – Tantra Yoga – Kriya Yoga – Introduction To Ashtanga Yoga

Unit 4: **6 hrs**

Mechanism of Stress related diseases: Psychic, Psychosomatic, Somatic and Organic phase. Role of Meditation & Pranayama on stress – physiological aspect of Meditation. Constant stress & strain, anxiety, conflicts resulting in fatigue among Executive. Contribution of Yoga to solve the stress related problems of Executive

Unit 5: **6 hrs**

Meaning and definition of Health – various dimensions of health (Physical, Mental, Social and Spiritual) – Yoga and health – Yoga as therapy. Physical fitness. Stress control exercise – Sitting meditation, Walking meditation, Progressive muscular relaxation, Gentle stretches and Massage.

TOTAL HOURS : 30

Reference Books:

1. Andrews, Linda Wasmer., (2005). *Stress Control for peace of Mind.* London: Greenwich Editions Lalvani, Vimla., (1998). *Yoga for stress.* London: Hamlyn
2. Nagendra, H.R., and Nagarathana, R., (2004). *Yoga perspective in stress management.* Bangalore: Swami Vivekananda Yoga Prakashana.
3. Nagendra, H.R., and Nagarathana, R., (2004). *Yoga practices for anxiety & depression.* Bangalore: Swami Sukhabodhanandha Yoga Prakashana.
4. Sukhabodhanandha, Swami., (2002). *Stress Management.* Bangalore: Prasanna trust.
5. Udupa, K.N., (1996). *Stress management by Yoga.* NewDelhi: Motilal Banaridass Publishers Private Limited

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Subject Code: EMCC22I08	Subject Name					Ty/ Lb /IE	L	T/ S.Lr	P/R	C	
	PERSONALITY DEVELOPMENT THROUGHLIFE ENLIGHTENMENT SKILLS										
	Prerequisite: Nil					IE	2	0/0	0/0	0	
L : Lecture T : Tutorial P : Project R : Research C: Credits T/L: Theory/Lab											
Objectives To learn to achieve the highest goal happily , To become a person with stable mind, pleasing personality and determination. To awaken wisdom in student											
COURSE OUTCOMES (COs) : At the end of this course the students would be able to know											
CO1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life										
CO2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity										
CO3	Study of Neetishatakam will help in developing versatile personality of students.										
Mapping of Course Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	
CO1	1	1	1	1	1	3	1	1	1	1	
CO2	1	1	1	1	1	3	1	1	1	1	
CO3	1	1	1	1	1	3	1	1	1	1	
COs / PSOs	PSO1			PSO2				PSO3			
CO1	1			1				1			
CO2	1			1				1			
CO3	1			1				1			
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program	Open Electives	Practical /	Internships / Technical Skill	Soft Skills	Audit course	
									✓		

Subject Code	Subject Name	Ty/Lb/IE	L	T/ S.Lr	P/R	C
EMCC22108	Personality Development through life Enlightenment Skills	IE	2	0/0	0/0	0

Unit 1: **10 hrs**

Neetisatakam-Holistic development of personality

Verses- 19,20,21,22 (wisdom) Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue)
Verses- 52,53,59(dont's) Verses-71,73,75,78(do's)

Unit 2: **10 hrs**

Approach to day to day work and duties.

Shrimad BhagwadGeeta: 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 3: **10 hrs**

Statements of basic knowledge.

Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18
Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

Reference Books:

TOTAL HOURS : 30

1. “Srimad Bhagavad Gita” by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Dr.M.G.R Educational & Research Institute (Deemed to be University)
Department of Computer Science and Engineering

