NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution – Affiliated to Anna University, Chennai)

K.R.NAGAR, KOVILPATTI – 628 503

REGULATIONS – 2019

DEPARTMENT OF
INFORMATION TECHNOLOGY

CURRICULUM AND SYLLABI OF
M.Tech. – INFORMATION AND CYBER WARFARE

SEMESTER – I

S. No.	Course Category	Course Code	Course Title	L	T	P	C	QP
THEORY COURSES								
1.	CFC	19IC11C	Quantization and Number theory	2	2	0	3	A
2.	PCC	19IC12C	Advanced Data Structures	3	0	0	3	A
3	PCC	19IC13C	Research Methodology and IPR	2	0	0	2	B
4.	PEC		Elective - I	3	0	0	3	A
5.	PEC		Elective – II	3	0	0	3	A
6.	AC	AC	Audit Course - I	2	0	0	0	D
PRACTICAL COURSES								
7.	PCC	19IC14C	Advanced Data Structures Laboratory	0	0	4	2	-
8.	PEC		Laboratory (Based on Electives)	0	0	4	2	-
			Total	**15**	**2**	**8**	**18**	**-**

SEMESTER – II

S. No.	Course Category	Course Code	Course Title	L	T	P	C	QP
THEORY COURSES								
1.	PCC	19IC21C	Cloud Computing Technologies	3	0	0	3	A
2.	PCC	19IC22C	Advanced Databases	3	0	0	3	A
3.	PEC		Elective - III	3	0	0	3	A
4.	PEC		Elective – IV	3	0	0	3	A
5.	AC		Audit Course - II	2	0	0	0	D
PRACTICAL COURSES								
6.	PCC	19IC23C	Mini Project with Seminar	0	0	4	2	-
7.	PCC	19IC24C	Cloud Computing Technologies Laboratory	0	0	4	2	-
8.	PEC		Laboratory (Based on Electives)	0	0	4	2	-
			Total	**14**	**0**	**12**	**18**	**-**

PCC – Programme Core Course   PEC – Programme Elective Course
AC-Audit Course

SEMESTER – III

S. No.	Course Category	Course Code	Course Title	L	T	P	C	QP
THEORY COURSES								
1.	PEC		Elective -V	3	0	0	3	A
2.	PEC		Elective -VI	3	0	0	3	A
3.	PEC		Elective -VII	3	0	0	3	A
PRACTICAL COURSES								
4.	PCC	19IC31C	Project Work –I	0	0	20	10	-
			Total	9	0	20	19	-

SEMESTER – IV

S. No.	Course Category	Course Code	Course Title	L	T	P	C	QP
PRACTICAL COURSES								
1.	PCC	19IC41C	Project Work - II	0	0	32	16	-
			Total	0	0	32	16	-

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE - 71

ELECTIVE COURSES

S. No.	Course Code	Course Title	L	T	P	C	QP
1.	19IC01E	Risk Assessment and Security Audit	3	0	0	3	A
2.	19IC02E	Forensics and Incident Response	3	0	0	3	A
3.	19IC03E	Distributed System Security	3	0	0	3	A
4.	19IC04E	E – Commerce Security	3	0	0	3	A
5.	19IC05E	Global Cyber Warfare	3	0	0	3	A
6.	19IC06E	Web Application Security	3	0	0	3	A
7.	19IC07E	Operating System Security	3	0	0	3	A
8.	19IC08E	IOT Security	3	0	0	3	A
9.	19IC09E	Malware Security	3	0	0	3	A
10.	19IC10E	Enterprise and Perimeter Security	3	0	0	3	A

S. No.	Course Code	Course Title	L	T	P	C	QP
11.	19IC11E	Secure Coding Practices	3	0	0	3	A
12.	19IC12E	Cyber laws and Security Policies	3	0	0	3	A
13.	19IC13E	Soft Computing	3	0	0	3	A
14.	19IC14E	Machine Learning	3	0	0	3	A
15.	19IC15E	Computational Statistics and Data Mining	3	0	0	3	A
16.	19IC16E	Information Ethics for Computer Professionals	3	0	0	3	A
17.	19IC17E	Deep Learning	3	0	0	3	A
18.	19IC18E	Digital watermarking and Steganography	3	0	0	3	A
19.	19IC19E	Social Network Security	3	0	0	3	A
20.	19IC20E	Big Data Analytics	3	0	0	3	A
21.	19IC21E	Intellectual Property Rights	3	0	0	3	A
22.	19IC22E	Digital Forensics	3	0	0	3	A
23.	19IC23E	Biometric Security Analysis	3	0	0	3	A
24.	19IC24E	Pattern Recognition	3	0	0	3	A
25.	19IC25E	Network and Wireless Security	3	0	0	3	A
26.	19IC26E	Vulnerability Assessment	3	0	0	3	A
27.	19IC27E	Data and Cloud Security	3	0	0	3	A
28.	19IC28E	Internet of Things	3	0	0	3	A
29.	19IC29E	Mobile Application Development	3	0	0	3	A
30.	19IC30E	Information security and Cryptography	3	0	0	3	A
31.	19IC31E	Vulnerability Assessment Laboratory	0	0	4	2	-
32.	19IC32E	Mobile Application Development Laboratory	0	0	4	2	-
33.	19GD01E	Business Analytics	3	0	0	3	A
34.	19GD02E	Industrial Safety	3	0	0	3	A
35.	19GD03E	Operations Research	3	0	0	3	A
36.	19GD04E	Cost Management of Engineering Projects	3	0	0	3	A
37.	19GD05E	Composite Materials	3	0	0	3	A
38.	19GD06E	Waste to Energy	3	0	0	3	A

AUDIT COURSES

S. No	Course Category	Course Code	COURSE TITLE	L	T	P	C	QP
1.	AC	19AC01E	English for Research Paper Writing	2	0	0	0	D
2.	AC	19AC02E	Disaster Management	2	0	0	0	D
3.	AC	19AC03E	Sanskrit for Technical Knowledge	2	0	0	0	D
4.	AC	19AC04E	Value Education	2	0	0	0	D
5.	AC	19AC05E	Constitution of India	2	0	0	0	D
6.	AC	19AC06E	Pedagogy Studies	2	0	0	0	D
7.	AC	19AC07E	Stress Management by Yoga	2	0	0	0	D
8.	AC	19AC08E	Personality Development through Life Enlightenment Skills	2	0	0	0	D

QP - QUESTION PATTERN

Subject Type	Question pattern	2 marks	4 marks	10 marks	11 marks	12 marks	20 marks	Total
Theory (3/4 Credit)	A	10	5	--	--	1 Qn Compulsory & 4 Qns (either or type)	--	100
Theory (2 Credit)	B	10	-	-	1 Qn Compulsory & 4Qn (either or type)			75
Theory (1 Credit)	C	5	--	1 Qn Compulsory & 1 Qn (either or type)	--	--	--	30
Theory Trans Disciplinary	D	--	--	--	--	--	5 out of 8	100
Design oriented	E	--	--	--	--	--	1 Qn Compulsory & 4 Qns (either or type)	100

