G H Raisoni Institute of Engineering & Technology, Nagpur

(An Autonomous Institute affiliated to RTM Nagpur University Nagpur)

B. Tech. in Computer Science & Engineering (Cyber Security)

Scheme 2020-21

Institute Vision

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

Institute Mission

- Our Efforts are dedicated to impart quality and value based education to raise satisfaction level of all stakeholders.
- Our strength is directed to create competent professionals.
- Our endeavour is to provide all possible support to promote research and development activities

Department Vision

To be in the frontier of Cyber Security education and to produce globally competent professionals with expertise in all fields with moral values committed to build a nation for common good.

Department Mission

Impart high quality experiential learning to get expertise in modern software tools, sophisticated network environments and uplift innovative research to cater to the real time requirements of the Industry, Government and Society.

B. Tech. in Computer Science & Engineering (Cyber Security)

Program Educational Objectives

The Program Educational Objectives of the Computer Science & Engineering (Cyber Security) under graduate program are designed to produce knowledgeable Cyber Security engineers who are ready to contribute effectively to the advancement of Secure Computing systems .The graduates shall:

PEO1	**Preparation:** To prepare graduates with the skills and abilities needed to safeguard computer systems. Develop defensive strategies by being aware of, communicating, and communicating to decision-marks the risks, dangers, and mitigation approaches.
PEO2	**Core Competence:** To promote Cyber Security Engineering design, research, product implementation, and services through strong technical, communication, and entrepreneurial skills.
PEO3	**Breadth:** To inculcate professional and ethical values in students to develop policies and procedures to manage the risks to the enterprise's security.
PEO4	**Professionalism:** To shape graduates and make them employable in industries/public sector/research organizations or work as an entrepreneur.
PEO5	**Learning Environment:** To help acquire student's professional certification and pursue higher education, learn and advance their careers to provide leadership and are effective in multidisciplinary environment.

Program Specific Outcomes

PSO1	Learn logical reasoning and subject fundamentals pertaining to Cyber Security concepts.
PSO2	Utilize the principles of security in the architecture of network and observe moral security principles with an emphasis on IT compliance and integrity for efficient design of network security for real world problems.
PSO3	Display professional and ethical behaviour, as well as a team-oriented attitude to sustain passion and zeal for real-world applications.

Program Outcomes

PO1	Engineering knowledge: Apply the knowledge of mathematics, science,engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Scheme and Curriculum
Scheme 2021 Scheme
Summary

Semester	Credits	Hours	Marks	No. of Theory Heads	No. of Practical Heads	Total Heads
I	18	26	575	5	7	12
II	19	26	550	5	6	11
III	24	27	650	7	3	10
IV	23	26	625	7	3	10
V	20	24	600	5	5	10
VI	21	27	575	6	5	11
VII	20	25	500	5	2	7
VIII	15	27	475	1	1	2
Total	160	208	4550	41	32	73

First Semester: B. Tech. Computer Science & Engineering
(Cyber Security)

Course Code	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme						Total Duration ESE
								Theory			Practical		Total Marks	
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT		
SEMESTER-I														
UBSL151	Matrices and Differential Calculus	BS	2	1	-	3	3	10	15	50	-	-	75	2 Hrs.
UBSL101	Engineering Physics	BS	1	1		2	2	10	15	50	25	-	75	2 Hrs.
UBSP101	Engineering Physics	BS	-	-	2	2	1	-	-		25	-	25	
UCSL101	Computer Programming	C	2	-		2	2	10	15	50		-	75	2 Hrs.
UCSP101	Computer Programming	C	-	-	4	4	2	-	-	-	50	-	50	
UCSL102	Foundation of Data Analytics	C	1	-		1	1	10	15	50	-	-	75	2 Hrs.
UCSP102	Foundation of Data Analytics	C	-	-	2	2	1	-	-	-	25	-	25	
UECL103	Introduction to Discrete Devices and Circuits	C	2	-		2	2	10	15	50		-	75	2 Hrs.
UECP103	Introduction to Discrete Devices and Circuits	C	-	-	2	2	1	-	-	-	25	-	25	
UCSP103	Problem Identification and Design Thinking	A	-	-	2	2	1	-	-	-	25	-	25	
UESP102	Introduction to Drones	A	-	-	2	2	1	-	-	-	25	-	25	
UISP101	Biomedical Engineering	A	-	-	2	2	1	-	-	-	25	-	25	
TOTAL			**8**	**2**	**16**	**26**	**18**	**50**	**75**	**250**	**200**		**575**	

Second Semester: B. Tech. Computer Science & Engineering (Cyber Security)

Course Code	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme						Total Duration ESE
								Theory			Practical		Total Marks	
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT		
SEMESTER-II														
UBSL152	Integral Calculus and Differential Equations	BS	2	1	-	3	3	10	15	50	-	-	75	2 Hrs.
UBSL153	Linear Algebra and Statistics	BS	2	1	-	3	3	10	15	50	-	-	75	2 Hrs.
UBSL131	Environmental Chemistry	BS	1	-		1	1	10	15	50	-	-	75	2 Hrs.
UBSP131	Environmental Chemistry	BS		-	2	2	1	-	-	-	25	-	25	-
UHUL101	Communication Skills	H	2	-	2	2	2	10	15	50	-	-	75	2 Hrs.
UHUP101	Communication Skills	H	-	-	2	2	1	-	-	-	25	-	25	-
UCSP104	Programming for Problem Solving	C	-	-	4	4	2	-	-	-	50	-	50	-
UECL104	Modeling of Digital Circuits	C	3	-		3	3	10	15	50	-	-	75	2 Hrs.
UECP104	Modeling of Digital Circuits	C	-	-	2	2	1	-	-	-	25	-	25	-
UECP105	Internet of Things	A	-	-	2	2	1	-	-	-	25	-	25	-
UHUP102	Foreign Language	A	-	-	2	2	1	-	-	-	25	-	25	-
TOTAL			**10**	**2**	**14**	**26**	**19**	**50**	**75**	**250**	**175**		**550**	

Third Semester: B. Tech Computer Science & Engineering (Cyber Security)

Course Code	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme						Total Duration ESE
								Theory			Practical		Total Marks	
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT		
SEMESTER-III														
UBSL255	Discrete Mathematics & Graph Theory	BS6	3	1		4	4	10	15	50	-	-	75	2 Hrs.
UCSL201	Data Structures and Algorithms	C	3	-	-	3	3	10	15	50	-	-	75	2 Hrs.
UCSP201	Data Structures and Algorithms	C	-		2	2	1		-	-	25	25	50	-
UCYL201	Computer Architecture	C	2	-	-	2	2	10	15	50	-	-	75	2 Hrs.
UCYL202	Cyber Laws & Cyber Ethics	C	3	-	-	3	3	10	15	50	-	-	75	2 Hrs.
UCYL203	Web Technology	C	3	-	-	3	3	10	15	50		-	75	2 Hrs.
UCYP203	Web Technology	C	-		2	2	1	-	-		25	-	25	-
UCSL207/	Object Oriented Programming	C	3	-	-	3	3	10	15	50	-	-	75	2 Hrs.
UCSP207	Object Oriented Programming	C	-		2	2	1	-	-	-	25	25	50	-
UCYL204	Introduction to Cyber Security	C11	3	-	-	3	3	10	15	50	-	-	75	2 Hrs
TOTAL			20	1	6	27	24	70	105	350	75	50	650	

Fourth Semester: B. Tech Computer Science & Engineering
(Cyber Security)

Course Code	Name of Course	Course Category	Teaching Scheme				Credit	Evaluation Scheme						Total Duration ESE
								Theory			Practical		Total Marks	
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT		
SEMESTER-IV														
UBSL256	Transforms & Numerical Methods	BS7	3	1		4	4	10	15	50	-	-	75	2 Hrs.
UCYL205	Fundamentals of Cryptography	C	3	-	-	3	3	10	15	50	-	-	75	2 Hrs.
UCSL205	Design and Analysis of Algorithm	C	3	-	-	3	3	10	15	50	-	-	75	2 Hrs.
UCSP205	Design and Analysis of Algorithm	C	-	-	2	2	1	-	-	-	25	25	50	
UCSL208	Computer Networks	C	3			3	3	10	15	50	-	-	75	2 Hrs.
UCSP208	Computer Networks	C	-	-	2	2	1				25		25	
UCSL206	OperatingSystem	C	3			3	3	10	15	50	-	-	75	2 Hrs.
UCYL207	Open elective-I Web cloud computing application.	OE	2	-	-	2	2	10	15	50	-	-	75	2 Hrs
UCYL206	Data Analytics	A	2			2	2	10	15	50	-	-	75	2 Hrs.
UCYP206	Data Analytics	A	-	-	2	2	1				25		25	
TOTAL			19	1	6	26	23	70	105	350	75	25	625	

Open Elective-I (IV Semester)

Subject Code	Name of Subject
UAIL211	Data Analysis for Business Intelligence
UCSL210	Introduction to Block-chain Technology
UEEL210	Non-Conventional Energy Sources
UECL211	Sensors and Transducers
UMEL213	Total Quality Management
UCEL212	Basics of Civil Engineering

Fifth Semester: B. Tech Computer Science & Engineering (Cyber Security)

Course Code	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme						Total Duration ESE
								Theory			Practical		Total Marks	
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT		
SEMESTER-V														
UCSL301	Database Management System	C	2	1		3	3	10	15	50			75	2 Hrs.
UCSP301	Database Management System	C			2	2	1				25	25	50	
UCSL401	Computer System Security	C	3			3	3	10	15	50			75	2 Hrs.
UCSP401	Computer System Security	C			2	2	1				25	25	50	
UCYL301	Ethical Hacking	C	3			3	3	10	15	50			75	2 Hrs.
UCYL302	Penetration Testing	C	3			3	3	10	15	50			75	2 Hrs.
UCYL303	Java Programming	C	2			2	2	10	15	50			75	2 Hrs.
UCYP303	Java Programming	C			2	2	1				25		25	
UHUL303	Engineering Economics and Industrial Management	H2	2			2	2	10	15	50			75	2 Hrs.
UHUP305	Aptitude	A9			2	2	1				25		25	
TOTAL			16	1	8	24	20	60	90	300	100	50	600	

Sixth Semester: B. Tech Computer Science & Engineering
(Cyber Security)

Course Code	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme						Total Duration ESE
								Theory			Practical		Total Marks	
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT		
SEMESTER-VI														
UAIL202A	Machine Learning Algorithm	C	2		2	2	2	10	15	50			75	2 Hrs.
UAIP202A	Machine Learning Algorithm	C			2	2	1				25			
UCYL304	Cyber Intelligence	C22	3			3	3	10	15	50			75	2 Hrs.
UXXLXXX	Elective - I	EL1	3			3	3	10	15	50			75	2 Hrs.
UXXPXXX	Elective - I	EL1			2	2	1				25		25	
UISL3XX	Open Elective- II	OE2	2			2	2	10	15	50			75	2 Hrs.
UHUL3XX	Humanities Elective	H3	2			2	2	10	15	50			75	2 Hrs.
UHUL304	Understanding Human Values	H4	3			3	3	10	15	50			75	2 Hrs.
UHUP302	Employability Skills	A10			2	2	1				25		25	
UHUP301	Campus Recruitment Training	A11			2	2	1				25		25	
UCSP303	Cloud Computing	A12-A13			4	4	2				25		25	
TOTAL			15		14	27	21	60	90	300	125		575	

Seventh Semester: B. Tech Computer Science & Engineering (Cyber Security)

Course Code	Name of Course	Course Category	Teaching Scheme				Credit	Evaluation Scheme						Total Duration ESE
								Theory			Practical		Total Marks	
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT		
SEMESTER-VII														
UXXLXXX	Elective-II	EL2	3			3	3	10	15	50			75	2 Hrs.
UXXPXXX	Elective-II	EL2			2	2	1				25		25	
UXXLXXX	Elective - III	EL3	3			3	3	10	15	50			75	2 Hrs.
UXXLXXX	Elective - IV	EL4	3			3	3	10	15	50			75	2 Hrs.
UXXLXXX	Elective - V	EL5	3			3	3	10	15	50			75	2 Hrs.
UXXLXXX	Elective - VI	EL6	3			3	3	10	15	50			75	2 Hrs.
UCYP412	Project	P1			8	8	4				50	50	100	
TOTAL			**15**		**10**	**25**	**20**	**50**	**75**	**250**	**75**	**50**	**500**	

Eighth Semester: B. Tech Computer Science & Engineering
(Cyber Security)

Course Code	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme						Total Duration ESE
								Theory			Practical		Total Marks	
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT		
SEMESTER-VIII														
UISL4XX	MOOCS Based Open Elective	OE3	3			3	3	10	15	50			75	2 Hrs.
UCYP413	Internship	P2			24	24	12				200	200	400	2 Hrs.
TOTAL			**3**		**24**	**27**	**15**	**10**	**15**	**50**	**200**	**200**	**475**	

SYLLABUS: III SEMESTER Computer Science and Engineering (Cyber Security)

Syllabus for

Discrete Mathematics and Graph Theory
Scheme (Theory: 3 hrs, Tutorial: 1hr.)

Course Title: **Discrete Mathematics and Graph Theory**										
Semester	III	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	BS	3	1	--	4	10	15	50	--	--
Course Code	UBSL255									
Teaching Mode	Offline	4			Total	75			--	
Duration of ESE	2.5 hrs					75				

Course Objectives	This course introduces size and kind of objects.
	It also skills to analyze objects meeting the criteria, finding "largest", "smallest", or "optimal" objects.
	It also introduces combinatorial structures and apply algebraic techniques to combinatorial problems
Course Outcomes	**CO1**: Know grouping of objects and operation, Relation, ordering of objects, concepts of Groups.
	CO2: Apply the concept of Boolean algebra in computer science engineering.
	CO3: Solve problems using basic graph theory and number theory.
	CO4: Develop algebraic technique to solve combinatorial problems using combinatorial structure and number theory.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	PO 1	PO2	PO3	PO4	PO 5	PO6	PO 7	PO 8	PO9	PO10	PO11	PO 12	PS O 1	PSO 2
CO1	3	3	--	--	--	--	--	--	--	--	--	3	--	--
CO2	3	3	--	--	--	--	--	--	--	--	--	3	--	--
CO3	3	3	--	--	--	--	--	--	--	--	--	3	--	--
CO4	3	3	--	--	--	--	--	--	--	--	--	3	--	--
CO5	3	3	--	--	--	--	--	--	--	--	--	3	--	--
CO6	3	3	--	--	--	--	--	--	--	--	--	3	--	--

Course Contents:

Unit	Contents	Hours
I	**Set Theory** Operations on sets, Laws of algebra of sets, Representation of sets on computer in terms of 0's & 1's. Partition & covering of a set, ordered pair, Product set, Relation–Different types of relations, Graph of relation, Matrix of relation, Transitive closure of relation, Properties of relations, Compatible relation. Functions, Partial ordering & partially ordered set, Hasse diagram of Poset, Totally ordered set, Peano axioms & Mathematical Induction.	8
II	**Group** Algebra or Algebraic systems like semigroup, monoid and examples. Homomorphism, Isomorphism of semigroup & monoid. Groups, properties of algebraic groups. Permutations groups, Subgroups, Cosets, Lagrange's theorem, properties of cyclic groups, generator of group, kernel of Homorphism, quotient group, Rings, types of rings, Fields, subring, Integral domain.	8
III	**Lattices and Boolean algebra** Lattice as Poset & as algebraic system, Types of lattices, Hasse diagrams, Sublattice, direct product of Lattices, Lattice Homomorphism, complement of elements of lattices, Various lattices, composition tables, Lattice , Boolean algebra; Boolean Expressions, Equivalence of Boolean Expression by tables, Simplification of circuit & equivalent circuit by truth tables.	8
IV	**Graph Theory** Graphs and its types, Sub graph, Quotient graph, Euler path, complete path, indegree, outdegree, reachability, cycle, matrix representation of graph. Transitive closure of graph, Adjacency matrix, Trees, Venn diagram, Representation of trees, binary trees, spanning trees, Prim's algorithm.	8
V	**Combinatorics** Definition of generating functions and examples, proof of simple combinatorial identities. Recursive relations: definitions & examples, explicitly formula for sequence, back tracking to find explicit formula of sequence, solving recurrence relations. Counting Theorem and application, multiplication principle of counting. Permutation & Combination with examples. The pigeon hole principle & extended pigeon hole principle and application of pigeon hole principle in solving simple problems.	8
VI	**Number Theory** Continued fractions, The study of continued fractions. Alpha has Infinite continued fraction if alpha is irrational. Alpha has periodic continued fractions if alpha is quadratic irrational. Application to approximation of irrationals by rationals. Hurwitz's theorem, Advanced topic on Combinatorial Theory.	8

Text Books	1.	Discrete Mathematical structure with application to computer science by Trembley & Manohar (Mc. Graw Hill)
	2.	Discrete Mathematical Structure by Kolmann , Busby & Ross (PHI)
	3.	Discrete mathematics by Lipschutz & Lipson , Schaum's outline, TMH
Reference Books	1.	Discrete Mathematics by Liu
	2.	Discrete Mathematics by John Truss (Addison Wesley, 2000)
	3.	Foundations of Discrete Mathematical by K. D. Joshi (Willey Eastern).