Subject Code: EMCC22I09	Subject Name : Research and Publication Ethics		Ty / Lb/ ETP/IE		L	T / S.Lr	P/ R	C					
	Prerequisite: Core subjects		IE		2	0/0	0/0	0					
T/L/ : Theory/Lab L : Lecture T : Tutorial P : Practical/Project R : Research C: Credits T/L Theory/Lab													
OBJECTIVE:													
<ul style="list-style-type: none"> • To understand the philosophy of science and ethics, research integrity and publication ethics. • To identify research misconduct and predatory publications. • To understand indexing and citation databases, open access publications, research metrics (citations, h-index, impact Factor, etc.). 													
COURSE OUTCOMES (COs) : By doing this course students will													
CO1	Understand the ethical issues related to Research and Publication												
CO2	Get to know about different types of plagiarism and ways for avoiding plagiarism												
CO3	Know about best practices and guidelines in publication ethics and also learns to avoid Publication misconduct												
CO4	Get to know about Violation of publication ethics, authorship and contributor ship and get to identify about Predatory publishers and journals.												
CO5	Get to know about various open sources database and research metrics like indexing, citation etc.,												
Mapping of Course Outcomes with Program Outcomes (POs)													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10			
CO1	2	3	3	3	3	2	3	3	2	3			
CO2	2	3	3	3	3	2	3	3	2	3			
CO3	2	3	3	3	3	2	3	3	2	3			
CO4	2	3	3	3	3	3	3	3	3	3			
CO5	2	3	3	3	3	2	3	3	2	3			
COs / PSOs	PSO1			PSO2				PSO3					
CO1	2			3				3					
CO2	2			3				3					
CO3	2			3				3					
CO4	2			3				3					
CO5	2			3				3					
1/2/3 indicates Strength of Correlation 3- High, 2- Medium, 1-Low													
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills	Audit Course			
										✓			

Subject Code: EMCC22I09	Subject Name : Research and Publication Ethics	T / L/ ETP/IE	L	T / S.Lr	P/ R	C
	Prerequisite: Core subjects	IE	2	0/0	0/0	0
T/L/ : Theory/Lab L : Lecture T : Tutorial P : Practical/Project R : Research C: Credits T/L Theory/Lab						

Unit I: Introduction

6hrs

Introduction to philosophy: Definition, nature and scope, concept, branches - Ethics: Definition, moral philosophy, nature of moral judgments and reactions – Ethics with respect to Science and Research Intellectual honesty and research integrity

Unit II: Scientific Conduct

6hrs

Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP) Redundant Publications: Duplicate and over lapping publications, salami slicing – Selective Reporting and misrepresentation of data

Unit III: Publication Ethics –I

6hrs

Publication ethics: Definition, introduction and importance – Best practices/standards setting initiative sand guidelines: COPE, WAME etc. Publication misconduct: definition, Concept, problems that lead to unethical behavior and vice-versa, types.

Unit IV: Publication Ethics – II

6hrs

Violation of publication ethics, authorship and contributor ship – Identification of publication misconduct, complaints and appeals – Predatory publishers and journals – Subject specific ethical issues, Complaints and appeals: examples and fraud from India and Abroad

Unit V: Data Bases and Research Metrics

6hrs

Open Access publication and Initiatives – Indexing databases – Citation databases, Web of Science, Scopus, etc. – Impact factor of journals as per Journal Citation report .SNIP, SJR, IPP,CiteScore - Metrics: h-index,gindex,i10index,altmetrics – Conflict of interest.

Total Hours : 30

References:

1. Bird A 2006, Philosophy of Science, Routledge
2. MacIntyre & Alasdair, 1967, A Short History of Ethics, London.
3. Chaddah, P2018, Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 9789387480865.
4. On Being a Scientist: A Guide to Responsible Conduct in Research, 2009, National Academy of Sciences, National Academy of Engineering and Institute of Medicine. 3rd edition, National Academies Press.
5. Resnik, D. B 2011, what is ethics in research & why is it important. National Institute of Environmental Health Sciences, pp.1—10. https://www.niehs.nih.gov/research/reso_uuces/bioethics/whatis/index.cfm
6. Bcall, J 2012, Predatory publishers are corrupting open access, Nature, Vol. 489, no.7415, pp. 179—179. <https://doi.org/10.1038/48917a>
7. Ethics in Science Education, 2019 Indian National Science Academy (INSA), Research and Governance