10,11 and 12 marks questions will be a single question and no subdivisions

FORMAT FOR COURSE CODE

| 1 | 9 | I | C | 2 | 3 | C |

- C → Compulsory Course
- 3 → Course Sequence Number
- 2 → Semester Number
- IC → Specialization Name
- 19 → Year of Regulation

| 1 | 9 | I | C | 0 | 1 | E |

- E → Elective Course
- 01 → Course Sequence Number
- IC → Specialization Name
- 19 → Year of Regulation
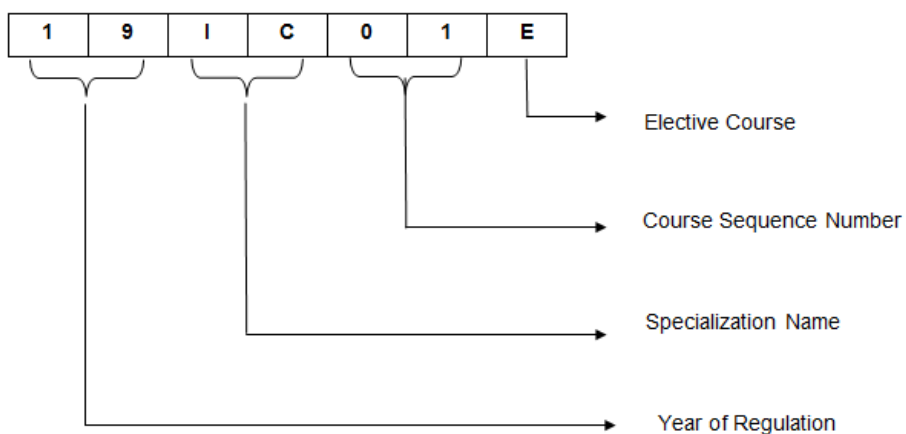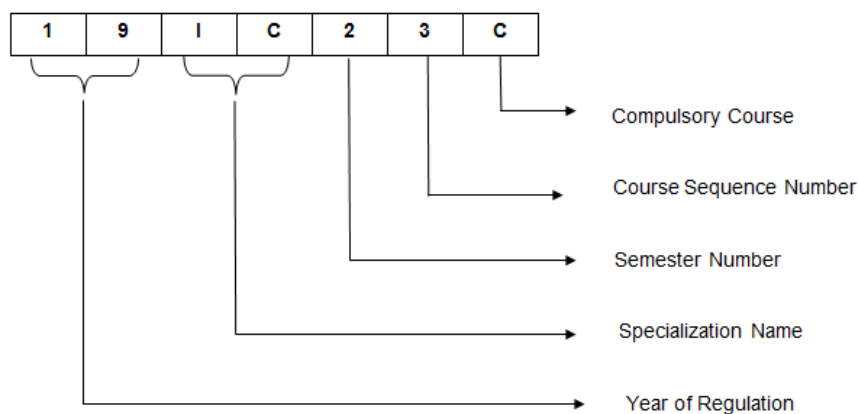
19IC11C	QUANTIZATION AND NUMBER THEORY	L T P C QP
		2 2 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: explain the basic concepts of quantization. (K2)
CO 2: grasp the concepts of vector quantization theory. (K2)
CO 3: acquire the basic concepts of Number theory. (K2)
CO 4: analyze the inter relation between varies arithmetical functions. (K2)
CO 5: describe the concept of quadratic residues. (K2)

UNIT I   QUANTIZATION   12

Quantization - Max Lloyed Quantizer - Uniform Quantizer - Properties of optimum Mean square quantizers - Non Uniform Quantization.

UNIT II   VECTOR QUANTIZATION   12

Vector Quantization - Relationship between transformation stage and quantization stage-Codebook design and k-means algorithm.

UNIT III   ARITHMETIC AND CONGRUENCES   12

Introduction – Divisibility- Greatest common divisor - Prime numbers - The fundamental theorem of arithmetic- Definition and basic properties of congruences - Residue classes and complete residue systems - Linear congruences.

UNIT IV   ARITHMETICAL FUNCTIONS   12

The Mobius function $\mu(n)$– The Euler totient function $\varphi(n)$– A relation connecting φ and μ – A product formula for $\varphi(n)$ – properties of $\varphi(n)$ –Multiplicative functions– completely multiplicative function.

UNIT V   QUADRATIC RECIPROCITY   12

Quadratic Residues – Legendre's symbol and its properties – Evaluation of $(-1|p)$ and $(2|p)$ – Gauss' lemma – The Quadratic Reciprocity law – Applications – The Jacobi symbol.

L: 30; T: 30; TOTAL: 60 PERIODS

REFERENCES

1. Allen Gersho, Robert M.Gray, "Vector Quantization and Signal Compression", Springer Science + Business Media, LLC, New York, Eighth Printing 2012.
2. Bernard Widrow, Istvain Kollar, "Quantization Noise", Cambridge University Press, 2008.
3. Tom M.Apostol, "Introduction to Analytic Number Theory", Springer International Student Edition, Narosa Publishing House, New Delhi, 2013.
4. G.A.Jones & J.M.Jones, "Elementary Number Theory", Springer publications, 2005.

19IC12C	ADVANCED DATA STRUCTURES	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: Explain the usage of algorithms in computing (K2)
CO2: Apply hierarchical data structures and its operations to solve problems (K3)
CO3: Apply the usage of graphs problem solving (K3)
CO4: Design data structures and algorithms that is appropriate for problems (K3)
CO5: Describe NP Completeness of problems (K2)

UNIT I   ROLE OF ALGORITHMS IN COMPUTING   9

Algorithms – Algorithms as a Technology- Insertion Sort – Analyzing Algorithms – Designing Algorithms- Growth of Functions: Asymptotic Notation – Standard Notations and Common Functions- Recurrences: The Substitution Method – The Recursion-Tree Method.

UNIT II   HIERARCHICAL DATA STRUCTURES   9

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red-Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion -B-Trees: Definition of B-trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Fibonacci Heaps: structure – Mergeable-heap operations- Decreasing a key and deleting a node-Bounding the maximum degree.

UNIT III   GRAPHS   9

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra"s Algorithm; All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm.

UNIT IV   ALGORITHM DESIGN TECHNIQUES   9

Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: An Activity-Selection Problem – Elements of the Greedy Strategy- Huffman Codes.

UNIT V   NP COMPLETE AND NP HARD   9

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP- Completeness and Reducability – NP-Completeness Proofs – NP-Complete Problems.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
2. Robert Sedgewick and Kevin Wayne, "ALGORITHMS", Fourth Edition, Pearson Education.
3. S.Sridhar,"Design and Analysis of Algorithms", First Edition, Oxford University Press. 2014
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Third Edition, Prentice-Hall, 2011.