Data Structure and Algorithms Scheme

(Theory: 3 hrs, Practical: 2 hrs.)

Course Title: **Data Structure and Algorithms**										
Semester	III	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	3	--	2	4	10	15	50	25	
Course Code	UCSL201 UCSP201									
Teaching Mode	Online	5			Total	75			25	
Duration of ESE						100				

Course Objectives	This course introduces basic idea of data structure while making aware of methods and structure used to organize large amount of data.
	It's also aimed at developing skill to implement methods to solve specific problems using basic data structures.
	The course also provides career opportunities in design of data, implementation of data, technique to sort and searching the data.
Course Outcomes	CO1: Illustrate various techniques of searching, Sorting and hashing
	CO2: Explain the significance of dynamic memory management Techniques
	CO3: Design and analyze different linear data structure techniques to solve real world problem.
	CO4: Implement non-linear data structure to find solution for given engineering applications.
	CO5: Summarize different categories of data Structures

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO 8	PO 9	PO1 0	PO1 1	PO12	PSO 1	PSO 2
CO1	3	3	3	1	3	--	--	--	--	--	--	--	2	3
CO2	3	3	3	2	3	--	--	--	--	--	--	--	2	3
CO3	3	3	3	3	3	2	--	--	--	--	--	--	2	3
CO4	3	3	3	3	3	2	--	--	--	--	--	--	2	3

Course Contents:

Unit	Contents	Hours
I	Introduction –Algorithms, Common operations on data structures, Types of data structures, Data structures & Programming, Program Design, Complexities, Time Complexity, Step count Method, order of Growth, Asymptotic Notation. Sorting and Searching Introduction, Sorting, Insertion Sort, Selection Sort, Merging, Merge-Sort, Shell Sort, Radix Sort, Searching and Data Modification, Hashing	9
II	Arrays: Introduction, Linear Arrays, Arrays as ADT, Representation of Linear array in Memory, Traversing Linear Arrays, Inserting and deleting, Sorting; Bubble Sort, Searching; Linear Search, Binary Search, : Linked List Introduction: Linked Lists, Representation of Linked Lists in Memory, Traversing a Linked List, Searching a Linked List, Memory Allocation; Garbage Collection, Insertion into a Linked List, Deletion from a Linked List, Header Linked List, Circularly Linked Lists, Two-Way Lists (or Doubly Linked Lists).	9
III	Stacks, Queue and Recursion- Introduction, Stacks ,Array Representation of Stacks ,Linked Representation of Stacks, Stack as ADT, Arithmetic Expression; Polish Notation, Application of Stacks, Recursion, Towers of Hanoi, Implementation of Recursive Procedures by Stacks, Queue, Linked Representation of Queues, Queues as ADT, Circular Queues, Deques, Priority Queues, Applications of Queues	9
IV	.Trees and Binary Trees -Binary Trees • Representation, Operations: Insert, Delete, Traversal: Preorder, In-order, Post-order, Traversal Algorithms Using Stacks, Header Nodes; Threads, Threaded Binary Trees, Binary Search Trees ,Searching and Inserting in Binary Search Trees, Deleting in a Binary Search Tree, Balanced Binary Trees, AVL Search Trees, Insertion in an AVL Search Tree, Deletion in an AVL Search Tree, m-way Search Trees ,Searching, Insertion and Deletion in an m-way Search tree, B-Trees ,Searching, Insertion and Deletion in a B-tree,B+-Trees Graph Algorithms	10
V	Graphs and their Applications -) Introduction, Graph Theory Terminology, Sequential Representation of Graphs, Adjacency Matrix; Path Matrix, Linked Representation of a Graph, Operations on Graphs, Traversing a Graph, Posets; Topological Sorting, Spanning Trees	8

Text Books	1.	AVAho, J Hopcroft, JD Ullman, Data Structures and Algorithms, Addison-Wesley, 1983.
	2.	THCormen, CF Leiserson, RL Rivest, C Stein, Introduction to Algorithms, 3rd Ed., MIT Press, 2009.
	3.	Sahni, S., "Data Structures, Algorithms, and Applications in C++", WCB/McGraw-Hill.
E--Books	1.	https://apps2.mdp.ac.id/perpustakaan/ebook/Karya%20Umum/Dsa.pdf
Reference Books	1.	Data Structures & Algorithms, 1e, Alfred V.Aho, Jeffery D. Ullman , Person.
	2.	MT Goodrich, R Tamassia, DM Mount, Data Structures and Algorithms in Java, 5th Ed., Wiley, 2010. (Equivalent book in C also exists.)
	3.	Wirth, N., "Algorithms and Data Structures", Prentice-Hall of India.
On-line TL Material	1.	https://nptel.ac.in/courses/106/102/106102064/
	2.	http://cse01-iiith.vlabs.ac.in/
	3.	https://ds2-iiith.vlabs.ac.in/data-structures-2/

********************PRACTICAL BASED ON ABOVE SYLLABUS*************************

Computer Architecture Scheme

(Theory: 2 hrs.)

Course Title: Computer Architecture										
Semester	III	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	Core	2 Hrs.	- -	--	2	10	15	50	--	--
Course Code	UCYL201									
Teaching Mode	Offline	2 Hrs			Total	75			-	
Duration of ESE	2 Hrs.					75				

Course Objectives	To understand the design principles of digital computing systems
	To provide essential understanding of different subsystems of modern computer system and design aspects these subsystems3
	To provide overview on performance enhancement methods in instruction execution
Course Outcomes	Upon successful completion of this course, student will be able to:
	CO1: To describe the basic components and design of a computer system
	CO2: To examine the issues involved in the instruction execution and various stages of instruction life stage
	CO3: To apply the concept of various memories and interfacing technologies
	CO4: To analyze the different parallel processing technique
	CO5: To design different high performance computing architecture

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	--	--	--	--	--	--	--	--	--	--	--	3	--
CO2	--	2	--	--	--	--	--	--	--	--	--	--	2	--
CO3	--	3	--	--	--	--	--	--	--	--	--	--	2	--
CO4	--	--	3	--	--	--	--	--	--	--	--	--	3	--
CO5	--	--	3	--	--	--	--	--	--	--	--	--	--	3

Course Contents:

Unit	Contents	Hours
I	**Basic functional blocks of Computer:** Overview and history of computer architecture, CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU–registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set, Case study–instruction sets of common CPUs, performance matrices for calculation of processing in Computer	5
II	**Computer Arithmetic:** Fixed point Addition, Subtraction, Multiplication and Division. Floating Point arithmetic, High performance arithmetic, Booth‟s algorithm, Data representation methods, IEEE standard single and double precision format and examples, ALU	5
III	**Memory Architecture:** Memory hierarchy, Memory Chip Organization, Cache memory, Virtual memory, Parallel Bus Architectures, Internal Communication Methodologies, Serial Bus Architectures, Mass storage, Input and Output Devices, Segmentation, TLB, Page replacement algorithms, DMA	5
IV	**Pipelining:** Basic concepts of pipelining, Arithmetic and Instruction Pipeline, throughput and speedup, pipeline hazards, Introduction, Logic Design Conventions, Building a Datapath-Pipelined Datapath and Control. Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions, Software interrupt and exceptions.	5
V	**Processor Architecture:** hardwired and micro-programmed design approaches, Case study - design of a simple hypothetical CPU. Multicore processors architecture, Instruction set architecture CISC, RISC, Introduction to Graphics Processing Units, Clusters and Warehouse scale computers, Advanced topics & its Application.	5

Cyber Laws and Cyber Ethics Scheme
(Theory: 3 hrs.)

Course Title: Cyber Laws and Cyber Ethics										
Semester	III	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category		3	-	-	3	10	15	50	-	-
Course Code	UCYL202									
Teaching Mode	Offline				Total	75			-	
Duration ESE	2 Hr	3 Hrs				75				

Course Objectives	To understand the basics need of Cyber laws
	To understand the ethical issues in Cyber Space
	To Understanding the initiatives taken by Government to incorporate Cyber Laws and Ethics
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Understand cyberspace & legal issues in cyber society .
	CO2: Understand facets of India IT act
	CO3 : Understand of intellectual property issues and development of the law in this regard
	CO4: Understanding e governance and , digital evidence management
	CO5: Interpret Cyber Ethics and its significance

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	--	**1**	--	--	--	**3**	--	**2**	--	--	--	--	**2**	--	--
CO2	--	**2**	--	--	--	**3**	--	**3**	--	--	--	**1**	**2**	--	--
CO3	--	--	--	--	--	**3**	--	**2**	--	--	--	**1**	--	**3**	--
CO4	--	--	--	**3**	**3**	**1**	--	**2**	--	--	--	--	**2**	--	--
CO5	--	**1**	--	--	--	**2**	--	**3**	--	--	--	--	--	**3**	--

Course Contents:

Unit	Contents	Hours
I	**Introduction to Cyber law:** Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Need for IT act – Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.	7
II	**Cyber Ethics:** The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics. Case Studies on Cyber crimes	7
III	**Intellectual Property Rights** – Copyrights- Software – Copyrights vs Patents debate - Authorship and Assignment Issues - Copyright in Internet - Multimedia and Copyright issues - Software Piracy - Trademarks - Trademarks in Internet – Copyright and Trademark cases, Patents - Understanding Patents - European Position on Computer related Patents, Legal position on Computer related Patents - Indian Position on Patents – Case Law, Domain names - registration - Domain Name Disputes-Cyber Squatting-IPR cases	7
IV	**The Indian IT Act**, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing, and the Weakness in Information Technology Act, Cybercrime and Punishment, Cyber law, Technology and Students: Indian Scenario. Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication	7
V	**Electronic Governance** Legal Recognition of Electronic Records and Electronic Evidence -Digital Signature Certificates - Securing Electronic records and secure digital signatures - Duties of Subscribers - Role of Certifying Authorities - Regulators under the Act -The Cyber Regulations Appellate Tribunal - Internet Service Providers and their Liability–Powers of Police under the Act – Impact of the Act on other Laws	7

Text Books	1 2	Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
E--Books	1.	https://www.pdfdrive.com/investigating-cyber-law-and-cyber-ethics-issues-impacts-and-practices-d157129939.html
Reference Books	1.	Farouq Ahmed, *Cyber Law in India*, New Era publications, New Delhi S.R.Myneni: *Information Technology Law(Cyber Laws)*, Asia Law House, Hyderabad.
Online TL Material	1.	https://www.pdfdrive.com/overview-of-cyber-laws-in-india-d4030769.html

Web Technology Scheme

(Theory: 3 hrs. Practical 2 hrs.)

Course Title: Web Technology										
Semester	III	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	III	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	Core	3 Hrs.		2 Hrs.	4	10	15	50	25	
Course Code										
Teaching Mode	Offline	5 Hrs			Total	75			25	
Duration of ESE	2					100				

Course Objectives	1. Students will able to understand and illustrate HTML.
	2. Students will be able to understand about XML, Dynamic HTML Properties.
	3. Student will able to understand basic of Java Script
	4. Student will able to design website.
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Understand basic principles of dynamic interactive web sites.
	CO2: Apply the different tags of HTML, CSS, and XHTML.
	CO3: Analyze various scripting languages to create interactive components in web pages.
	CO4: Design and implement dynamic websites with good aesthetic sense
	CO5: Understanding Semantic Web and Applying Web Analytics over Semantic Web.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1	2	3	3	3	1	2	1	2	1	--	--	--	2	2	--
CO2	--	2	2	2	3	2	1	--	1	--	--	--	2	2	--
CO3	2	2	2	2	1	1	1	--	1	--	--	--	2	1	--
CO4	--	1	2	3	1		1	2	1	--	--	--	3	2	--
CO5	2	2	2	2	1	2	1	1	1	--	--	--	3	2	--

Course Contents:

Unit	Contents	Hours
I	Internet and World Wide Web - Overview, Web System Architecture, Web Clients and Web Servers, Application Servers. Hypertext Transfer Protocol -primitives, methods, content transport, HTTP1.1 and HTTP2, HTTPS, SSL. Introduction to HTML: HTML Common tags- List, Tables, images, forms, Frames; Cascading, Style sheets. Client side programming with XHTML, HTML5, CSS3.	7
II	Dynamic HTML: Introduction, Object Referencing, Dynamic Styles, Dynamic Positioning, Using the frames Collection, navigator Object, Summary of the DHTML Object Model, Event Model. XML: Introduction to XML, Defining XML tags, their attributes and values, Document type definition, XML Schemas, Document Object model, XHTML, XPath and XSLT	8
III	JavaScript: Functions- Introduction, Data types, Variables, Expressions and Operators. JavaScript Statements, loops, arrays, strings, function,JavaScript Global Functions, Recursion, javaScript arrays, JavaScript objects. Event driven programming with JavaScript, Client-side validation; Server side programming, Sessions and Session Tracking techniques.	8
IV	PHP : Starting to script on server side, Arrays, function and forms, advance PHP Databases : Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs.	10
V	Service Oriented Architecture – SOAP. Web 2.0 technologies, Introduction to semantic web. Capturing Information from semantic web pages; Data analytics over semantic and linked Web. Internet/Web of Things, Applications and Research Trends.	7

Object Oriented Programming Scheme

(Theory: 3 hrs, Practical: 2 hrs.)

Course Title: **Object Oriented programming**										
Semester	III	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	PC	3	-	2	4	10	15	50	25	-
Course Code	UCSL207/ UCSP207									
Teaching Mode		5			TOTAL	75			25	
Duration of ESE						100				

Course Objectives	1. This course introduces student's general idea and concepts of object oriented programming.
	2. It is also aimed at developing skills to implement these concepts.
	3. The course provide carrier opportunities in design of some applications as object oriented concepts plays dominant role in software development
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Articulate the principles of object oriented programming using C++
	CO2: Apply function overloading, constructor overloading, operator overloading & its uses in programming
	CO3: Implement inheritance and polymorphis concepts and its use for application development
	CO4: Implement static and dynamic memory allocation for software development
	CO5: Develop generic programming applications using templates

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--
CO2	--	--	3	--	--	--	--	--	--	--	--	--	3	--	--
CO3	--	--	2	2	--	--	--	--	--	--	--	--	3	--	--
CO4	--	--	--	2	--	--	--	--	--	--	--	--	2	--	--
CO5	--	--	--	2	--	--	--	--	--	--	--	--	2	--	--

Course Contents:

Unit	Contents	Hours
I	Principles Of Object Oriented Programming: Differences between C and C++.A look at procedure Oriented programming, object oriented programming paradigm, basic concepts of OOP, Benefits of OOP, OO languages, A sample program, structure of C++ program. Introduction to OOPS :The origins of C++, What is Object Oriented Programming?, Some C++ fundamentals, Headers & Name Spaces, Introducing C++ Classes, Function overloading, Operator overloading, Inheritance, Constructors & Destructors, Function & Operator Overloading:	8
II	Overloading constructor functions, Localizing variables, Function overloading & Ambiguity, Finding the address of an overloaded function, this Pointer, Operator overloading, References, Using reference to overload a unary operator, Overloading [], overloading ( ), Applying operator overloading.	8
III	Inheritance, Virtual Functions and polymorphism Inheritance and the access specifies, Constructors and Destructors in derived classes, Multiple Inheritance, Passing parameters to a basic class, Pointers and references to derived types, Virtual Functions, Why virtual functions?, Pure virtual functions and abstract types, Early Vs Late binding.	8
IV	Static & Dynamic allocation Static & Dynamic allocation using new and delete, static class members, Virtual base classes, const member functions and mutable, volatile member functions, Using the asm keyword, linkage specification, The .* and ->* operators, Creating conversion functions, Copy constructors, Granting access, namespaces, Explicit constructors, typename and export.	8
V	Templates & Exception Handling Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters, Exception Handling, fundamentals, options the uncaught exception ( ), Applying exception Handling, and RTTI, casting operators, Recent trends in Object Oriented Programming in C++ , Advanced topics & its Application	8

Sr. No.	Name of Experiments / Mini Projects/ Case Studies
1	Write a program to compute the area of triangle and circle by overloading the area() function.
2	Define a class to represent a bank account. Include the following members : Data members:- Name of depositor, Account number, Type of account, Balance amount in the account Member functions:- To assign initial values, To deposit an amount, To withdraw an amount after checking the balance, To display name & balance Write a main program to test program using class and object.
3	Create two classes DM and DB which stores values of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out addition operation
4	Create a class MAT of size m * n. Define all possible matrix operations for MAT type objects
5	Create Stud class to display student information using constructor and destructor. (Default constructor, Multiple constructor, Copy constructor, Overloaded constructor)
6	Consider class network of given figure. The class master derives information from both account and admin classes which in turn derive information from the class person. Define all the four classes and write a program to create, update and display the information contained in master objects.
7	A book shop sells both books and video tapes. Create a class media that stores the title and price of the publication. Create two derived classes, one for storing number of pages in the book and another for storing playing time of tape. A function display() must be defined in all classes to display class contents. Write a program using polymorphism and virtual function.
8	Write a program to show use of this pointer, new and delete.
9	Write a function template for finding the minimum value contained in an array
10	Write a program containing a possible exception. Use a try block to throw it and catch block to handle it properly.
	Open Ended Experiments / New Experiments
1	Write a class template to represent a generic vector. Include member functions to perform following tasks -To create a vector -To modify the value of given element -To multiply by scalar value. -To display vector.
2	Write a C++ program to design a simple calculator

Text Books	1.	Object Oriented Programming in C++ -Robert Lafore, edition, Galgotia Publications
	2.	The Complete Reference C++, Herbert Schildt, 4th Edition, TMH
E--Books	1.	C++ And Object-Oriented Programming Paradigm, *Jana, Debasish*
Reference Books	1.	Let's C++ by Y. Kanetkar, BPB publications
	2	Object oriented programming with C++, E Balagurusamy, 4th edition, TMH

Introduction to Cyber Security Scheme

(Theory: 3 hrs.)

Course Title: Introduction to Cyber Security										
Semester	III	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	IIII	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	Core	3	-	-	3	10	15	50	-	-
Course Code	UCYL204									
Teaching Mode	Offline	3 Hrs			Total	75			-	
Duration of ESE	2 Hr					75				

Course Objectives	To understand the basics need of cyber security
	To understand the parameters in cyberspace
	To understand the security applied at different levels
	Understanding computer ethics & security policies
	Understanding the initiatives taken for cyber security
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: To explain cyberspace & different possible cyber crime
	CO2: To choose the correct browser & applying email security
	CO3: To take care of security in social media & smartphones
	CO4: To confirm security while electronic transactions
	CO5: To understand & apply for security policies & explore more initiatives

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O 2	
CO1	--	**3**	--	--	--	--	--	--	--	--	--	--	**3**	--	--
CO2	--	**3**	**2**	--	--	--	--	--	--	--	--	--	**2**	--	--
CO3	--	**1**	**3**	--	--	--	--	--	--	--	--	--	--	**3**	--
CO4	--	**1**	**3**	--	--	--	--	--	--	--	--	--	--	--	--
CO5	--	**1**	--	--	--	**3**	--	--	--	--	--	--	--	**3**	--

Course Contents:

Unit	Contents	Hours
I	**Introduction to Cyber Space** History of Internet Cyber Crime Information Security Introduction to cryptography Computer Ethics and Security Policies GDPR Privacy and concerns	7
II	**Browser selection according to the requirement and email security, password & wi-fi security** Guidelines to choose web browsers Securing web browser Antivirus Email security Guidelines for setting up a Secure password Two- steps authentication Password Manager Wi- Fi Security Network and cloud security	7
III	**Social media, basic Windows & smartphone security** Guidelines for social media security , Tips and best practices for safer Social Networking Basic Security for User Account Password Smartphone Security Android Security IOS Security	7
IV	**Online Banking, Credit Card and UPI Security, Micro ATM, e-wallet and POS Security** Online Banking Security Mobile Banking Security Security of Debit and Credit Card UPI Security Security of Micro ATMs e-wallet Security Guidelines Security Guidelines for Point of Sales(POS)	7
V	**Cyber Security Initiatives in India** Counter Cyber Security Initiatives in India Cyber Security Exercise Cyber Security Incident Handling Cyber Security Assurance	7

Text Books	1.	"Introduction to Cyber Security: Fundamentals" Ugo Ekpo (MBCS CITP), Independently published (October 12, 2018)
E--Books	1.	Cybersecurity: The Beginner's Guide A Comprehensive Guide to Getting Started in Cybersecurity, Erdal Ozkaya
Reference Books	1.	Cybersecurity Essentials, Wiley Brand, Christopher Grow, Philip Craig, Donald Short, Charles J. Brooks
on line TL Material	1.	https://onlinecourses.swayam2.ac.in/nou19_cs08/preview

SYLLABUS: IV SEMESTER Computer Science and Engineering (Cyber Security)

Syllabus for
Transforms and Numerical Methods Scheme
(Theory: 3 hrs, Tutorial: 1hr.)

Course Title: **Transforms and Numerical Methods**										
Semester	IV	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	BS	3	1	--	4	10	15	50	--	--
Course Code	UBSL256									
Teaching Mode	Offline	4			Total	75			--	
Duration of ESE	2.5 hrs					75				

Course Objectives	The objectives of this course is to teach students to comprehend the transform method to solve differential and difference equations.
	Learn Numerical methods to solve algebraic, transcendental, simultaneous and ordinary differential equations.
Course Outcomes	Upon successful completion of this course, student will be able to:
	CO1:. Understand the mathematical descriptions in Laplace Transform
	CO2: Understand the mathematical descriptions in Z- transform.
	CO3: Understand numerical techniques to solve various algebraic and transcendental equations
	CO4: Apply the knowledge of numerical techniques to solve ordinary differential equations

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

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

Course Contents:

Unit	Contents	Hours
I	**Laplace Transforms:** Laplace transform: definition and their simple properties, Transform of derivatives and integrals, Evaluation of integrals by Laplace transform, Inverse Laplace transform and its properties, Convolution theorem, Laplace transforms of periodic function and unit step function. Solutions of mathematical models (ODE & PDE) using Laplace Transform. Solution of simultaneous ordinary differential equations by Laplace Transform method.	12
II	**Z-Transforms:** Definition, properties of Z- Transforms, Inverse Z- Transform and relation between Z transform and Laplace Transform. Convolution Theorem, Application of Z-Transform to solve difference equations with constant coefficients.	12
III	**Numerical Methods-I:** Error analysis, Solutions of algebraic and transcendental equations. Bisection method, False position method, Newton-Raphson method and their convergences. Solution of system of linear equations by Gauss Seidel method, Crout's method, Gauss Jordan method, Jacobi's Method	12
IV	**Numerical Methods-II:** Solution of ordinary differential equation by Taylor series method, Runge-Kutta fourth order method, Euler modified method, Picard's Method, Milne's Predictor corrector method. Solution of Simultaneous and higher order differential equations.	12

Text Books	1.	Higher Engineering Mathematics, Grewal B.S.: Khanna Publishers; 2013 Forty Third
EBooks	1.	http://www.math.ust.hk/~machas/numerical-methods.pdf
Reference Books	1.	Advanced Engineering Mathematics, Kreyszig, E. John Wiley & Sons; 2000, Eight
	2.	Advanced Engineering Mathematics, Jain, R.K. and Iyengar, S.R.K,2007,Third
	3.	Numerical Methods, Dr. P Kandasamy, S.Chand Publishers Edition forty third.
	4.	Introduction to Numerical Analysis, S. Baskar and S. Sivaji Ganesh, 2013

Fundamentals of Cryptography Scheme
(Theory: 3 hrs.)

Course Title: Fundamentals of Cryptography										
Semester	IV	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	IV	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	Core	3	-	-	3	10	15	50	-	-
Course Code	UCYL205									
Teaching Mode	Offline	3 Hrs			Total	75			-	
Duration of ESE	2 Hr					75				

Course Objectives	Understanding of the basic concepts of Cryptography
	To understand the techniques of Classical Cryptosystems
	To understand concepts of Symmetric cryptography
	To understand concepts of Asymmetric cryptography
	To Provide students with a comprehensive overview of Message Authentication Code and Hash Functions
Course Outcomes	CO1: To elaborate the role of cryptography & its fundamentals
	CO2: To apply various cryptography techniques
	CO3: To apply concepts of Symmetric cryptography
	CO4 : To apply concepts of Asymmetric cryptography
	CO5 : TO analyze MAC and Hash Codes

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O 2	PS O3
CO1	**2**	**2**	**3**	--	--	--	--	--	--	--	--	--	**3**	--	--
CO2	--	**2**	--	--	--	--	--	--	--	--	--	--	--	**2**	--
CO3	--	**3**	--	--	--	--	--	--	--	--	--	--	**1**	--	--
CO4	--	--	**3**	**3**	--	--	--	--	--	--	--	--	--	**2**	--
CO5	**3**	--	--	**3**	--	--	--	--	--	--	--	--	--	--	**3**

Course Contents:

Unit	Contents	Hours
I	**Introduction to Cryptography:** Introduction to, Terminology, History of Cryptography ,Shannon's Description of a Conventional Cryptosystem, Statistical Description of a Plaintext Source, Problems, Attacks, services, mechanisms, security attacks, security services, a model for internet work security, encryption model, steganography.	8
II	**Classical Cryptosystems :** Caesar, Simple Substitution, Caesar Cipher, .Playfair ,Simple Substitution Cryptanalysis by The Method of a Probable Word .Vigenère Cryptosystem ,Kasiski's Method, Transpositions, Rail Fence The One-Time Pad Transposition.	8
III	**Introduction to Symmetric cryptography**: Symmetric cryptography, algorithms under symmetric cryptography.Block Ciphers Some General Principles Some Block Cipher ModesCodebook Mode Cipher Block Chaining Cipher Feedback Mode DES DES ,Triple DES and IDEA .	8
IV	**Introduction to Asymmetric cryptography**: , Asymmetric cryptography, algorithms under asymmetric cryptography, placement of encryption function, traffic confidentiality, key distribution, Public key cryptography, Chinese remainder theorem, discrete logarithms.	8
V	**Message Authentication and Hash Functions** Authentication requirements, functions, codes**,** security of hash function & MACs. Hash & MAC algorithms. Digital signatures & authentication protocols.	8

Text Books	1.	a) Cryptography and networks security principles & practice by William Stallings (Pearson Education prentice Hall b) FUNDAMENTALS OF CRYPTOLOGY KLUWER ACADEMIC PUBLISHERS By Henk C.A. van Tilborg Eindhoven University of Technology The Netherlands
E--Books	1.	Cryptography and networks security principles & practice by William Stallings (Pearson Education prentice Hall
Reference Books	1.	Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition Cryptography and Network Security : ForouzanMukhopadhyay, McGraw Hill, 3rd Edition
On line TL Material	1.	1. nptel.ac.in/courses/106105031 (IIT K) 2. https://nptel.ac.in/courses/106105031/39 3. https://nptel.ac.in/courses/106106129 4. https://onlinecourses.nptel.ac.in/noc18_cs24

Design and Analysis of Algorithm Scheme
(Theory: 3 hrs, Practical: 2 hrs.)