19IC13C	RESEARCH METHODOLOGY AND IPR	L T P C QP
		2 0 0 2 B

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: Understand research problem formulation. (K2)

CO2: Analyze research related information. (K4)

CO3: Understand the research ethics. (K2)

CO4: Understanding that when IPR would take such important place in growth of individuals & Nation. (K2)

CO5: Recognize the importance of Report writing. (K2)

UNIT I   RESEARCH FORMULATION AND DESIGN   6

Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review - primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.

UNIT II   DATA COLLECTION AND ANALYSIS   6

Method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statistical package (Sigma STAT,SPSS for student t-test, ANOVA, etc.), hypothesis testing.

UNIT III   RESEARCH ETHICS, IPR AND SCHOLARY PUBLISHING   6

Ethics - ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual Property rights (TRIPS); scholarly publishing - IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability.

UNIT IV   CONTEMPORARY ISSUES IN IPR   6

Interface between IPR and Human Rights -Interface between IPR and Competition Law -IPR and sustainable development – Impact of Internet on IPR - IPR of Biological systems & E-Commerce.

UNIT V   INTERPRETATION AND REPORT WRITING   6

Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

L: 30; TOTAL: 30 PERIODS

REFERENCES

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., "An introduction to Research Methodology", RBSA Publishers, 2015.
2. Kothari, C.R., "Research Methodology: Methods and Techniques", New Age International, 2018.
3. Wadehra, B.L. "Law relating to patents, trademarks, copyright designs and geographical indications". Universal Law Publishing, Reprint, 2011.
4. Anthony, M., Graziano, A.M. and Raulin, M.L.. Research Methods: A Process of Inquiry, Allyn and Bacon 2012.
5. Carlos, C.M., Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options. Zed Books, New York, 2000.

19IC14C   ADVANCED DATA STRUCTURES LABORATORY   L T P C
0 0 4 2

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: Design and implement basic and advanced data structures extensively. (K3)

CO2: Design algorithms using graph structures. (K3)

CO3: Design and develop efficient algorithms with minimum complexity using design techniques. (K4)

Pre-requisites: Data Structures, Design and Analysis of Algorithm.

List of Experiments

1. Implement the following sorting algorithms and analyze their complexities:
   (a) Insertion sort
   (b) Merge sort
   (c) Quick sort
   (d) Heap sort
2. Implementation of a Binary Search Tree operations.
3. Red-Black Tree Implementation.
4. Heap Implementation.
5. Fibonacci Heap Implementation.
6. Graph Traversals.
7. Spanning Tree Implementation.
8. Shortest Path Algorithms (Dijkstra's algorithm, Bellmann Ford Algorithm).
9. Implementation of Matrix Chain Multiplication.

P: 60; TOTAL: 60 PERIODS

19IC21C	CLOUD COMPUTING TECHNOLOGIES	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students should be able to
   CO1: Describe the concepts of storage virtualization, network virtualization and its management. (K2)
   CO2: Apply the concept of virtualization in the cloud computing. (K3)
   CO3: Describe the architecture, infrastructure and delivery models of cloud computing. (K2)
   CO4: Develop services using Cloud computing. (K3)
   CO5: Apply the security models in the cloud environment. (K3)

UNIT I   VIRTUALIZATION   9

Basics of Virtual Machines - Process Virtual Machines – System Virtual Machines –Emulation – Interpretation – Binary Translation - Taxonomy of Virtual Machines. Virtualization –Management Virtualization —— Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization.

UNIT II   VIRTUALIZATION INFRASTRUCTURE   9

Comprehensive Analysis – Resource Pool – Testing Environment –Server Virtualization – Virtual Workloads – Provision Virtual Machines – Desktop Virtualization – Application Virtualization -
Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

UNIT III   CLOUD PLATFORM ARCHITECTURE   9

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design – Layered cloud Architectural Development – Virtualization Support and Disaster Recovery – Architectural Design Challenges - Public Cloud Platforms : GAE,AWS – Inter-cloud Resource Management.

UNIT IV   PROGRAMMING MODEL   9

Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack, Nimbus.

UNIT V   CLOUD SECURITY   9

Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud - Key privacy issues in the cloud – Cloud Security and Trust Management.

L: 45; TOTAL: 45 PERIODS

REFERENCES
   1. Danielle Ruest, Nelson Ruest, "Virtualization: A Beginner"s Guide", McGraw-Hill Osborne Media, 2009.
   2. Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005
   3. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management and Security", CRC Press, 2010.

4. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
5. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy", O"Reilly Media, Inc., 2009.
6. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, 2009.
7. Tom White, "Hadoop: The Definitive Guide", Yahoo Press, 2012

19IC22C	ADVANCED DATABASES	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: Acquire knowledge on parallel and distributed databases and its applications.(K2)
CO2: Explain the usage and applications of Object Oriented databases. (K2)
CO3: Describe the principles of intelligent databases. (K2)
CO4: Explain the usage of advanced data models. (K2)
CO5: Learn emerging databases such as XML, Cloud and Big Data. (K2)

UNIT I   PARALLEL AND DISTRIBUTED DATABASES   9

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Case Studies.

UNIT II   OBJECT AND OBJECT RELATIONAL DATABASES   9

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

UNIT III   INTELLIGENT DATABASES   9

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2) - Taxonomy- Applications-Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases-TSQL2- Deductive Databases: Logic of Query Languages – Data log- Recursive Rules-Syntax and Semantics of Datalog Languages- Implementation of Rules and Recursion- Recursive Queries in SQL- Spatial Databases- Spatial Data Types- Spatial Relationships- Spatial Data Structures-Spatial Access Methods- Spatial DB Implementation.

UNIT IV   MOBILE DATABASES   9

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models -Concurrency Control - Transaction Commit Protocols- Multimedia Databases- Information Retrieval.

UNIT V   EMERGING TECHNOLOGIES   9

XML Databases: XML-Related Technologies-XML Schema- XML Query Languages- Storing XML in Databases-XML and SQL- Native XML Databases- Web Databases- Geographic Information Systems- Biological Data Management- Cloud Based Databases: Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models- Query Languages- Introduction to Big Data-Storage-Analysis.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Sixth Edition, McGraw Hill, 2011.
2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education/Addison Wesley, 2010.

3. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, "Advanced Database Systems", Morgan Kaufmann publishers, 2006.
4. Vijay Kumar, "Mobile Database Systems", John Wiley & Sons, 2006.
5. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", 8th Edition, Pearson Education, 2006.

19IC23C   **MINI PROJECT WITH SEMINAR**   **L T P C**
                                                                                                0 0 4 2

During the seminar session, each student is expected to prepare and present a topic on Information and Cyber Warfare / technology, for duration of about 15 to 20 minutes. Each student is expected to present at least twice during the semester and the student is evaluated based on the presentation skill, concept and Query clarification. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A Faculty is to be allotted and he / she will guide and monitor the progress of the student and maintain the attendance also. The seminar will be assessed by a committee appointed by the COE.