Course Title: Design and Analysis of Algorithm										
Semester	IV	Teaching Scheme				Evaluation Scheme				
Term	EVEN					Theory			Practical	
Course Category	C	Th	Tu	Pr	Credits	TAE	CAE	ESE	Int	Ext
Course Code	UCSL205/ UCSP205	3 Hrs	N A	2 Hrs	4	10	15	50	25	25
Teaching Mode	Offline									
Duration of ESE	2 Hrs	5 Hrs			Total	75			50	
						125				

Course Objectives	This course introduces students the general idea of analysis and design of algorithms while making them aware of basic methods of algorithm analysis and design.
	It is also aimed at developing skills to solve real life applications which involve algorithm development
	The course also provides career opportunities in analysis, design and optimization technique in algorithms
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Recall basic concepts of algorithm in analysis and Design of algorithms.
	CO2: Examine Recurrence relations, solutions of recurrence of searching sorting methods
	CO3: Apply Greedy methods used for analysis and Design of Algorithm
	CO4: Analyze Dynamic Programming concepts in designing algorithm
	CO5: Evaluate advanced techniques and tools available for algorithm analysis and development

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

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

Course Contents:

Unit	Contents	Hours
I	Unit – I: Mathematical foundations & Asymptotic notations summation of arithmetic and geometric series, n, n2, , Complexity calculation of various standard functions, Principles of designing algorithms, ,Asymptotic notations of analysis of algorithms, analyzing control structures, worst case and average case analysis, Iterative Algorithm analysis. Amortized analysis, application of amortized analysis.	9
II	Unit – II :Advanced data structures Recurrence relations, solutions of recurrence relations using technique of characteristic equation and generating functions Divide and conquer basic strategy, matrix operation, Strassens matrix multiplication , binary search, quick sort, merge sort.	9
III	Unit – III :Greedy Method Greedy method – basic strategy, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path etc.	9
IV	Unit IV : Dynamic Programming Dynamic Programming basic strategy, multistage graphs, all pairs shortest path, single source shortest paths, optimal binary search trees, traveling salesman problems.	9
V	Unit V:Traversal And Search Techniques Basic Traversal and Search Techniques, breadth first search and depth first search, Backtracking basic strategy, 8-Queen's problem, graph coloring, Hamiltonian cycles etc NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP-complete, decision and optimization problems, graph based problems on NP Principle & Advance Topic: (As per the instructor)	9

Text Books	1.	Thomas H. Cormenet. al. "Introduction to Algorithms", Prentice Hall of India.
	2.	Design & Analysis of Computer Algorithms by Aho,. Horowitz, Sahani, Rajsekharam, Pearson education
Reference Books	1.	"Computer Algorithms", Galgotia Publications Pvt. Ltd. Brassard, Bratley, "Fundamentals of Algorithms", Prentice Hall
	2.	Computer Algorithms: Introduction to Design and analysis, 3rd Edition, By Sara Baase& A. V. Gelder Pearson Education.
On-line TL Material	1.	NPTEL course on Design and Analysis of Algorithms: https://www.class-central.com/course/nptel-design-and-analysis-of- algorithms-3984

List of Practical

Sr. No.	Name of Experiments
1	To Implement and analyze time complexity of Searching Algorithm.
2	To Implement and analyze time complexity of Sorting Algorithm.
3	To Implement and analyze time complexity of algorithm using Divide and Conquer Technique.
4	To Implement and analyze time complexity of Greedy Algorithm.
5	To Implement and analyze time complexity of Algorithm of Dynamic Programming Technique.
6	To implement and analyze time complexity of Minimum Cost spanning Tree Algorithm.
7	To implement and analyze time complexity of Single source shortest path Algorithm.
8	Program to Print all the nodes reachable from a given starting node in a digraph using DFS method.
9	To implement and analyze time complexity of All pair shortest path Algorithm.
10	To implement and analyze time complexity of Graph Traversing Algorithm.
Open Ended Experiments / New Experiments.	
1	Open Source Practical: NP Complete
2	Open Source Practical: Graph Coloring
Details of on line Laboratory Resource Material Instruction / Operating Manuals	
1	**Virtual Lab: Graphs traversing https://virtual-labs.github.io/exp-bfs-iiith/bfs/bfs_demo.html**
2	**Virtual Lab** : Spanning Trees http://cse01- iiith.vlabs.ac.in /exp9/Introduction.html?domain=Computer%20Science&lab=Data%20Structures

Computer Networks Scheme
(Theory: 3 hrs, Practical: 2 hrs.)

Course Title: **Computer Networks**										
Semester	IV	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	3	--	2	4	10	15	50	25	--
Course Code	UCSL208 UCSP208									
Teaching Mode	Offline	5 Hrs			Total	75			25	
Duration of ESE	3 Hrs					100				

Course Objectives	To understand the computer network architectures.
	To make aware of design and performance perspective of network architectures.
	To discuss current trends in communication
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Analyze the need for OSI reference model in computer networking
	CO2: Studying the various transmission medium used in physical layer
	CO3: Analyzing different Elementary protocols for communication and Identify IEEE standards employed in computer networking
	CO4: Solve and apply various Routing Algorithm and Protocols
	CO5: Use techniques involved in developing transport and application layer of computer networking.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	--	3	--	--	--	--	--	--	--	--	--	--	3	2	--
CO2	--	--	3	--	--	--	--	--	--	--	--	--	3	--	--
CO3	--	--	--	--	3	--	--	--	--	--	--	--	2	3	--
CO4	--	--	3	--	--	--	--	--	--	--	--	--	3	2	--
CO5	--	--	--	3	--	--	--	--	--	--	--	--	2	3	--

Course Contents:

Unit	Contents	Hours
I	Unit-I: Introduction The use of computer networks. Network hardware. LAN's, Man's, WAN's, internet works, Network software, protocol hierarchies, design issues for layers, interfaces and services, Connectionless oriented and connectionless services, service primitives, relationship of Services to protocols, the OSI reference model, TCP/IP reference model, comparison ofOSI And TCP/IP reference model.	8
II	Unit-lI: Physical Layer The theoretical basis for data communication-Fourier analysis, bandwidth- limited signals, Maximum data rate of a channel, transmission media- magnetic media, and twisted pair coaxial Cable, fiber optics. Wireless transmission, microwave transmission. Multiplexing, switching, Narrow and ISDN - services, architecture, interface, perspective on N-ISDN, broadband ISDN & ATM-virtual circuits versus circuit switching, transmission in ATM networks, ATM Switches.	8
III	Unit-Ill: Data Link Layer Design issues - services provided to the network Layer, framing, error control, flow control, Error correcting & detecting codes, elementary data link protocols, simplex stop and wait Simplex protocols for noisy channel, sliding window protocols-one bit protocol, go back Protocol, selective repeat protocol. The medium access sub layer - static and dynamic channel Allocation in LANs and MANs, Multiple access protocols - ALOHA. CSMA, collision free Protocols, limited contention protocols, IEEE 802.11 wireless LAN protocols, IEEE Standards 802 for LAN and MANs-802.3 & Ethernet, token bus. Token ring,	8
IV	Unit-IV: The Network Layer Design issues, services provided to the transport layer, internal organization, comparison of Virtual circuit and datagram subnets, routing algorithms. Optimality principle, shortest path Routing, flooding, flow- based routing, distance vector routing, link state routing, hierarchical Routing, broadcast & multicast routing, congestion control algorithms, general principles Prevention policies, traffic shaping. flow specifications, congestion control in virtual circuit Subnets. choke packets, load shedding, jitter control. IP protocol, IP address. Subnets, internet Control protocols, OSPF. BGP.	8
V	Unit V: Transport and Application Layer Transport and Application Layer - services provided to the upper layer, Quality of Service, Transport service primitives, elements of transport protocols, addressing, establishing a Connection, releasing a connection, flow control & buffering, multiplexing, crash recovery,	8

Text Books	1.	Computer Networks, Andrew S. Tanenbaum, David J. Wetherall, Fifth Edition, Pearson
	2.	Data Communication And Networking, Behrouz A. Forouzam, Fourth Edition, McGraw Hill
	3.	An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
E--Books	1.	Fayez Gebali, Analysis of Computer and Communication Networks, First Edition, Springer
	2.	An Introduction to Computer Networks, Peter L Dordal, Department of Computer Science, Loyola University Chicago(http://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf)
	3.	TCP/IP Network Administration, Craig Hunt
Reference Books	1.	Jean Walrand , Pravin Varaiya, High-Performance Communication Networks (The Morgan Kaufmann Series in Networking), Second Edition, Morgan Kaufmann Publishers
	2.	V. S. Bagad, I. A. Dhotre, Computer Communication Networks, Third Edition, Technical Publications, Illustrated
	3.	Norman Abramson, Franklin F. Kuo, Computer-communication networks, Fourth Edition, Prentice-Hall, 1973, Illustrated
On-line TL Material	1.	Coursera – "Data communication Network Services" by Cisco
	2.	NPTEL – "Data Communication" by IIT Kharagpur
	3.	Swayam – "Computer Networks" by Anand More,

********************PRACTICAL BASED ON ABOVE SYLLABUS*************************

Operating Systems Scheme
(Theory: 3 hrs,)

Course Title: **Operating Systems**										
Semester	IV	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	3	--	-	3	10	15	50	--	--
Course Code	UCSL206									
Teaching Mode	Offline	5			Total	75				
Duration of ESE	2Hrs					75				

Course Objectives	Introduces general idea, structure and functions of operating system
	Making students aware of basic mechanisms used to handle processes, memory, storage devices and files.
	Recent trends in the operating system
Course Outcomes	**CO1**: Identify basic structure and purpose of operating system.
	CO2: Interpret the concepts of process and illustrate various CPU scheduling algorithms.
	CO3: Interpret the concepts of inter process communication.
	CO4: Schematize Deadlock & security mechanisms in operating systems.
	CO5: Analyze different memory management techniques with advantages and disadvantages.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

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

Course Contents:

Unit	Contents	Hours
I	Evolution of OS, Types of OS, Basic h/w support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation.	6
II	Process & Its Scheduling Process concept, process control block, Types of scheduler, context switch, threads, multithreading model, goals of scheduling and different scheduling algorithms,	4
III	Process management and synchronization: Concurrency conditions, Critical section problem, software and hardware solution, semaphores, conditional critical regions and monitors, classical inter process communication problems	4
IV	Deadlock definitions, Prevention, Avoidance, detection and Recovery, Goals of Protection, access matrix, Deadlock implementation	8
V	Memory Management & File systems**:** Contiguous allocation, Relocation, Paging, Segmentation, Segmentation with paging, demand paging, Virtual Memory Concepts, page faults and instruction restart, page replacement algorithms, working sets, Locality of reference, Thrashing, Garbage Collection. File concept, Access methods space allocation strategies, disk arm scheduling strategies.	8

Text Books	1.	Operating System concepts – Silberchatz; Galvin, Addison Wesley, 6th Edn.
	2.	Modern Operating Systems – Tanenbaum, Pearson Edn. 2 ndedn
	3.	Operating Systems: Internals and Design Principles -- William Stallings
Reference Books	1.	Operating Systems – S R Sathe, Macmillan Publishers, India, 2008
	2.	Operating System –Milan Milenkovik, McGraw-Hill, 1987
	3.	Operating Systems - 3 rd Edition by Gary Nutt, Pearson Education.
On-line TL Material	1.	https://nptel.ac.in/courses/106/108/106108101/

Data Analytics Scheme
(Theory: 3 hrs, Practical 2 hrs.)

Course Title: Data Analytics										
Semester	IV	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term		Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	TH/PR	3Hrs.	-	2Hrs.	3	10	15	25	25	-
Course Code	UCYL206/ UCYP206									
Teaching Mode	Offline	5 Hrs			Total	50			25	
Duration of ESE	2					75				

Course Objectives	To perform descriptive statistics on the given dataset
	To perform inferential statistics on the given dataset
	Apply linear regression and logistic regression and perform data visualization on the given dataset.
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Analyze the dataset and perform Descriptive Statistics
	CO2: Analyze the dataset and perform an Inferential Statistics
	CO3: Apply regression Analysis on the given dataset
	CO4: Create an interactive data visualization
	CO5: Study Unsupervised learning Techniques

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O 2	PS O 3
CO1	**3**	--	--	--	--	--	--	--	--	--	--	--	**2**	--	--
CO2	**3**	--	--	--	--	--	--	--	--	--	--	--	**2**	--	--
CO3	--	--	**3**	--	--	--	--	--	--	--	--	--	**3**	--	--
CO4	--	--	**3**	--	--	--	--	--	--	--	--	--	--	**3**	--
CO5	--	--	--	--	**3**	--	--	--	--	--	--	--	--	--	--

Course Contents:

Unit	Contents	Hours
I	Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases and Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.	9
II	Descriptive statistics, data preparation. Exploratory Data Analysis data summarization, data distribution. Visualizing numerical data - graphing systems, measures of central tendency and dispersion – correlation - transforming data - exploring categorical variables.	8
III	Regression: linear regression simple linear regression, multiple & Polynomial regression, Sparse model	5
IV	Supervised Learning: First step, learning curves, training validation and test. Learning models generalities, support vector machines, decision trees and random forest.	7
V	Unsupervised learning, clustering, similarity and distances, quality measures of clustering, case study.	7

Text Books	1.	Data Analytics: The Complete Beginner's Guide: the Black Book,Byron Francis, CreateSpace Independent Publishing Platform, 2016
	2.	Gupta S. C., & Kapoor V. K., Fundamental of Mathematical Statistics, Sultan Chand & Sons, 2018.
	3.	Teetor P, R cookbook: Proven recipes for data analysis, statistics, and graphics, O' Reilly Media Inc., 2011.
E--Books	1.	Fundamentals of Mathematical Statistics, Gupta SC, Kapoor V.K.. Publisher: Sultan Chand & Sons. Publishing Year: 2020. http://dcpehvpm.org/E-Content/Stat/FUNDAMENTAL%20OF%20MATHEMATICAL%20STATISTICS-S%20C%20GUPTA%20&%20V%20K%20KAPOOR.pdf
Reference Books	1.	Joel Grus , Data Science from Scratch First Principles with Python, O'Reilly Media, 2016
on line TL Material	1.	https://www.iare.ac.in/sites/default/files/lecture_notes/APA%20Lecture%20notes.pdf
	2.	https://www.csus.edu/indiv/h/hopfem/notes.htm

Sr. No.	Name of Experiments
1	Loading dataset and visualizing data
2	Producing descriptive statistics measures
3	Demonstrate handling of missing data
4	Demonstrate Scatter Plot
5	Demonstrate Histogram Plot
6	Demonstrate Linear Regression for a given dataset
7	Demonstrate Multiple Linear Regression for a given dataset
8	Demonstrate Logistic Regression for a given dataset
9	Demonstrate Clustering for a given dataset
10	Demonstrate random Forest method for a given dataset
Open Ended Experiments / New Experiments	
1	Demonstrate Classification for a given dataset
2	Demonstration of data analysis on virtual Lab
Details of on line Laboratory Resource Material Instruction / Operating Manuals	
1.	https://www.iiitmk.ac.in/DAVirtalLab/#work

Syllabus of Open Elective-I

Course Title: Data Analysis for Business Intelligence										
Semester	IV	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	Even	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	OE	2	-	-	2	10	15	50	-	-
Course Code	UAIL211									
Teaching Mode	Offline	2 Hrs			Total	75			-	
Duration of ESE	2 Hrs					75				

Course Objectives	To learn Data Collection & Pre-Processing.
	To learn the basic rudiments of business intelligence system
	Be exposed with different data analysis tools and techniques
Course Outcomes	Upon successful completion of this course, student will be able to:
	C01: Understand Data Collection & Pre-Processing
	C02: List & Define the fundamentals of business intelligence & interpret the data of business intelligence.
	C03: Acquire the knowledge of exploratory Data Analysis.
	C04: Understand Machine Learning for Business
	C05: Analyze and design a real world problem using Data Visualization

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes													
	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PS O2
CO1	--	--	3	--	--	--	--	--	--	--	--	--	2	2
CO2	--	--	3	3	--	--	--	--	--	--	--	--	3	3
CO3	--	--	3	--	--	--	--	--	--	--	--	--	2	2
CO4	--	--	3	3	--	--	--	--	--	--	--	--	3	3
CO5	--	2	--	--	--	--	--	--	--	--	--	--	1	1

Course Contents:

Unit	Contents	Hours
I	**Data Collection & Pre-Processing:** Understanding the Dataset, Python package for data science, Importing and Exporting Data in Python, Basic Insights from Datasets, Identify and Handle Missing Values Data Formatting, Data Normalization Sets, Binning, Indicator variables.	5
II	**Introduction to Business Intelligence**: evolution of BI, BI value chain, introduction to business analytics, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities.	5
III	**Exploratory Data Analysis:** Descriptive Statistics, Basic of Grouping, Correlation.	5
IV	**Machine Learning for Business:** Machine learning and data use cases, Machine learning types, Business requirements and model design.	5
V	**Data Visualization**: Loading Data in pandas, Plotting Data with matplotlib Different Types of Plots. **Introduction to Tableau**: Building and Customizing Visualizations Analyzing Data in Tableau: Preparing for Analysis, Exploring Visualizations Mapping Analysis, Groups, Sets, and Parameters.	5

Text Books	1.	Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence Systems", 9th Edition, Pearson 2013.
Reference Books	1.	Fundamentals of Business Analytics, R N Prasad and S Acharya, Wiley India, 2011.
	2.	David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager"s Guide", Second Edition, 2012
Online Material	1	https://courses.cognitiveclass.ai/courses/course-v1:CognitiveClass
	2	https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-mg24/#:~:text=Course%20abstract&text=This%20course%20seeks%20to%20present,%2C%20predictive%2C%20and%20prescriptive%20analytics.
		https://nptel.ac.in/courses/110/106/110106072/

Course Title: Introduction to Blockchain Technology										
Semester	IV	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	OE	2	--	-	2	10	15	50	---	--
Course Code	UCSL210									
Teaching Mode	Offline	3 Hrs			Total	75				
Duration of ESE	3 Hrs					75				

Course Objectives	The student should be made to:
	1. Understand the technical aspects of crypto currencies and block chain technologies.
	2. Understand fundamental concepts of the cryptographic concepts
	3. Understand fundamental concepts of the cryptocurrencies.
	4. Understand the concepts of cryptocurrency regulations.
Course Outcomes	At the end of the course, the student should be able to
	CO1: Analyse the concept of bit coin and mathematical background behind it
	CO2: Apply the tools for understanding the background of crypto currencies
	CO3: Evaluate security, privacy, and efficiency of a cryptocurrency.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

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

Course Contents:

Unit	Contents	Hours
I	**Introduction:** Bit coin - Wallet - Blocks - Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bit coin. Bitcoin blockchain, the challenges, and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their uses.	7
II	**CRYPTOGRAPHIC FUNDAMENTALS:** 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.	8
III	**Cryptocurrency:** History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin	7
IV	**Cryptocurrency Regulation:** Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy.	8

Text Books	1.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
	2.	Anshul Kaushik, “Block Chain and Crypto Currencies”, Khanna Publishing House, Delhi
Reference Books	1.	Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies
	2.	Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
	3.	DR. Gavin Wood, “ETHEREUM: A Secure Decentralized Transaction Ledger,”Yellow paper.2014.
	4.	**Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum ,smart contracts**
On-line TL Material	1.	Prof. Sandeep Shukla, IIT Kanpur https://nptel.ac.in/courses/106/104/106104220/
	2.	Prof. Praveen Jayachandran, IIT Kharagpur https://nptel.ac.in/courses/106/105/106105184/

UEEL210: Non-Conventional Energy Sources											Exam Duration
Teaching Scheme				Credits	Continuous Evaluation Scheme						
					Theory			Practical		Total	
Th	Tu	Pr.	Total Hours		TAE	CA E	ESE	Int	Ext		2 Hrs
2	-	-	2	2	10	15	50	-	-	75	

Course Objectives	The subject aims at basic solar power generation
	1. Students should able to develop in-depth knowledge for Various renewable energy resources available at a location
	2. Students should able to develop and read hydrographs, estimate flow, head, and power. Geothermal, wave, tidal and OTEC resources, site selection.
	3. Students should able to develop the concept of hybrid technology.
Course Outcomes	Upon successful completion of this course, student will be able to:
	1. To understand the basic principles of solar photovoltaic Technology.
	2. To understand the basic principles of wind energy conversion system.
	3. To understand the basic knowledge of other Nonconventional Energy Sources.
	4. To understand the basic concept of Hybrid Technology.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	--	3	--	--	--	--	1	3	2
CO2	3	2	2	1	1	--	3	--	--	--	--	1	3	2
CO3	3	2	2	1	1	--	3	--	--	--	--	1	3	2
CO4	3	2	2	1	1	--	3	--	--	--	--	1	3	2

Course Contents:

Unit	Contents	Hours
I	**Basic concept of Solar Energy:** Basics of Sun, Solar Constant, Solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surfaces, why south facing?, comparison of true south & Magnetic south.	04
II	**Solar Energy Collectors:** Physical Principles of the conversion of solar radiation into heat, flat plate collectors, transitivity of cover systems, energy balance equation and collector efficiency, concentrating collectors, comparison of concentrating and flat plate collectors, selective absorber coatings. Solar Energy Storage: Solar Energy Storage system (Thermal, Electrical, Chemical, Mechanical), Solar ponds. Application of Solar Energy: Solar water heating, space heating, space cooling, solar thermal heat conversion, solar photovoltaic energy conversion, solar pumping, solar cooking, online grid connected, solar photovoltaic generation system.	08
III	**Wind Energy:** Basic principles of wind energy conversion, wind energy conversion system, wind data & energy estimation, site selection consideration, basic components of wind energy conversion system (WECS), classification of WEC system, generating system, energy storage, application of wind energy.	6
IV	**Nonconventional Energy Source:** ENERGY from OCEANS: Ocean thermal electric conversation (OTEC), Claude & Anderson cycles, evaporators, Bio-fouling, Hybrid cycle, components of OTEC for power generation. Energy from Tides: Introduction, basic principles of Tidal power, components of Tidal Power Plants, operation methods of utilization of Tidal Energy; Estimation of Energy & Power in simple single basin. Tidal system: Advantages & limitations of Tidal Power Generations, energy & power from wares, waveenergy conversions devices. Brief Introduction to operating principlesonly): small scale hydro electric power generation, Energy from Bio –Mass, Geothermal Energy, MHDpower generation, fuel cell etc.	08
V	**Basic concept of Hybrid Technology:** Types of Hybrid Technology systems, solar-wind hybrid technology concept, Basic Optimizing techniques to improve the efficiency of Hybrid system.	04

Text Books	**1**	D Non Conventional Energy Sources, G.D. Rai, Khanna publishers
		C Non Conventional Energy Resources, B. H. Khan, 2nd , The McGraw Hill Companies
	2	Energy Technology : Nonconventional, Renewable and Conventional, S. Rao & B. B. Parulekar, 1st, Khanna Publisher
Reference Books	1	Solar Energy: Principles of thermal collection and storage, S. P. Sukhatme, 2nd edition, Tata McGraw Hill Publishing Company Ltd.
	2	Solar Photovoltaics : Fundamental, Technologies and Applications, Chetan Singh Solanki, PHI Learning Pvt. Ltd.
On-line TL Material	1	https://www.youtube.com/watch?v=BTyJrRy8DUE&list=PLwdnzlV3ogoUtaGiq-_lVJc4CC6x_czs9D

Course Title: SENSORS AND TRANDUCERS										
Semester	I	Teaching Scheme				Evaluation Scheme				
Term	ODD					Theory			Practical	
Course Category	OE	Th	Tu	Pr	Credits	TAE	CAE	ESE	Int	Ext
Course Code	UECL211	2 Hrs.	-	-	2	10	15	50	-	-
Teaching Mode	Online/Black Board									
Duration of ESE	2 Hrs.	2 Hrs.			Total	75			-	
						75				

Course Objectives	• To understand the concepts of measurement technology.
	• To learn the various sensors used to measure various physical parameters.
	• To learn the fundamentals of signal conditioning, data acquisition and
Course Outcomes	**Upon successful completion of this course, student will be able to:**
	CO1. Expertise in various calibration techniques and signal types for sensors.
	CO2. Apply the various sensors in the Automotive and Mechatronics applications
	CO3. Study the basic principles of various Force, Magnetic and Heading Sensors.
	CO4. Differentiate Between Optical, Pressure And Temperature Sensors
	CO5. Understand Industrial Timer Circuits

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

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

Course Contents

Unit	Contents	Hours
I	**INTRODUCTION** Basics of Measurement – Classification of errors – Error analysis – static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.	06
II	**MOTION, PROXIMITY AND RANGING SENSORS** Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer. – GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).	06
III	**FORCE, MAGNETIC AND HEADING SENSORS** Strain Gauge, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor, Heading Sensors – Compass, Gyroscope, Inclinometers.	06
IV	**OPTICAL, PRESSURE AND TEMPERATURE SENSORS** Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple.	06
V	**INDUSTRIAL TIMERS** Classification, Types, Electronic Timers, RC and Digital Timers, Time Based Generators	06

Text Book/Reference Books/Online Material

Text Books	1.	Ernest O Doebelin, “Measurement Systems – Applications and Design”, Tata McGraw-Hill, 2009.
	2.	Sawney A K and Puneet Sawney, “A Course in Mechanical Measurements and Instrumentation and Control”, 12th edition, Dhanpat Rai & Co, New
EBooks	1.	Sensor and Transducer by I.R.Sinclair
Reference Books	1.	Patranabis D, “Sensors and Transducers”, 2nd Edition, PHI, New Delhi,
	2.	John Turner and Martyn Hill, “Instrumentation for Engineers and Scientists”, Oxford Science Publications, 1999.
	3.	Richard Zurawski, “Industrial Communication Technology Handbook”2nd edition, CRC Press,
online TL Material	1.	NPTEL Lecture

Subject Code: TOTAL QUALITY MANAGEMENT (UMEL213)											
Teaching Scheme				Credits	Continuous Evaluation Scheme						
					Theory				Practical		Total
Th.	Tu	Pr.	Total Hours		TAE	CAE	ESE	Duration of ESE (Hrs)	Int	Ext	
2	-	-	2	2	10	15	50	3	-	-	75

Course Objectives	**1.** To facilitate the understanding of Quality Management principles and process.
	2. To train them with various tools and techniques of Quality Management.
	3. To inculcate the importance of Quality in an organization.
	4. To make understood about the ISO Quality systems.
Course Outcomes	**1.** Apply knowledge to demonstrate the tools utilization for quality improvement.
	2. Analyze total quality management principles and process.
	3. Apply the various quality systems in implementation of Total quality management.
	4. Analyze the various types of techniques are used to measure quality

Course Contents:

Unit	Contents	Hours
I	**INTRODUCTION** Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.	5
II	**TQM PRINCIPLES** Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer experience and advocacy, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5S, Principles of kaizen, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.	5
III	**TQM TOOLS & TECHNIQUES I** The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking –Reason to bench mark, Bench marking process – FMEA – Stages, Types.	5
IV	**TQM TOOLS & TECHNIQUES II** Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.	5
V	**QUALITY SYSTEMS** Need for ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing-QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.	4

Text Books	1. Dale H. Besterfiled, et at., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).
	2. Total Quality Management, V. Jayakumar, Lakshmi Publications.(reprint 2005)
Reference Books	1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6 th Edition, South-Western (Thomson Learning), 2005
	2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
On-line TL Material	https://nptel.ac.in/courses/110/104/110104080/ The NPTEL course the "Total Quality Management-I" by PROF. RAGHU NANDAN SENGUPTA, IIT Kanpur

SEMESTER-V

Course Title: **DATABASE MANAGEMENT SYSTEM**										
Semester	V	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C14	2 Hrs.	1 Hr.		3	10	15	50		
Course Code	UCSL301									
Teaching Mode	Offline	3 Hrs			Total	75				
Duration of ESE	2 Hrs					75				

Course Objectives	This course introduces general idea of database management system, also gives idea to design databases using data modeling and design techniques.
	It is also aimed to developing skills to implement real life applications which involve database handling.
	This course also provide carrier opportunities in subject areas of designing, storage techniques and data handling and managing techniques
Course Outcomes	**CO1**: Analyze an information storage problem and derived an information model expression in the form of Entity relation diagram and design appropriate data model for it.
	CO2: Demonstrate SQL queries to perform CRUD (Create, Retrieve, Update, Delete) operations on database and perform inferential analysis of data model
	CO3: Identify features of database management systems and Relational database and Understand functional dependencies and various normalization forms
	CO4: Perform basic transaction processing and management and ensure database security, integrity and concurrency control
	CO5: Analyze the management of structured and unstructured data management with recent tools and technologies

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	--	--	3	--	3	--	--	--	--	--	--	--	2	--
CO2	--	--	3	3	--	--	--	--	--	--	--	--	3	--
CO3	--	2	3	--	--	--	--	--	--	--	--	--	--	3
CO4	--	--	3	2	--	--	--	--	--	--	--	--	2	--
CO5	--	--	2	--	3	--	--	--	--	--	--	--	2	--

Course Contents:

Unit	Contents	Hours
I	Introduction to DBMS - DBMS Architecture, Data Models, E-R Diagram, Relational Database design:	6
II	SQL Concepts - Basics of SQL, DDL, DML, DCL, structure – creation, alteration, defining constraints, Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types.	8
III	Functional Dependency (FD) – Basic concepts, closure of set of FD, closure of attribute set, Decomposition, Normalization – 1NF, 2NF, 3NF, BCNF, 4NF	5
IV	Transaction control commands – Commit, Rollback, Save point. Transaction Management: Transaction concepts, properties of transactions, serializability of transactions, Two- Phase Commit protocol, Deadlock, two-phase locking protocol. Cursors, Stored Procedures, Stored Function, Database Trigger, Database recovery.	7
V	Indexing and hashing, Query processing, Query Optimization, Data Mining, Advances in databases	4

Text Books	1.	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts 4th Ed, McGraw Hill, 2002.
	2.	Jeff Ullman, and Jennifer Widom, A First Course in Database systems, 2nd Ed.
E-Books	1.	https://ebooks.lpude.in/computer_application/mca/term_1/DCAP204_MANAGING_DATABASE_DCAP402_DATABASE_MANAGEMENT_SYSTEMS.pdf
Referenc e Books	1.	G. K. Gupta :"Database Management Systems", McGraw – Hill.
	2.	Regina Obe, Leo Hsu, PostgreSQL: Up and Running, 3rd Ed, O'Reilly Media 2017.
	3.	Kristina Chodorow, Shannon Bradshaw, MongoDB: The Definitive Guide, 3rd Ed, O'Reilly Media 2018.
	4.	RamezElmasri and ShamkantNavathe, Fundamentals of Database Systems 2nd Ed, Benjamin Cummings, 1994.
online TL Material	1.	https://nptel.ac.in/courses/106/105/106105175/

Course Title: **Computer System Security**										
Semester	VII	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C22	3 Hrs	NA	2 Hrs	4	10	15	50	25	25
Course Code	UCSL401/ UCSP401									
Teaching Mode	Offline	5 Hrs			Total	75			50	
Duration of ESE	2 Hrs					125				

Course Objectives	1. This course covers the fundamentals of computer systems security.
	2. It introduces many different areas of security such as encryption, malicious code, Authentication and access control, trusted computer systems, operating system and network security.
	3. The objective of this course is to provide students with a comprehensive overview of the threats to computer security, technologies for security assurance, and engineering approaches to security solutions.
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Understand the basic concepts and goals of Information security such as Confidentiality, Integrity, Authentication, Non - Repudiation, Authorization, and Availability and their relevance in various Contexts.
	CO2: Identify and design the various cryptographic algorithms for the appropriate protection measures against malicious code.
	CO3: Apply the modern principles of network security threats and determine efforts to counter them.
	CO4: Analyze, implement and maintain security requirements and mechanisms in various computer systems and networks.
	CO5: Design and apply the principles of trusted system to achieve the degree of Assurance.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS03
CO1	3	2	2	2	3	2		2			2	3	2	2	3
CO2	3	2	2	2	3	2		2			2	3	2	2	3
CO3	3	2	2	2	3	2		2			2	3	2	2	3
CO4	3	2	2	2	3	2		2			2	3	2	2	3
CO5	3	2	2	2	3	2		2			2	3	2	2	3