P: 60; TOTAL: 60 PERIODS

19IC24C   **CLOUD COMPUTING TECHNOLOGIES LABORATORY**   **L T P C**
                                                                                      0 0 4 2

COURSE OUTCOMES
Upon completion of this course, the students will be able to
   CO1: Analyze the use of Cloud Applications. (K4)
   CO2: Apply resource allocation, scheduling algorithms. (K3)
   CO3: Implement Energy-conscious model. (K3)
   CO4: Create virtual machines from available physical resources. (K3)
   CO5: Setup a private cloud. (K3)

LIST OF EXERCISES:
   1. Usage of Google Apps.
   2. Installation of Guest OS using virtual box.
   3. Implement PaaS using Amazon AWS.
   4. Simulate VM allocation algorithm.
   5. Simulate Task Scheduling algorithm.
   6. Simulate Energy-conscious model.
   7. Simulate Datacenter Network topologies.
   8. Analyze Cloud Computing Environments or Applications using Cloud Analyst.
   9. Setup a Private Cloud Using Eucalyptus / Open stack
   10. Solve applications using Map Reduce Concept

                                                                 P: 60; TOTAL: 60 PERIODS

19IC01E	RISK ASSESSMENT AND SECURITY AUDIT	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: Gain the knowledge about Information Risk. (K2)
CO2: Discover knowledge in collecting data about organization. (K3)
CO3: Explain various data analysis on Information Risk Assessment. (K2)
CO4: Describe about IT audit and its activities. (K2)

UNIT I   INTRODUCTION   9

Introduction to Risk – Information Security Risk Assessment Overview- Drivers, Laws and Regulations- Risk Assessment Frame work – Practical Approach.

UNIT II   DATA COLLECTION   9

The Sponsors- The Project Team- Data Collection Mechanisms- Executive Interviews- Document Requests- IT Assets Inventories- Profile & Control Survey- Consolidation.

UNIT III   DATA ANALYSIS   9

Compiling Observations- Preparation of catalogs- System Risk Computation- Impact Analysis Scheme- Final Risk Score.

UNIT IV   RISK ASSESSMENT   9

System Risk Analysis- Risk Prioritization- System Specific Risk Treatment- Issue Registers- Methodology- Result- Risk Registers- Post Mortem.

UNIT V   SECURITY AUDIT PROCESS   9

Pre-planning audit- Audit Risk Assessment- Performing Audit- Internal Controls- Audit Evidence- Audit Testing- Audit Finding- Follow-up activities.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Mark Talabis Jason Martin, "Information Security Risk Assessment Toolkit: Practical Assessments through Data Collection and Data Analysis", Kindle Edition. ISBN: 978-1-59749-735-0, 2012.
2. 2. David L. Cannon, Brian T. O'Hara, Allen Keele, "CISA Certified Information Systems Auditor sStudy Guide", Fourth Edition, SYBEX Publication. ISBN: 978-0-470-23152-4, 2016.

19IC02E	FORENSICS AND INCIDENT RESPONSE	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: Summarize the activities of initial and incident responses. (K2)
CO2: Investigate web server attacks, DNS attacks and router attacks. (K3)
CO3: Describe the techniques related to system investigation. (K2)

UNIT I   INCIDENT AND INCIDENT RESPONSE   9

Introduction to Incident - Incident Response Methodology – Steps - Activities in Initial Response Phase after detection of an incident.

UNIT II   INITIAL RESPONSE AND FORENSIC DUPLICATION   9

Initial Response & Volatile Data Collection from Windows system - Initial Response & Volatile Data Collection from Unix system - Forensic Duplication: Forensic duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic Duplicate/Qualified Forensic Duplicate of a Hard Drive.

UNIT III   STORAGE AND EVIDENCE HANDLING   9

File Systems-FAT, NTFS - Forensic Analysis of File Systems - Storage Fundamentals-Storage Layer, Hard Drives Evidence Handling-Types of Evidence, Challenges in evidence handling, Overview of evidence handling procedure.

UNIT IV   NETWORK FORENSICS   9

Collecting Network Based Evidence - Investigating Routers - Network Protocols - Email Tracing - Internet Fraud.

UNIT V   SYSTEMS INVESTIGATION AND ETHICAL ISSUES   9

Data Analysis Techniques - Investigating Live Systems (Windows & UNIX) - Investigating Hacker Tools - Ethical Issues – Cybercrime.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGrawHill, 2006.
2. Peter Stephenson, "Investigating Computer Crime: A Handbook for Corporate Investigations", Sept 1999.
3. Eoghan Casey, "Handbook Computer Crime Investigation's Forensic Tools and Technology", Academic Press, First Edition, 2001.
4. Skoudis. E., Perlman. R. Counter Hack: "A Step-by-Step Guide to Computer Attacks and Effective Defenses", .Prentice Hall Professional Technical Reference. 2001.
5. Norbert Zaenglein, "Disk Detective: Secret You Must Know to Recover Information From a Computer", Paladin Press, 2000.
6. Bill Nelson, Amelia Philips and Christopher Steuart, "Guide to computer forensics and investigations", course technology, Cengage Learning; Fourth edition, ISBN: 1-435-49883-6, 2009.

19IC03E   **DISTRIBUTED SYSTEM SECURITY**   **L T P C QP**
                                                                          3 0 0 3 A

COURSE OUTCOMES
Upon completion of this course, the students will be able to
    CO1: describe the basics of distributed systems security. (K2)
        CO2: define the concepts of security engineering. (K2)
    CO3: explain the threats, vulnerabilities and its solutions in distributed systems security. (K2)
    CO4: apply the distributed systems security concepts with various case studies. (K4)

UNIT I   INTRODUCTION   9
Introduction - Distributed Systems - Distributed Systems Security.

UNIT II   SECURITY ENGINEERING   9
Secure Development Lifecycle Processes Overview - A Typical Security Engineering Process - Important Security Engineering Guidelines and Resources - Common Security Issues and Technologies - Security Issues - Common Security Techniques.

UNIT III   THREATS AND VULNERABILITIES   9
Host-level threats and vulnerabilities - Infrastructure-level threats and vulnerabilities - Application-level threats and vulnerabilities - Service-level threats and vulnerabilities.

UNIT IV   SOLUTIONS   9
Host-level solutions - Infrastructure-level solutions - Application-level solutions - Service-level solutions.

UNIT V   CASE STUDIES   9
SOX Compliance - SOX Security Solutions - Multilevel Policy-Driven Solution Architecture - The Financial Application - Security Requirements Analysis - Final Security Architecture.

L: 45; TOTAL: 45 PERIODS

REFERENCE
1. Abhijit Belapurkar, Anirban Chakrabarti, Harigopal Ponnapalli, Niranjan Varadarajan, SrinivasPadmanabhuni, SrikanthSundarrajan, "Distributed Systems Security: Issues, Processes and Solution", 2009.