Course Contents:

Unit	Contents	Hours
I	**Introduction:** attacks, services, mechanisms, security attacks, security services, a model for internet work security, encryption model, steganography, classical encryption techniques, modern techniques - simplified DES, block cipher principles, data encryption standard, strength of DES, differential & linear cryptanalysis, block cipher design principles, block, cipher modes of operation.	7
II	**Confidentiality using conventional encryption:** placement of encryptionfunction, traffic confidentiality, key distribution, random number generation. Public key cryptography: principles, RSA algorithm, key management,, diffie-hellman key exchange, elliptic curve Cryptography ,Chinese remainder theorem, discrete logarithms.	7
III	**Message Authentication & hash functions:** Authentication requirements, functions, codes, hash functions, security of hash function & MACs. Hash & Mac algorithms: MD5 message digest algorithm, secure hash algorithm (SHA-I), digital signatures & authentication protocols: digital signatures, authentication protocols, digital signature standard.	7
IV	**Computer System security:** IP security: overview, architecture, authentication header, encapsulating security payload, combining security associations, key management. Computer Security testing: Penetration Testing, Security Penetration Tools like Netsparker, Wireshark, Metasploit, Burp Suite Pen Tester etc.	7
V	**Web security**: requirements, secure sockets layer & transport layer security, secure electronic transaction, networks management security. System Security: Intruders, viruses and worms, Firewalls: design principles, trusted systems. Privacy rules: Access, data backup, test security systems and processes. Mobile security issues, Security Issues in Cloud. Issues and Challenges of Mobile Cloud Computing.	7

Text Books	1.	Cryptography and networks security principles & practice 2/c by William Stalings(Pearson Education prentice Hall).
	2.	Networks security Essentials Applications & standards by William Stalings (Pearson Education, LPF).
	3.	Cryptography in C and C++ by Michael Welschenbach (A press IDG Books India).
E--Books	1.	https://freecomputerbooks.com/compscspecialSecurityBooks.html
	2.	http://www.cs.unibo.it/~babaoglu/courses/security/resources/documents/Computer_Security_Principles_and_Practice_(3rd_Edition).pdf
	3.	http://www.uoitc.edu.iq/images/documents/informatics-institute/exam_materials/Introduction%20to%20Computer%20Security%20pdf%20DONE.pdf
Referenc e Books	1.	Introduction to Data Compression by Khalid Sayood (Morgan kaufmann/Harcourt India).
	2.	Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press.
	3.	Michael T. Goodrich and Roberto Tamassia, Introduction to Computer Security, Addison Wesley, 2011.
On line TL Material	1.	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-858-computer-systems-security-fall-2014/download-course-materials/
	2.	http://nptel.ac.in/courses/106105031/
	3.	http://freevideolectures.com/Course/3027/Cryptography-and-Network-Security

List of Practical:

Sr. No.	Name of Experiments (Programming Language: C++, Python)
1	Perform encryption and decryption using Caesar cipher Algorithm.
2	Perform encryption and decryption using Play Fair Cipher.
3	Perform encryption and decryption using Rail Fence Technique. (Row Transposition Techniques)
4	Perform encryption and decryption using (Colunmar Transposition Techniques)
5	Perform encryption and decryption using One Time Pad Algorithm.
6	Write a program to implement extended Euclidean Algorithm.
7	Write a program to Develop a Secure System by Applying RSA Cryptography Algorithms.
8	Write a C program to implement Digital signature algorithm
9	Write a Program to Implement Elliptic curve based Arithmetic.
10	Write a program to implement Diffie–Hellman Key Exchange.
11	Open source Tools

Course Title: Ethical Hacking										
Semester	V	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	Core	3	-	-	3	10	15	50	-	-
CourseCode	UCYL301									
Teaching Mode	Offline	3 Hrs			Total	75			-	
Duration of ESE	2 Hrs					75				

Course Objectives	To understand how intruders escalate privileges.
	To understand Intrusion Detection, Policy Creation, Social Engineering, BufferOverflows and different types of Attacks and their protection mechanisms
	To learn about ethical laws and tests
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Understand the legal and ethical requirements related to ethical hacking.
	CO2: Creating access to an environment using foot-printing.
	CO3: Apply Data Security in various environment.
	CO4: Creating Network Protection System & Hacking Web Servers.
	CO5: Analyze the tools for conducting ethical hacking.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1		**3**				**1**						**2**			
CO2		**3**	**2**	**2**		**3**						**1**			
CO3		**3**	**3**	**2**	**2**	**1**	**1**					**3**			
CO4		**2**	**2**	**3**	**3**	**1**						**2**			
CO5				**3**	**3**	**3**		**2**	**2**	**1**		**3**			

Course Contents:

Unit	Contents	Hours
I	**INTRODUCTION TO ETHICAL HACKING**: Ethical Hacking Definition, difference between hacking and ethical hacking. Vulnerability, Attack Vector. Five stages of hacking: Reconnaissance (Survey), Probing, Actual attack, maintaining presence, Covering attack tracks, Introduction to OWASP top 10 attacks. **Case Study**: Study google dork query useful for ethical hacking	8
II	**SCANNING AND SYSTEM HACKING:** Port Scanning, Network Scanning, Vulnerability Scanning, NMAP Scanning tool, OS Fingerprinting. **System Hacking**: Password cracking techniques, Key loggers, Escalating privileges, URL Hiding Files, Sniffers & SQL Injection: Active and passive sniffing, ARP Poisoning, Session Hijacking, DNS Spoofing, Conduct SQL Injection attack, Counter measures. Study of open source scanning tools. **Case Study**: Find all available open source scanning tools and prepare a comparative table on these parameters, operating system support, ability to search, scanning time, ability to detect vulnerabilities and ease of use	8
III	**DATA SECURITY**: Physical Security – Attacks and Protection, Steganography – Methods, Attacks and Measures, Cryptography – Methods and Types of Attacks, Wireless Hacking, Windows Hacking, Linux Hacking.	8
IV	**NETWORK PROTECTION SYSTEM & HACKING WEB SERVERS**: Routers, Firewall & Honeypots, IDS & IPS, Web Filtering, Vulnerability, Penetration Testing, Session Hijacking, Web Server, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow, Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobiles Phone Hacking.	8
V	**HACKING ENVIRONMENT DAMN VULNERABLE WEB APPLICATION (DVWA)** Installation and configuration of DVWA environment. Virtual box installation, Installation of Kali Linux within virtual box. Kali Linux penetration testing and ethical hacking tools. What is TOR? How can you use it to protect your anonymity online? Social Engineering: Phases of an attack, Common targets, Common sources of information. Web Servers and applications: Common attacks and flaws, Current tools.	8

Text Books	1	Michael T. Simpson, Kent Backman, James E. “Corley, Hands-On Ethical Hackingand Network Defense”, Second Edition, CENGAGE Learning, 2010.
E--Books	1.	www.beiruteyecenter.com/uploads/3794_1008_4334.pdf
Reference Books	1.	Steven DeFino, Barry Kaufman, Nick Valenteen, “Official Certified Ethical Hacker Review Guide”, CENGAGE Learning, 2009-11-01.
	2.	Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy”, Syngress Basics Series – Elsevier, August 4, 2011.
	3.	Whitaker & Newman, “ Penetration Testing and Network Defense” , Cisco Press, Indianapolis, IN, 2006
Online TL Material	1.	https://www.youtube.com/watch?v=fNzpcB7ODxQ

Course Title: Penetration Testing										
Semester	V	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	Core	3	-	-	3	10	15	50	-	-
CourseCode	UCYL 302									
Teaching Mode	Offline	3 Hrs			Total	75			-	
Duration of ESE	2 Hrs					75				

Course Objectives	To understand how intruders escalate privileges.
	To understand Intrusion Detection, Policy Creation, Social Engineering, BufferOverflows and different types of Attacks and their protection mechanisms
	To learn about penetration testing.
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Develop the concept of penetration testing.
	CO2: Apply technique of reconnaissance.
	CO3: Evaluate exploitation and elaborate the technology.
	CO4: Understanding post exploitation maintaining access.
	CO5: Describe and execute the penetration test.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

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

Course Contents:

Unit	Contents	Hours
I	**INTRODUCTION TO PENETRATION TESTING:** Introduction - Terminologies - Categories of Penetration Testing - Phases of Penetration Test -Penetration Testing Reports - Information Gathering Techniques - Active, Passive and Sources of Information Gathering - Approaches and Tools.	8
II	RECONNAISSANCE Reconnaissance in cyber security Reconnaissance pen testing steps Active vs passive cyber reconnaissance Extracting Information from E-mail Servers.Threat Agent: Attack of the Drones. Sifting through the Intel to Finding Attackable Targets.	8
III	**EXPLOITATION:** Medusa: Gaining Access to Remote Services.Metasploit: Hacking Hugh Jackman Style. John the Ripper: King of the Password Crackers. Password Resetting: The Building and the Wrecking Ball.Wireshark: Sniffing Network Traffic. Wireshark: Sniffing Network Traffic.	8
IV	**POST EXPLOITATION AND MAINTAINING ACCESS** Rootkits Hacker Defender: It is Not What You ThinkDetecting and Defending Against Rootkits Meterpreter: The Hammer that Turns Everything into a Nail	8
V	**APPLYING THE PENETRATION TEST** Writing the Penetration Testing Report You Do Not Have to Go Home but You Cannot Stay HereWhere Do I Go from Here? Wrap Up The Circle of Life	8

Text Books	1	Vijay Kumar Velu “Mastering kali Linux for Advanced penetration testing” IN 2022. Weidman, Georgia. Penetration testing: a hands-on introduction to hacking / Georgia Weidman. IN 2014.
E--Books	1	https://www.scribd.com/book/470612770/Penetration-Testing
Reference Books	1.	Sean -Philip oriyano “penetration testing essentials”, Released December 2016Publisher(s): Sybex ISBN: 9781119235309
	2.	Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy”, Syngress Basics Series – Elsevier,August 4, 2011.
	3.	Philip L. Wylie “The Pentester Blueprint” SBN-139781119684305Publisher:Wiley
OnlineTL Material	1.	https://www.youtube.com/watch?v=q-ZrX41cIOA

Course Title: JAVA PROGRAMMING										
Semester	V	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th.	Tu.	Pr.	Credits	TAE	CAE	ESE	Int	Ext
Course category	Core	2	-	2	3	10	15	50	25	-
Course Code	UCYL303									
Teaching mode	Offline	4			Total	75			25	
Duration of ESE	120 Min					100				

Course Objectives	To learn the fundamentals of object-oriented programming in Java, including describing classes, objects, invoking methods.
	To familiarize the students with concept of packages and exception handling mechanisms
	To teach the basics concepts of streams, threads, Event handling mechanism and User Interface designing.
Course Outcomes	**CO1**: Understand the principles of object-oriented programming, create classes,instantiate objects, invoke methods.
	CO2: Understand concept of generics and collection classes
	CO3: Understand the use of exception handling mechanism and handle character andbyte streams
	CO4: Design User Interface and implement threads and perform basic operations on Threads
	CO5: Implement an event handling mechanism & event classes.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes													
	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO 7	PO8	PO9	PO1 0	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	2	2	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-		2	-	-	-	-	-	-	-	-	-

Unit	Content	Hours
UNIT 1	Introduction to java programming, Features of Object Oriented Programming languages like data encapsulation, inheritance, polymorphism and late binding. Fields and Methods, Concept of a class, Access control of members of a class, instantiating a class. **Collection classes:** Arrays, Vectors, Array list, Introduction to streams, byte streams, character streams	6
UNIT II	Concept of constructor and method overloading, inheritance, use of super keyword and final keyword in inheritance, run time polymorphism. Abstract classes and methods, interface, implementation of interface, static and non-static members.	4
UNIT III	Creating packages, importing packages, Exceptions, types of exception, use of try catch block, handling multiple exceptions, multiple catch clauses, Nested try Statements, using finally, throw and throws clause, Built-in Exception, user defined exceptions.	5
UNIT IV	File handling in Java, Basics of Thread programming, Sleep, Join. Introduction to Java User Interface, Concepts of Applet Class, Applet architecture, Applet Display methods, Parameter passing to applet. Event Handling in Applet.	5
UNIT V	Swing Components and Containers, JLabel, JTextField, JList, JCombobox, Swing Buttons (button, toggle button, checkbox, radio button), JTable, JTabbedPane Event handling mechanism, Event Classes, Event Listener interfaces, delegation event model, adapter classes.	5

Text Books:

- **Herbert Schildt;** JAVA The Complete Reference; Seventh Edition, Tata McGraw- HillPublishing Company Limited 2007
- **Cay S. Horstmann and Gary Cornell;** Core JAVA Volume-II Advanced Features; EighthEdition; Prentice Hall, Sun Microsystems Press 2008.

Reference Books:

- **Herbert Schildt and Dale Skrien**; Java Fundamentals A Comprehensive Introduction; TataMcGraw- Hill Education Private Ltd 2013.
- **Java 6 Programming Black Book by Kogent Solution Inc.,**Dreamtech Press Publication.
- **Java 2 Black Book** by Steve Holzner, Paraglyph Press, 2nd Ed.

JAVA PROGRAMMING (UCYP303)

Sr.No	Name of Experiment
1	Install JDK, write a simple "Hello World" or similar java program, compilation, debugging,executing using java compiler and interpreter.
2	Write a program in Java to generate first n prime numbers.
3	Write a program in Java to convert number into words & print it
4	Write a program in Java to develop overloaded constructor. Also develop the copy constructor to create a new object with the state of the existing object.
5	Write a program in Java to demonstrate single inheritance, multilevel inheritance and hierarchicalinheritance.
6	Write a program that illustrates interface inheritance. Interface P12 inherits from both P1 and P2. Each interface declares one constant and one method. The class Q implements P12. Instantiate Q and invoke each of its methods. Each method displays one of the constants
7	Write a program in Java to demonstrate multiple try block and multiple catch exception
8	Write a program in Java to demonstrate use of synchronization of threads when multiple threads are trying to update common variable.
9	Write an Applet which will play two sound notes in a sequence continuously use the play () methods available in the applet class and the methods in the Audio clip interface
10	Use JDBC connectivity and create Table, insert and update data

<table>
<tr><td colspan="11">Course Title: Engineering Economics and Industrial Management</td></tr>
<tr><td rowspan="2">Semester</td><td rowspan="2">V</td><td colspan="4" rowspan="2">Teaching Scheme</td><td colspan="6">Evaluation Scheme</td></tr>
<tr><td colspan="4">Theory</td><td colspan="2">Practical</td></tr>
<tr><td>Term</td><td>ODD</td><td>Th</td><td>Tu</td><td>Pr</td><td>Credits</td><td>TAE</td><td>CAE</td><td>ESE</td><td>INT</td><td>EXT</td></tr>
<tr><td>Course Category</td><td>H</td><td rowspan="2">2</td><td rowspan="2">NA</td><td rowspan="2">NA</td><td rowspan="2">2</td><td rowspan="2">10</td><td rowspan="2">15</td><td rowspan="2">50</td><td rowspan="2">NA</td><td rowspan="2">NA</td></tr>
<tr><td>Course Code</td><td>UHUL303</td></tr>
<tr><td>Teaching Mode</td><td>Offline</td><td colspan="3" rowspan="2">2 Hrs.</td><td rowspan="2">Total</td><td colspan="3">75</td><td colspan="2">--</td></tr>
<tr><td>Duration of ESE</td><td>2 Hrs.</td><td colspan="5">75</td></tr>
</table>

Course Objectives	Understanding of basic knowledge of Economics and its application.
	Understanding of Management as discipline and its practices.
	Strengthening knowledge of management in the functional area of Marketing and Finance.
Course Outcomes	Understand the basic concepts of Micro & Macro-Economics and its applications
	Implement the fiscal policies for government organizations and NGO's
	Analyzing the functions of Management and its importance
	Evaluate the marketing strategies.
	Formulate the scope of financial management.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

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

Course Contents:

Unit	Contents	Hours
I	Demand, Utility and Indifference curves, approach to Analysis of demand, Elasticity of demand, Measure of demand elasticity, Factors of Production, Advertising elasticity. Market and Market Structures: Price and output determination under perfect competition, monopolistic competition, oligopoly & monopoly, Depreciation and methods for its determination.	7
II	Functions of central and commercial banks, Inflation, Deflation, Stagflation, Direct and Indirect Taxes, New economic policy, Liberalization, Globalization, Privatization, Monetary & Fiscal policies of the government, Meaning and phases of business cycles.	6
III	Definition, nature and scope of Management, Functions of management - Planning, Organizing, Directing, Controlling, Principles of management, Communication.	5
IV	Meaning of Marketing management, concepts of marketing, Marketing Mix, Service Marketing, Product Life Cycle, New Product Development, Pricing strategies, Channels of distribution, Promotion Mix	7
V	Meaning, nature and scope of Financial Management, Sources of Financing, Ratio Analysis. Time value of money.	5

Text Books	1.	Modern Economics Theory, by K.K. Dewett, S. Chand & company ltd., 3rd Edition, 2006
	2.	Essentials of Management by Harold Koontz & Hein & Weihrich Tata McGraw Hill Publishing, 7th Edition, 2008.
	3.	Marketing Management by Philip Kotler, Kevin Keller, 14th Edition, 2016.
	4.	Financial Management by M.Y. Khan & P.K. Jain, Tata McGraw Hill Publishing, 5th Edition, 2008.
E--Books	1.	http://164.100.133.129:81/econtent/Uploads/Managerial_Economics%20(1).pdf [Economics]
	2.	http://164.100.133.129:81/econtent/Uploads/Financial_Management.pdf [Financial Management]
	1	Management by Stephen P. Robbins Mary A. Coulter, 14th Edition
	2.	Marketing Management by Ramaswamy V S and Namakumari, Macmillan India Ltd.
	3.	Financial Management by I M Pandey, Vikas Publishing House, New Delhi.

SEMESTER-VI

Course Title: **Machine Learning Algorithms**										
Semester	III	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	3	-	2	4	10	15	50	25	-
Course Code	UAIL202 UAIP202									
Teaching Mode		5			Total	75			25	
Duration of ESE	2 hrs					100				

Course Objectives	The objectives of the course is to introduce students about the basic of machine learning algorithms.
	To understand nature of the problem and apply suitable machine learning algorithm
Course Outcomes	CO1 : Understand modern notions in machine learning and computing
	CO2 : Understand a wide variety of learning algorithms
	CO3 : Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own
	CO4 : Evaluate Machine Learning Models generated from data
	CO5 : Apply the algorithms to a real problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
CO1	2											2	2	2
CO2		3											2	
CO3			3	2									2	
CO4			3	3									2	
CO5			3	3	3				3				3	

Course Contents:

Unit	Contents	Hours
I	Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation	6
II	Linear regression, Decision trees, over fitting Instance based learning, Feature reduction, Collaborative filtering based recommendation	8
III	Probability and Bayes learning ,Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM	8
IV	Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning	6
V	Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model	6

Text Books	1.	Mitchell Tom, Machine Learning. McGraw Hill, 1997.
	2.	Introduction to machine learning, Ethem Alpaydin. —2nd ed., The MIT Press, Cambridge, Massachusetts, London, England.
	3.	Chris Bishop, Pattern Recognition and Machine Learning
Reference Books	1.	Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning Data Mining, Inference, and Prediction
	2.	Richard O. Duda, Peter E. Hart, David G. Stork. Pattern classification, Wiley, New York, 2001.
	3.	Machine Learning: The Art and Science of Algorithms that Make Sense of Data (1st Edition) – Peter Falch
On line TL Material	1	https://www.coursera.org/learn/machine-learning
	2	https://www.udemy.com/course/machinelearning/
	3	https://nptel.ac.in/courses/106/105/106105152/

Sr. no.	Practical List	Mapping with CO	Mapping with PO & PSO
1	Implement a program for Linear Regression	CO1,CO2	PO1,PO2,PO3 and PSO1,PSO2
2	Implement a program for Decision Tree	CO3,CO4	PO1,PO2,PO3,PO4,PO5,PO11,PO12 and PSO1,PSO2
3	Implement the concept of K-Nearest neighborhood Algorithm	CO1,CO2	PO1,PO2,PO3,PO4,PO5,PO11,PO12 and PSO1,PSO2
4	Implement a program for Principle Component Analysis	CO3,CO4	PO1,PO2,PO3,PO4,PO5,PO11,PO12 and PSO1,PSO2
5	Implement the concept of Logistic Regression	CO1,CO2	PO1,PO2,PO3,PO4,PO5,PO11,PO12 and PSO1,PSO2
6	Implement the concept of Naïve Bayes Algorithm	CO3,CO4	PO1,PO2,PO3,PO4,PO5,PO11,PO12 and PSO1,PSO2
7	Demonstrate use of Clustering: using k-means algorithm through python program	CO3,CO4	PO1,PO2,PO3,PO4,PO5,PO11,PO12 and PSO1,PSO2
Practical Beyond Syllabus			
8	Exploring Virtual Lab	CO3,CO4	PO1,PO2,PO3,PO4,PO5,PO6,PO7 , PO11,PO12 and PSO2

Course Title: Cyber Intelligence										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category		3	-	-	3	10	15	50	-	-
Course Code	UCYL304									
Teaching Mode	Offline	3 Hrs			Total	75			-	
Duration of ESE	2 Hrs					75				

Course Objectives	To understand the need of security in cyber world
	To understand Cyber threats and threat factors
	Platforms and regulations to share operational, strategic, tactical, and technical intelligence
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Identify the primary issues threatening the information security world.
	CO2: Analyze the basics of threat intelligence including types, capabilities, strategy, lifecycle, maturity model, and frameworks.
	CO3: Develop strategies for data feeds and methods to collect data
	CO4: Determine the process of threat analysis including threat modeling, evaluation, fine-tuning, creating a knowledge base and runbook.
	CO5: Design threat intelligence standards and formats for sharing

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3
CO1		**3**				**1**						**2**	**3**		
CO2		**2**	**2**	**2**		**3**						**2**	**2**		
CO3		**3**	**3**	**2**	**2**	**1**	**1**					**3**		**1**	**1**
CO4		**2**	**2**	**2**	**3**	**1**						**2**		**1**	**2**
CO5				**3**	**3**	**3**		**2**	**2**	**1**		**3**		**2**	**2**

Unit	Contents	Hours
I	**Introduction to Threat Intelligence:** Threat Intelligence Overview, Threat Intelligence Strategy and External Sources, Threat Intelligence Platforms, Threat Intelligence Frameworks, Security Intelligence, Threat Intelligence Sources	8
II	**Data Loss Prevention and Mobile Endpoint Protection:** What is Data Security and Protection, Data Security Top Challenges, Data Security Common Pitfalls, Industry Specific Data Security Challenges, Capabilities of Data Protection, Critical Data Protection Capabilities. Log Management- Introduction, categories & it's Importance.	8
III	**Scanning** Vulnerability Assessment Tools, Port Scanning, Network Protocol Analyzers **Application Security and Testing** Characteristics of a Security Architecture, High-level Architectural Models6m Solutions Architecture, Security Patterns, Application Security Overview, Application Security Threats and Attacks, Application Security Standards and Regulations, DevSecOps Overview, Application Security Defects - Writing Secure Code, Cross-Site Scripting - Common Attacks	9
IV	**SIEM Platforms** SIEM Concepts and Benefits, SIEM Deployment, SIEM Solutions – Vendors, QRadar SIEM - An Industry Example, User Behavior Analytics, AI and SIEM, AI and SIEM - An Industry Example	8
V	**Threat Hunting** Fight and Mitigate Upcoming Future Attacks with Cyber Threat Hunting, SOC Cyber Threat Hunting, Cyber Threat Hunting – An Industry Example	7

Text Books	1	The Cyber Intelligence Handbook: An Authoritative Guide for the C-Suite, IT Staff, and Intelligence Team, By David M. Cooney Jr. (Author), Muireann O'Dunlaing (Editor), Mark McGibbon (Foreword)
E--Books	1.	https://www.pdfdrive.com/cyber-threat-intelligence-d187708760.html
Reference Books	1.	Data Privacy Principles and Practice by Natraj Venkataramanan and Ashwin Shriram, CRC Press
	2.	The Threat Intelligence Handbook: A Practical Guide for Security Teams to Unlocking the Power of Intelligence, by Chris Pace
	3.	Practical Cyber Intelligence: How action-based intelligence can be an effective response to incidents By Wilson Bautista Jr.
Online TL Material	1.	https://www.youtube.com/watch?v=L-8x9jl-G18&list=RDLVL-8x9jl-G18&start_radio=1&rv=L-8x9jl-G18&t=5

Elective-I (EL-I)

Course Title: Web Application Security										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	Elective -I	3	-	2	3	10	15	50	25	-
Course Code										
Teaching Mode	Offline	5Hrs			Total	75			25	
Duration of ESE	2 Hr					100				

Course Objectives	1. To reveal the underlying in web application.
	2. To identify and aid in fixing any security vulnerabilities during the web development process
	3. To understand the security principles in developing a reliable web application.
Course Outcomes	CO1.Identify the vulnerabilities in the web applications.
	CO2. Identify the various types of threats and mitigation measures of web applications.
	CO3. Apply the security principles in developing a reliable web application.
	CO4 Use industry standard tools for web application security.
	CO5. Apply penetration testing to improve the security of web applications

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	
CO1		**2**	**3**		**2**								**3**		
CO2		**2**												**2**	
CO3		**3**											**1**		
CO4			**3**	**3**										**3**	
CO5				**3**	**3**										

Course Contents:

Unit	Contents	Hours
I	**Overview of Web Applications Security Fundamentals** Introduction history of web applications interface ad structure benefits and drawbacks of web applications Web application Vs Cloud application Security Fundamentals: Input Validation - Attack Surface Reduction Rules of Thumb- Classi- fying and Prioritizing Threads. Origin Policy - Exceptions to the Same-Origin Policy - Cross-Site Scripting and Cross-Site Request Forgery - Reflected XSS - HTML Injection	8
II	**Web Application Vulnerabilities** Understanding vulnerabilities in traditional client server application and web applications, client state manipulation, cookie based attacks, SQL injection, cross domain attack (XSS/XSRF/XSSI) http header injection. SSL vulnerabilities and testing - Proper encryption use in web application- Session vulnerabilities and testing - Cross-site request forgery.	8
III	**Web Application Mitigations** Http request , http response, rendering and events , html image tags, image tag security, issue, java script on error , JavaScript timing , port scanning , remote scripting , running remote code, frame and iframe , domain relaxation	6
IV	**Secure Website Design** Secure website design : Architecture and Design Issues for Web Applications, Deployment Considerations Input Validation, Authentication, Authorization, Configuration Management , Sensitive Data, Session Management, Cryptography, Parameter Manipulation, Exception Management, Auditing and Logging, Design Guidelines, Forms and validity, Technical implementation	8
V	**Cutting Edge Web Application Security** Clickjacking - DNS rebinding - Flash security - Java applet security - Single-sign-on solution and security - IPv6 impact on web security	6

Text Books	1.	Sullivan, Bryan, and Vincent Liu. Web Application Security, A Beginner's Guide. McGraw Hill Profe ssional, 2011. 2. Stuttard, Dafydd, and Marcus Pinto. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws. John Wiley Sons, 2011
E--Books	1.	
Reference Books	1.	Web Application Security: Exploitation and Countermeasures for Modern Web Applications Paperback – Import, 13 March 2020 by Andrew Hoffman (Author)

Elective-I_Course Title: High Performance Computing										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	E-I	3	-	2	4	10	15	50	25	-
Course Code										
Teaching Mode	Offline	5 Hrs			Total	75			25	
Duration of ESE	2 Hr					100				

Course Objectives	To introduce the concepts of Modern Processors.
	To introduce Optimization techniques for serial code.
	To introduce Parallel Computing Paradigms.
	To introduce Parallel Programming using OpenMP and MPI.
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1:Learn the advantages, issues and challenges of the current processors
	CO2: Comprehend and implement various optimization techniques for serial code.
	CO3: Understand the various parallel programming paradigms and learn how to choose the right one based on the application domain.
	CO4: Implement parallel codes that are optimized for performance.
	CO5:. Implement the concept of CUDA programming

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	1														
CO2	2		2				1							2	
CO3	2		2	2										2	
CO4					2									2	
CO5	2														

MODULE	DETAILS	HOURS
I	**Modern Processors :** Stored Program Computer Architecture- General purpose cache- based microprocessor-Performance based metrics and benchmarks- Moore's Law- Pipelining- Super scalarity-SIMD- Memory Hierarchies Cache- mapping- prefetch- Multicore processors- Mutithreaded processors- Vector Processors- Design Principles- Maximum performance estimates- Programming for vector architecture.	**7**
II	**Basic optimization techniques for serial code :** scalar profiling- function and line based runtime profiling- hardware performance counters- common sense optimizations- simple measures, large impact- the role of compilers - computational accuracy. Dynamic memory management- loop kernels and iterators data access optimization: balance analysis and light speed estimates-	**7**
III	**Parallel Computers** : Taxonomy of parallel computing paradigms- Shared memory computers- Cache coherance- UMA - ccNUMA- Distributed-memory computers- Hierarchical systems- Networks- Basic performance characteristics- Buses- Switched and fat- tree networks- Mesh networks- Hybrids - Basics of parallelization - Why parallelize - Data Parallelism - Function Parallelism	**7**
IV	**Distributed memory parallel programming with** MPI : message passing - introduction to MPI – example - messages and point-to-point communication - collective communication – nonblocking point-to-point communication- virtual topologies - MPI parallelization of Jacobi solver- MPI implementation - performance properties	**7**
V	**Shared memory parallel programming with OpenMp** : introduction to OpenMp - parallel execution - data scoping- OpenMp work sharing for loops- synchronization OpenMP programming. **CUDA Programming:** Introduction to CUDA architecture for parallel processing, CUDA Parallelism Model, Introduction to CUDA-C, Parallel programming in CUDA-C,	**7**
	TOTAL HOURS	**35**

Sr	BOOK TITLE/AUTHORS/PUBLICATION
1	Georg Hager, Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall / CRC Computational Science series, 2011
2	Charles Severance, Kevin Dowd, High Performance Computing, O'Reilly Media, 2nd Edition, 1998.
3	Kai Hwang, Faye Alaye Briggs, Computer Architecture and Parallel Processing, McGraw Hill, 1984.