19IC04E   **E – COMMERCE SECURITY**   **L T P C QP**
                                                            3 0 0 3 A

COURSE OUTCOMES
Upon completion of this course, the students will be able to
   CO1: Explain the basic concepts, theories, and business models underlying e- commerce. (K2)
   CO2: Analyze the importance of security and trust in e-commerce, and be able to realize techniques to foster the process of doing business on the Web. (K4)
   CO3: Explain the added value, risks and barriers in the adoption of e-Business and   e-Commerce. (K2)
   CO4: Comprehend the important issues in design and development, such as website effectiveness, usability, brand strategy, and personalizing the user experience. (K2)
   CO5: Apply necessary tools and information to design and build systems that take advantage of trusted computing.(K3)

UNIT I   INTRODUCTION TO E-COMMERCE   9
Network and E-Commerce – Types of E-Commerce – E-Commerce Business Models: B2C, B2B, C2C, P2P and M-commerce business models – Ecommerce.

UNIT II   PAYMENT SYSTEMS & SECURITY   9
Types of payment system – Credit card E-Commerce transactions– B2C E-Commerce Digital payment systems – B2B payment system.E-Commerce Security Environment – Security threats in E-Commerce environment – Policies, Procedures and Laws.

UNIT III   INTER-ORGANIZATIONAL TRUST IN E-COMMERCE   9
Need – Trading partner trust – Perceived benefits and risks of E-Commerce – Technology trust mechanism in E-Commerce – Perspectives of organizational, economic and political theories of inter-organizational trust – Conceptual model of inter-organizational trust in E-Commerce participation.

UNIT IV   INTRODUCTION TO TRUSTED COMPUTING PLATFORM   9
Overview – Usage Scenarios – Key components of trusted platform – Trust mechanisms in a trusted platform.

UNIT V   PLATFORMS & MODELS   9
Secured platforms for organizations and individuals – Trust models and the E-Commerce domain**.**

                                        L: 45; TOTAL: 45 PERIODS

REFERENCES
   1. Gary Schneider, "Electronic Commerce", Course Technologies, Sixth Edition, 2006.
   2. Kenneth C. Laudon and Carol Guercio Trave, "E-Commerce Business Technology Society", Pearson Education, 2005.
   3. Pauline Ratnasingam, "Inter-Organizational Trust for Business-to-Business E- Commerce", IRM Press, 2005.
   4. Siani Pearson, et al, "Trusted Computing Platforms: TCPA Technology in Context", Prentice Hall PTR, 2002.

19IC05E	GLOBAL CYBER WARFARE	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: explain the warfare domain and Cyber act (K2)
CO2: gain knowledge on non-state actors in cyber conflicts between nation states (K2)
CO3: describe various modes of attack that have been used in cyber warfare (K2)
CO4: examine the military doctrines for cyber warfare developed by federations (K2)
CO5: explain the warfare framework used by Russia and US. (K2)

UNIT I   OPERATIONAL HISTORY OF CYBER WARFARE   9

Cyberspace as a Warfare Domain -Purpose, Plausibility -Limits of Cyberwar -Netcentricity– OperationalCyberwar - A Conceptual Framework - Act of War - Relationship to IO- Cyber Crime - Future Threats - Rise of Nonstate Hacker - Noteworthy Events - Gaza Cyber war.

UNIT II   RESPONDING TO INTERNATIONAL CYBER ATTACKS   9

Law of War- Nonstate actors and Law of War -Analysing Cyber Attacks - Technological Limitations - Issues -Intelligence Component of Cyber Warfare-Korean DDOS Attacks-One year after RU-GE War -Ingushetia Conflict - Predictive Role of Intelligence - Nonstate Hackers and Social Web - Dark side of Social Networks-TwitterGate - Automating Process- False Identities - Components of Bulletproof Networks - SORM-2 - Kremlin and Russian Internet.

UNIT III   WEAPONIZING MALWARE   9

Introduction - New Threat Landscape - StopGeogia.ru Malware Discussions - Twitter as DDoS Command Post against Iran, Social Engineering - Channel Consolidation - Adversary's Look at LinkedIn - BIOS Based Rootkit Attack - Malware for Hire - Targeted Attacks Against Military Brass and Government Executives. Organized Crime in Cyber space - Subtle Threat - Atrivo/Interchange -EST Domains-McColo- Russian Organized Crime and Kremlin.

UNIT IV   ROLE OF CYBER IN MILITARY DOCTRINE   9

Introduction- Russian Federation- FEP -Information wars- RF Military Policy- Art of Misdirection China Military Doctrine -Anti-access Strategies - 36 Stratagems - US Military Doctrine - Advice for Policymakers -Shoot the Hostage - Use Active Defenses to Defend Critical Information Systems - Scenarios and Options to Responding to Cyber Attacks- Nation Cyber Security.

UNIT V   INFORMATION WARFARE FRAMEWORK   9

Russian Government Policy- Laws and Amendments - Government Structures - Russian Military of Defense - Administrative Changes - Electronic Warfare Troops - Military Units - Russian Federation Ministry ofCommunications and Mass Communications - US Department of Defense Cyber Command - Organizational Structure.Active Defense for Cyber - Covert Action - Cyber Active Defense under International Law -Cyber Active Defenses as Cover Action under International Law - Cyber Attacks Under International Law Nonstate Actors.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Jeffrey Carr, "Inside Cyber Warfare: Mapping the Cyber Underworld", published by O,ReillyMedia,Inc. second edition 2012.
2. Martin C. Libicki JohnVacca , "Cyber deterrence and Cyberwar", published by RAND Corporation, 2009
3. Brandon Valeriano,RyanC.Maness "Cyberwar versus Cyber realities: conflict in the internation system", Oxford University Press, 2015.

19IC06E	WEB APPLICATION SECURITY	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: describe the principles and techniques associated with the cyber security Practices. (K2)

CO2: evaluate techniques used to break into an insecure web application and identify relevant Counter measures. (K4)

CO3: integrate approaches to secure networks, intrusion detection and prevention Systems. (K3)

CO4: analyze the various security threats in maintaining secure database and   Counter measures. (K4)

UNIT I   WEB APPLICATION INSECURITY AND DEFENCE MECHANISM   9

The Evolution of Web Applications, Web Application Security, Key Problem Factors, Handling User Access, Handling User Input, Handling Attackers, HTTP Protocol, Web Functionality, Encoding Schemes.

UNIT II   HACKING AUTHENTICATION & SESSION MANAGEMENT   9

Authentication Technologies, Design Flaws in Authentication, Implementation Flaws in Authentication, Securing Authentication. The Need for State, Weaknesses in Token Generation, Weaknesses in Session Token Handling, Securing Session Management.

UNIT III   ATTACKING ACCESS CONTROLS & DATA STORES   9

Common Vulnerabilities, Attacking Access Controls, Securing Access Controls. Injecting into Interpreted Contexts, Injecting into SQL, Injecting into NoSQL, Injecting into XPath, Injecting into LDAP.