URL:-

https://edoras.sdsu.edu/~mthomas/docs/cuda/cuda_by_example.book.pdf

https://pdfcoffee.com/cuda-workshop-lab-manual-pdf-free.html

Course Title:E1- DSP (Digital Signal Processing)										
Semester	VI	Teaching Scheme				Evaluation Scheme				
Term	EVEN					Theory			Practical	
Course Category	Open Elective-1	Th	Tu	Pr	Credits	TAE	CAE	ESE	Int	Ext
CourseCode		3 Hrs	NA	2 Hrs	4	10	15	50	25	
TeachingMode	Offline									
Durationof ESE	2 Hrs	5 Hrs			Total	75			25	
						100				

Course Objectives	To introduce students with transforms for analysis of discrete time signals and systems.
	To understand the digital signal processing, sampling and aliasing.
	To use and understand implementation of digital filters.
	To understand concept of sampling rate conversion and DSP processor architecture.
Course Outcomes	After successfully completing the course students will be able to.
	CO1: Understand use of different transforms and analyze the discrete time signals and systems.
	CO2: Realize the use of LTI filters for filtering different real world signals.
	CO3: Capable of calibrating and resolving different frequencies existing in any signal.
	CO4: Design and implement multistage sampling rate converter.
	CO5: Design of different types of digital filters for various applications.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

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

Course Contents:

Unit	Contaents:	Hours
I	**DSP Preliminaries:** Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals, Basic elements of DSP and its requirements, advantages of Digital over Analog signal processing.	5
II	**Discrete Fourier Transform:** DTFT, Definition, Frequency domain sampling, DFT, Properties of DFT, circular convolution, linear convolution, Computation of linear convolution using circular convolution, FFT.	5
III	**Z transform:** Need for transform, relation between Laplace transform and Z transform, between Fourier transform and Z transform, Properties of ROC and properties of Z transform, Relation between pole locations and time domain behavior, causality and stability considerations for LTI systems, Inverse Z transform, Power series method, partial fraction expansion method, Solution of difference equations.	5
IV	**IIR Filter Design:** Concept of analog filter design (required for digital filter design), Design of IIR filters from analog filters, IIR filter design by impulse invariance method, Bilinear transformation method. Characteristics of Butterworth filters, Chebyshev filters, Butterworth filter design, IIR filter realization using direct form, cascade form and parallel form, Lowpass, High pass, Bandpass and Bandstop filters design using spectral transformation (Design of all filters using Lowpass filter)**.**	5
V	**Introduction to Multirate signal processing:** Concept of Multirate DSP, Introduction to Up sampler, Down sampler and two channel filter bank, Application of Multirate signal processing in communication, Music processing, Image processing and Radar signal processing.	5

text books	1.	S.K.Mitra, Digital Signal Processing: A computer based approach.TMH A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.
Reference Books	1.	L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, 1992.
	2.	J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1992.

Digital Signal Processing Lab

1	Write a MATLAB program to generate discrete time signal and plot them.
2	Write a MATLAB program to evaluate linear convolution between two sequences.
3	Write a MATLAB program to evaluate: To evaluate auto co-relation between two signals. To evaluate cross–relation between two signals.
4	Write a MATLAB program to obtain frequency response of first order system with the transfer function $H(z)=1/(z+1)(z+0.8)$ to compute inverse Z-transform of the given signal (Partial fraction expansion method)
5	Write a MATLAB program to compute the n-point DFT of a given sequence to plot magnitude and phase Spectrum.
6	Write MATLAB program to compute the circular convolution of two given sequence using DFT and IDFT.
7	To design FIR filter using Windowing Technique in MATLAB
8	To design FIR IIR filter using Chebyshev filter in MATLAB.
9	Write a program to design and implementation of IIR butterworth filter to meet given specifications.
10	Write MATLAB code to read and display different types of images and perform image conversion.

Course Title: Cyber Laws and Cyber Ethics										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category		2	-	-	2	10	15	50	-	-
Course Code	UCYL306									
Teaching Mode	Offline	2 Hrs			Total	75			-	
Duration ESE	2 Hr					75				

Course Objectives	To understand the basics need of Cyber laws
	To understand the ethical issues in Cyber Space
	To Understanding the initiatives taken by Government to incorporate Cyber Laws and Ethics
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Understand cyberspace & legal issues in cyber society .
	CO2: Understand facets of India IT act
	CO3 : Understand of intellectual property issues and development of the law in this regard
	CO4: Understanding e governance and , digital evidence management

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	--	**1**	--	--	--	**3**	--	**2**	--	--	--	--	**2**	--	--
CO2	--	**2**	--	--	--	**3**	--	**3**	--	--	--	**1**	**2**	--	--
CO3	--	--	--	--	--	**3**	--	**2**	--	--	--	**1**	--	**3**	--
CO4	--	--	--	**3**	**3**	**1**	--	**2**	--	--	--	--	**2**	--	--

Course Contents:

Unit	Contents	Hours
I	**Introduction to Cyber law:** Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Need forIT act – Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.	5
II	**Cyber Ethics:** The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics. Case Studies on Cyber crimes	5
III	**Intellectual Property Rights** – Copyrights- Software – Copyrights vs Patents debate - Copyright in Internet - Multimedia and Copyright issues - Software Piracy - Trademarks - Trademarks in Internet – Copyright and Trademark cases, Patents - Understanding Patents - European Position on Computer related Patents, Legal position on Computer related Patents - Indian Position on Patents – Case Law, Domain names – registration.	5
IV	**The Indian IT Act**, Challenges to Indian Law and Cybercrime Scenario in India, Cybercrime and Punishment,. Network Service Providers Liability. **Electronic Governance-**Legal Recognition of Electronic Records and Electronic Evidence - Digital Signature Certificates- Securing Electronic records and secure digital signatures -- Internet Service Providers and their Liability–Powers of Police under the Act – Impact of the Act on other Laws	6

Text Books	1 2	Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
E--Books	1.	https://www.pdfdrive.com/investigating-cyber-law-and-cyber-ethics-issues-impacts-and-practices-d157129939.html
Reference Books	1.	Farouq Ahmed, *Cyber Law in India,* New Era publications, New Delhi S.R.Myneni: *Information Technology Law(Cyber Laws)*, Asia Law House, Hyderabad.
Online TL Material	1.	https://www.pdfdrive.com/overview-of-cyber-laws-in-india-d4030769.html

Course Title: **Understanding Human Values**										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	H	3	--	--	3	10	15	50	--	--
Course Code	UHUL304									
Teaching Mode		3			Total	75			--	
Duration of ESE	2 Hrs.					75				

Course Objectives	Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence
	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
	Strengthening of self-reflection and development of commitment and courage to act.
Course Outcomes	**CO1: Students are expected to become more aware of themselves.**
	CO2: Students are expected to become more aware of their surroundings (family, society, nature).
	CO3: Students should become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
	CO4: Students would have better critical ability, they would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
	CO5: Students would be able to apply what they have learnt to their own self in different day-to-day settings in real life.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						2		3	1			2			
CO2			3			2		2		2		2			
CO3			3			3	3	2							
CO4			2			2	2	2							
CO5			1			1	1	2				3			

Course Contents:

Unit	Contents	Hours
I	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education:** Purpose and motivation for the course, Self-Exploration, Continuous Happiness and Prosperity, Right understanding relationship and physical facility, Understanding happiness and prosperity correctly, Method to fulfill the above human aspirations.	8
II	**Understanding Harmony in the Human Being - Harmony in Myself!** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body', Understanding the Body as an instrument of 'I', Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body.	8
III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding values in human-human relationship, Understanding the meaning of Trust, Understanding the meaning of Respect, Understanding the harmony in the society, Visualizing a universal harmonious order in society	8
IV	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence** Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature, Understanding Existence as Co-existence, Holistic perception of harmony	8
V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics, Strategy for transition from the present state to Universal Human Order: a) At the level of individual, b) At the level of society.	8

Text Books	1.	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010
Reference Books	1.	JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
	2.	A Foundation Course in Human Values & Professional Teachings , Rajiv Sangal
	3.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
	4.	The Story of Stuff (Book)
	5.	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
	6.	Small is Beautiful - E. F Schumacher.
	7.	Slow is Beautiful - Cecile Andrews
	8.	Economy of Permanence - J C Kumarappa
	9.	Bharat Mein Angreji Raj – Pandit Sunderlal
	10.	Rediscovering India - by Dharampal
	11.	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
	12.	India Wins Freedom - Maulana Abdul Kalam Azad
	13.	Vivekananda - Romain Rolland (English)
		Gandhi - Romain Rolland (English)

Course Title: **Employability Skills**										
Semester	VI	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	A	--	--	2	1				25	--
Course Code	UHUP302									
Teaching Mode		2			Total	--			25	
Duration of ESE	3 Hrs.					25				

Course Objectives	To introduce them with the current market scenarios
	To equip the students with the essential skills for employability
	To demonstrate self-sufficiency to be highly employable or venture their start-ups
Course Outcomes	**CO1:**Students shall exhibit their ability to set clear and realistic professional objective
	CO2: Enabling them to make well informed choices and commercially equipped
	CO3: Master Verbal (LSRW) and non-verbalcommunication skills required in the process of recruitment
	CO4: Students shall exhibit improved Interpersonal skills for better professional conduct
	CO5: Students shall exercise higher order thinking skills, creativity skills, convincing and Negotiation skills

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1							**3**								
CO2						**3**	**3**	**3**							
CO3										**3**					
C04						**3**	**3**	**3**		**3**					
C05						**3**					**3**	3			

Course Contents:

Unit	Contents	Hours
I	**Orientation - Researching Job and Company- Emerging Market Trends:**Experience sharing of Major Campus interviews, Skill Requirements, Current Market trends, Researching the Job and company	4
II	**Personal and company commercial:**Guidelines for preparing a 30- 90 second self Introduction .Questions to think about in developing a commercial Understand " What to avoid" in a commercial - **Self Selling Proficiency**: What to say and do, How to demonstrate commercial awareness in an interview ,Post Interview activity, Telephone etiquette in a phone Interview **Resume Building :**Guidelines on framing resume and cover letter Checklist to ensure completeness , Sample resumes and cover letter references Basic Guidelines on Video Resume an its difference with conventional	6
III	**Verbal and Non-Verbal Communication:**Format of Business Correspondence, Email and Letter writing etiquette, Hands on training on email and letter writing with case study, Body Language in an Interview- Dos' and Donts', Tips and techniques on Essay Writing How to knot the crux on Essay writingPractise on some common essay writing topics in an interview - **Voice Versant Neutralization :** Voice Modulation, Pitch and tone training and Accent Neutralization	6
IV	**Personal Interview- Group Discussion**: Preparation tips on GD and Extempore: Dos' and Donts', Presentation on PI Preparation and FAQs -Role Plays/ Mock Interview with Technical Faculty and Mock Interview by Faculty **Assessment and feedback series:**	4

Text Books	1.	Employability Book – Global Education Ltd(Under Review)
Reference Books	1.	Employability Skills by NIMI Chennai, First Edition Aug 2019
	2.	What employers wants by Karen Holmes, March 2017 Edition
E-Learning	1.	Udemy , Coursera, Alison, Edx, WPA Apprentice, Hubspot, Codecademy

Sr. No.	Name of Experiments / Mini Projects/ Case Studies/ Activity based
1	Explore AWS Cloud Based IaaS Service
2	Implement Virtualization using Virtualbox/VMware Workstation
3	Creating a Warehouse Application in SalesForce.com PaaS
4	Explore Cloud Services using CloudSim Simulator
5	Explore Cloud Service using Google Cloud
6	Explore Cloud Service and table formation using Microsoft Azure Cloud
7	Creating a Warehouse Application in SalesForce.com PaaS
8	Explore open source cloud platform Openstack
9	Implement container management with Kubernetes
10	Implement DevOps and MLOPS using Cloud
Open Ended Experiments / New Experiments	
1	Explore different IoT Cloud Framework
2	Explore Fog Computing Framework
Details of on line Laboratory Resource Material Instruction / Operating Manuals	
1	https://cloud.google.com/training
2	https://trailhead.salesforce.com/en
3	https://aws.amazon.com/
4	https://azure.microsoft.com/en-in/

Course Title: **CLOUD COMPUTING**										
Semester	V	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	ODD	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C21	NA	NA	4 Hrs	2	NA	NA	NA	25	NA
Course Code	UCSP303									
Teaching Mode	Online	4 Hrs			Total	--			25	
Duration of ESE	NA					25				

Course Objectives	To understand Cloud Computing concepts, technologies, architecture and applications
	To understand the underlying principle of cloud virtualization, cloud storage, data management and data visualization
	To understand different cloud programming platforms and tools to develop and deploy applications on cloud
Course Outcomes	Upon successful completion of this course, student will be able to:
	CO1: Develop and deploy cloud application using popular cloud platforms
	CO2: Design and develop highly scalable cloud-based applications by creating and configuring virtual machines on the cloud and building private cloud
	CO3: Design and deploy a cloud application in a PaaS environment
	CO4: Develop cloud computing solutions for an enterprise
	CO5: Analyze various cloud programming models and apply them to solve problems on the cloud

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

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

Unit	Contents	Hours
Cours I	Introduction to Cloud Computing and Virtualization: Virtualization Concepts, Cloud Computing Fundamental: Overview of Computing Paradigm, Evolution of cloud computing, Defining cloud computing, Components of a computing cloud, Essential Characteristics of Cloud Computing, Cloud Taxonomy. Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service (SaaS), Hardware-as-a-service: (HaaS), Oriented Architecture (SOA)	6
II	Cloud Computing Architecture and Service Management in Cloud: ComputingCloud architectural principles, Role of Web services, Benefits and challenges to Cloud architecture, Cloud Service Models, cloud computing vendors. Cloud Services, Management, Performance and scalability of services, tools and technologies used to manage cloud services deployment	6
III	Data Management in Cloud Computing and Resource Management in Cloud)	5
IV	Cloud Security and Risk Management:Cloud Security: Understanding cloud based security issues and threats, Data security and Storage, Identity& Access Management, Risk Management in cloud, Governance and Enterprise Risk Management.	7
V	Open Source and Commercial Clouds: Openstack, AWS, Google Cloud, Microsoft Azure, Cloud Simulator and IoT Cloud Framework, Research trend in Cloud Computing, Fog Computing,	7

Text Books	1.	Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley,2011
	2.	Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010
E--Books	1.	CLOUD COMPUTING Principles and Paradigms Link: http://dhoto.lecturer.pens.ac.id/lecture_notes/internet_of_things/CLOUD%20COMPUTING%20Principles%20and%20Paradigms.pdf
Reference Books	1.	Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
	2.	Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India,2010
Online TL Material	1.	https://nptel.ac.in/courses/106/105/106105167/

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2	https://trailhead.salesforce.com/en
3	https://aws.amazon.com/
4	https://azure.microsoft.com/en-in/