UNIT IV   ACCESSING BACK-END COMPONENTS   9

Injecting OS Commands, Manipulating File Paths, Injecting into XML Interpreters, Injecting into Back-end HTTP Requests, injecting into Mail Services.

UNIT V   ANALYZING APPLICATION LOGIC   9

The Nature of Logic Flaws, Real-World Logic Flaws, Fooling a Password Change Function Breaking the Bank, Cheating on Bulk Discounts, Invalidating Input Validation , Racing Against the Login, Avoiding Logic Flaws.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Dafydd Stuttard, Marcus Pinto , "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", Second Edition, 2011.
2. Joel Scambray, Vincent Liu and Caleb Sima, "Hacking Exposed Web Applications", Third Edition, 2010.
3. Ryan C. Barnett and Jeremiah Grossman, "Web Application Defender's Cookbook: Battling Hackers and Protecting Users", 2012.

19IC07E   **OPERATING SYSTEM SECURITY**   **L T P C QP**
3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: analyze the access control procedures. (K2)
CO 2: explain security and authorization mechanisms in operating system. (K3)
CO 3: describe the information flow models and transmission channel. (K2)
CO 4: explain various kernel methods involved in virtual machine system. (K3)
CO 5: Illustrate security based real time applications. (K3)

UNIT I   INTRODUCTION AND ACCESS CONTROL FUNDAMENTALS   9

Introduction – Secure operating system-Goals-Trust model-Threat model- Protection system-Assessment criteria. Case study: Role based access control (RBAC).

UNIT II   SECURITY IN OPERATING SYSTEM   9

Multics system-Unix security – Windows security - Authorization and security analysis-Vulnerabilities. Case Study: Building secure operating system for Linux.

UNIT III   INFORMATION FLOW   9

Information flow secrecy models-Information flow integrity models-Covert channel-Security kernel-Secure communication processor- Gemini secure operating system.

UNIT IV   SECURE VIRTUAL MACHINE SYSTEM   9

Separation kernels-VAX VMM security kernel-Security in other virtual machine systems- System assurance.

UNIT V   SECURITY APPLICATIONS   9

Firewall and border security-Web, remote access and VPN security- E-mail security-Security through disaster recovery.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Trent Jaeger, "Operating System Security", Morgan &Claypool publisher, 2008.
2. Michael Palmer, "Guide to Operating Systems Security", Information security professionals, 2003.

19IC08E	**IOT SECURITY**	**L T P C QP**
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

     CO 1: Describe the basics of securing Internet of Things. (K2)
     CO 2: Explain architecture and threats in IoT. (K2)
     CO 3: Analyze various privacy schemes related to IoT (K3)
     CO 4: Discuss the authentication mechanisms for IoT security and privacy. (K3)
     CO 5: Discuss security issues for various applications using case studies (K4)

UNIT I   INTRODUCTION: SECURING THE INTERNET OF THINGS   9

Introduction – Security Requirements in IoT architectures – Security in Enabling Technologies – IoT Security Life Cycle – Cryptographic Fundamentals for IoT Security Engineering - Security Concerns in IoT Applications – Basic Security Practices.

UNIT II   SECURITY ARCHITECTURE IN THE INTERNET OF THINGS   9

Introduction – Security Requirements in IoT – Insufficient Authentication/Authorization – Insecure Access Control – Threads to Access Control, Privacy, and Availability – Attacks Specific to IoT – Malware Propagation and Control in Internet of Things.

UNIT III   PRIVACY PRESERVATION   9

Privacy Preservation Data Dissemination - Privacy Preservation for IoT used in Smart Building – Exploiting Mobility Social Features for Location Privacy Enhancement in Internet of Vehicles – Lightweight and Robust Schemes for Privacy Protection in Key personal IOT Applications: Mobile WBSN and Participatory Sensing.

UNIT IV   TRUST, AUTHENTICATION AND DATA SECURITY   9

Trust and Trust Models for IoT – Emerging Architecture Model for IoT Security and Privacy – preventing Unauthorized Access to Sensor Data – Authentication in IoT – Computational Security for the IoT – Secure Path Generation Scheme for real-Time Green IoT – Security Protocols for IoT Access Networks.

UNIT V   SOCIAL AWARENESS AND CASE STUDIES   9

User Centric Decentralized Governance Framework for Privacy and Trust in IoT – Policy Based Approach for Informed Consent in IoT - Security and Impact of the IoT on Mobile Networks – Security Concerns in Social IoT – Security for IoT Based Healthcare – Smart cities.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Shancang Li, Li Da Xu, "Securing the Internet of Things," Syngress (Elsevier) publication, 2017, ISBN: 978-0-12-804458-2.
2. Fei Hu, "Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations," CRC Press (Taylor & Francis Group), 2016, ISBN: 978-1-4987-2319-0.
3. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A Hands-on approach," VPT Publishers, 2014, ISBN: 978-0996025515.
4. Alasdair Gilchris, "Iot Security Issues," Walter de Gruyter GmbH & Co, 2017.
5. Sridipta Misra, Muthucumaru Maheswaran, Salman Hashmi, "Security Challenges and Approaches in Internet of Things," Springer, 2016.
6. Brian Russell, Drew Van Duren, "Practical Internet of Things Security," Packet Publishing Ltd, 2016.

19IC09E	**MALWARE SECURITY**	**L T P C QP**
		3 0 0 3 A

COURSE OUTCOMES
Upon completion of this course, the students will be able to
  CO 1 Analyze the malware security issues related to software. (K3)
  CO 2: Estimate the distributed, Stealthy malware detection and defense mechanism (K3)
  CO 3: Describe the malware preservation techniques (K2)
  CO 4: Analyze the different coding techniques for variety of applications. (K3)

UNIT I   SOFTWARE ANALYSIS AND ASSURANCE   9
Static disassembly and code analysis - Properties of malicious code: Behavioral- Structural- SQL injection attack- Detection – prevention - Next generation platform for analyzing executable.

UNIT II   DISTRIBUTED MALWARE DETECTION AND DEFENSE   9
Very fast containment of scanning worms, revisited- Sting: An End-to-End- Self – Healing - Defending against Internet Worms - An insider looks at botnets - Co operative intrusion detectors- Challenge the base rate fallacy.

UNIT III   STEALTHY AND TARGETED MALWARE DETECTION AND DEFENSE   9
Composite hybrid techniques - Defending against targeted attacks - Stealthy malware detection - Verifying code integrity - Enforcing untampered code execution - legacy systems - Secure information flow analysis.

UNIT IV   MALWARE PRESERVATION TECHNIQUES   9
Infection mechanism – Targets - Virus propagation mechanism - Defending against virus – Malware – Self preservation techniques- Wrap stars - Trojan Software Distribution Sites - poisoning the source.

UNIT V   MALICIOUS CODE   9
Mobile Code- Browser scripts - Active X control - java applets - Mobile code in e- Mail clients - distributed application and mobile code - Additional defense against malicious mobile code - User mode root kits: Windows - Unix.

L: 45; TOTAL: 45 PERIODS

REFERENCES
    1. Mahai christodorescu, et al, "Malware detection-Advances in information security", Springer, 2007.
    2. Ed skoudis and lenny zeltser, "malware – fighting malicious code" prentice hall international, 2004.
    3. Mehadi masud, latifur khan, Bhavani Thuraisingam, "Data mining tool for malware detection", Taylor and Francis group, CRC press, 2012.

19IC10E	ENTERPRISE AND PERIMETER SECURITY	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: explain the Enterprise security architecture and models. (K2)

CO2: describe the usage of firewalls and system integration. (K2)

CO3: outline the importance of encryption and system monitoring in enterprise management. (K2)

CO4: discuss the usage of Packet filtering techniques and network proxy security in enterprise (K2)

CO5: explain the VPN network protocols, Intrusion detection and host defense mechanism.(K2)

UNIT I   ENTERPRISE SECURITY OVERVIEW   9

The façade of Enterprise security-Pitfalls-Road map to secure Enterprise-Security architectures-third party services-Security architecture models-Trust model-Enterprise trust models-Micro and data centric architectures-Security policy and standards.

UNIT II   SECURING THE NETWORK AND SYSTEMS   9

Next generation firewalls-Threat detection and mitigation-Network Segmentation-security architecture in DMZ-System classification-application white listing-host firewall-policy enforcement.

UNIT III   SECURING ENTERPRISE DATA AND MONITORING   9

Data classification-Data Loss prevention-Encryption and Hashing-Securing wireless networks and implementation-Monitoring strategies-Privileged user access-system monitoring-Building the incident response team.

UNIT IV   THE ESSENTIALS OF NETWORK PERIMETER SECURITY   9

Perimeter security fundamentals-packet filtering-IP Chains-Packet filtering devices-Egress filtering-Problems with filters-Stateful firewalls-application level traffic and state-Statefull filtering and inspection-Proxy firewalls-types of proxies-Tools for proxies.

UNIT V   FORTIFYING THE SECURITY PARAMETER   9

Virtual private networks-VPN protocol -Network intrusion detection-sensor placement-host hardening-host defense components-Host based firewalls-Challenges of host based defense.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Aaron Woody, "Enterprise Security: A Data-Centric Approach to Securing the Enterprise", Packt Publishing, 2013.

2. Stephen Northcutt, Lenny Zeltser, Scott Winters, Karen Kent, Ronald W. Ritchey, "Inside Network Perimeter Security", Second Edition, Sams Publishing, 2005.

3. Van haren, "Open Enterprise Security Architecture (O-Esa): A Framework And Template For Policy-Driven Security", The Open Group publishing, 2011.

4. John Sherwood, Andrew Clark, David Lynas, "Enterprise Security Architecture: A Business-Driven Approach", CRC Press, Taylor and Francis group,2005

5. Daniel Minoli, "Enterprise Architecture A to Z: Frameworks, Business Process Modeling, SOA, and Infrastructure Technology", Auerbach Publications, 2008.

6. Don Murdoch, "Blue Team Handbook: A Condensed Field Guide for the Cyber Security Incident Responder", GSE Publishers, 2014.

7. Stephen Northcutt ,"Network Intrusion Detection: An Analyst's Handbook", New Riders Professional Library, 1999.

19IC11E	**SECURE CODING PRACTICES**	**L T P C QP**
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: describe the need for secure coding and proactive development process. (K2)
CO2: explain and demonstrate secure coding practices. (K2)
CO3: enumerate input issues related to database and web. (K2)
CO4: explain fundamental principles of software security engineering. (K2)

UNIT I   INTRODUCTION   9

Need for secure systems- Proactive security development process - Security principles to live by and threat modeling.

UNIT II   SECURE CODING IN C   9

Character strings- String manipulation errors – String Vulnerabilities and exploits – Mitigation strategies for strings- Pointers – Mitigation strategies in pointer based vulnerabilities – Buffer Overflow based vulnerabilities.

UNIT III   SECURE CODING IN C++ AND JAVA   9

Dynamic memory management- Common errors in dynamic memory management- Memory managers- Double –free vulnerabilities –Integer security- Mitigation strategies.

UNIT IV   DATABASE AND WEB SPECIFIC INPUT ISSUES   9

Quoting the Input – Use of stored procedures- Building SQL statements securely- XSS related attacks and remedies.

UNIT V   SOFTWARE SECURITY ENGINEERING   9

Requirements engineering for secure software: Misuse and abuse cases- SQUARE process model- Software security practices and knowledge for architecture and design.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Michael Howard, David LeBlanc, "Writing Secure Code", Microsoft Press, Second Edition, 2003.
2. Robert C.Seacord, "Secure Coding in C and C++", Pearson Education, Second Edition, 2013.
3. Julia H. Allen, Sean J. Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, "Software Security Engineering: A guide for Project Managers", Addison-Wesley Professional, 2008.

19IC12E	**CYBER LAWS AND SECURITY POLICIES**	**L T P C QP**
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: explain the basic information on cybercrime. (K2)

CO2: describe cyber laws for various crime activities. (K2)

CO3: identify the security policies for cyber issues. (K2)

CO4: analyze the role of organization for securing cyberspace. (K4)

CO5: explain the need for security in organizations. (K2)

UNIT I   INTRODUCTION TO CYBER CRIME   9

Introduction, Forgery, Hacking, Software Piracy, Computer Network intrusion - Category of Cybercrime - Cybercrime Mobile & Wireless devices - Tools and Methods used in Cybercrime - Phishing & Identity Theft.

UNIT II   CYBER LAW   9

Power of Arrest without Warrant under the IT act, 2000: A Critique - Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals – Jurisdiction in the cyber world – Battling Cyber Squatters and Copyright Protection – E-Commerce taxation – Digital signatures, certifying authorities and E-Governance – Indian Evidence Act – Protection of Cyber Consumers in India.

UNIT III   CYBER AND INFORMATION SECURITY POLICY   9

Cyber governance issues – Cyber user issues – Cyber conflict issues – Cyber management issues – Cyber infrastructures issues - Introduction - Corporate policies - Tier 1, Tier 2 and Tier3 policies - process management - planning and preparation - developing   policies - asset classification policy - developing standards.

UNIT IV   SECURING CYBERSPACE   9

The private sector role in securing cyberspace - National governments and their role in securing cyberspace - International law's role in securing cyberspace - Privacy, surveillance and the law Cyber War and Strategy - Authentication and Identity - Current legislative and policy initiatives.

UNIT V   ORGANIZATIONAL AND HUMAN SECURITY   9

Organizational and Human Security: Adoption of Information Security Management Standards, Human Factors in Security - Role of information security profession.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Reich, Pauline C, "Law, Policy, and Technology: Cyber terrorism, Information Warfare, and Internet Immobilization", IGI Global, 2012.
2. Jennifer L. Bayuk, Jason Healey, Paul Rohmeyer, Marcus H. Sachs, Jeffrey Schmidt, "Cyber Security Policy Guidebook", John Wiley & Sons, 2012.
3. VivekSood, "Cyber Law Simplified", Tata Mcgraw Hill, 2001.
4. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
5. Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer - verlag, 1997.

19IC13E	SOFT COMPUTING	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES
Upon completion of this course, the students will be able to
- CO 1: apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems (K3)
- CO 2: implement neural networks to pattern classification and regression problems. (K3)
- CO 3: apply genetic algorithms to combinatorial optimization problems.(K4)
- CO 4: effectively use of existing software tools to solve real problems using a soft computing approach (K5)

UNIT I   FUZZY SYSTEMS   9
Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions- Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems –Fuzzy Decision Making - Fuzzy Tool box in Matlab.

UNIT II   ARTIFICIAL NEURAL NETWORKS   9
Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks –Unsupervised Learning Neural Networks – NNTool in Matlab.

UNIT III   NEURO - FUZZY MODELING   9
Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – ANFIS Applications using Matlab.

UNIT IV   GENETIC ALGORITHMS   9
Evolutionary Computation – Genetic Algorithms – Terminologies and Operators of GA –Ant Colony Optimization – Particle Swarm Optimization – GATool using Matlab.

UNIT V   APPLICATIONS   9
Fuzzy Classification – Fuzzy Pattern Recognition – Applications of Neural Networks: Bio informatics, Knowledge Extraction, Security Systems, Natural Landmark Recognition Task - Applications of Genetic Algorithm: Machine Learning, Image Processing, Data Mining and Wireless Networks.

L: 45; TOTAL: 45 PERIODS

REFERENCES
1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", Third Edition, Wiley, 2010.
2. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", First Edition, Prentice-Hall of India, 2003.
3. S.N.Sivanandam, S.N.Deepa, "Introduction to Genetic Algorithms", First edition, Springer, 2007.
4. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", First Edition, Springer, 2007.
5. Simon Haykin, "Neural Networks and Learning Machines", Third Edition, Pearson Education, 2008.

19IC14E	MACHINE LEARNING	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: explain theory for underlying machine learning (K2)
CO2: construct algorithms to learn linear and non-linear models (K3)
CO3: implement data clustering algorithms (K3)
CO4: construct algorithms to learn tree and rule-based models (K3)
CO5: apply reinforcement learning techniques (K3)

UNITI   FOUNDATIONS OF LEARNING   9

Components of learning – learning models – geometric models – probabilistic models – logic models – grouping and grading – learning versus design – types of learning – supervised – unsupervised – reinforcement – theory of learning – feasibility of learning – error and noise – training versus testing – theory of generalization – generalization bound – approximation generalization tradeoff – bias and variance – learning curve.

UNIT II   LINEAR MODELS   9

Linear classification – univariate linear regression – multivariate linear regression – regularized regression – Logistic regression – perceptrons – multilayer neural networks – learning neuralnetworks structures – support vector machines – soft margin SVM – going beyond linearity generalization and overfitting – regularization – validation.

UNIT III   DISTANCE-BASED MODELS   9

Nearest neighbor models – K-means – clustering around medoids – silhouttes – hierarchical clustering – k-d trees – locality sensitive hashing – non-parametric regression – ensemble learning– bagging and random forests – boosting – meta learning.

UNIT IV   TREE AND RULE MODELS   9

Decision trees – learning decision trees – ranking and probability estimation trees – regression trees – clustering trees – learning ordered rule lists – learning unordered rule lists – descriptive rule learning – association rule mining – first-order rule learning.

UNIT V   REINFORCEMENT LEARNING   9

Passive reinforcement learning – direct utility estimation – adaptive dynamic programming temporal - difference learning – active reinforcement learning – exploration – learning an action utility function – Generalization in reinforcement learning – policy search – applications in game playing – applications in robot control.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, "Learning from Data", AMLBook Publishers, 2012.
2. P. Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press, 2012.
3. K. P. Murphy, "Machine Learning: A probabilistic perspective", MIT Press, 2012.
4. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
5. D. Barber, "Bayesian Reasoning & Machine Learning", Cambridge University Press, 2012.
6. M. Mohri, A.Rostamizadeh, and A.Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.
7. T. M. Mitchell, "Machine Learning", McGraw Hill, 1997.
8. S. Russel and P. Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Prentice Hall, 2009.

19IC15E   COMPUTATIONAL STATISTICS AND DATA MINING   L T P C QP

**   3 0 0 3 A**

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1:explain the fundamental concepts in machine learning (K2)

CO2: analyze the functionalities of various clustering and association approaches.(K4)

CO3: outline the estimation methods for regression and time series in mining. (K2)

CO4: gain knowledge on various computational statistical methods.(K2)

CO5: discuss the evaluation procedure for statistical analysis. (K4)

UNIT I   INTRODUCTION TO MACHINE LEARNING   9

Basic concepts in machine learning and data mining. Bayesian and modelling, model selection. Linear regression and regularization.Linear discriminant analysis and logistic regression. Bagging and boosting. Splines, generalized additive models, trees, and random forests. Kernel smoothers and support vector machines.

UNIT II   CLUSTERING AND ASSOCIATION ANALYSIS   9

Principles and tools for dividing objects into groups and discovering relationships hidden in large data sets. Partitional methods and hierarchical clustering. Cluster evaluation. Association analysis using item sets and association rules.Evaluation of association patterns.

UNIT III   REGRESSION AND TIME SERIES   9

Classical Linear Regression Model-OLS method of estimation; tests of hypotheses- Use of dummy variables in regression-residuals and fitted values-Variable selection- Validation of assumptions using graphical techniques- Logistic regression; odds ratio, concordance-discordance measures.

UNIT IV   COMPUTATIONAL STATISTICS   9

Computer arithmetic-Random number generation and simulation techniques-Markov Chain Monte Carlo methods-Numerical linear algebra-Optimization methods in statistics-MCMC methods: Metropolis-Hastings and Gibbs sampling.

UNIT V   STATISTICAL EVIDENCE EVALUATION   9

Probabilistic reasoning and likelihood theory- Bayesian hypothesis testing- Bayesian belief networks.Statistical decision theory and influence diagrams- Elements of forensic theory-Sensitivity analysis.

**   L: 45; TOTAL: 45 PERIODS**

REFERENCES

1. Jiawei Han &MichelineKamber, "Datamining – Concepts and Techniques", Morgan Kaufmann Publishers, Elsevier, Third Edition, 2011.
2. James, G., Witten, D. Hastie, T. and Tibshirani, R. "An Introduction to Statistical Learning", Springer, 2014.
3. C.P. Robert and G. Casella,"Introducing Monte Carlo Statistical Methods with R", Springer, 2010
4. T. Hastie, R. Tibshirani, J. Friedman,"The Elements of Statistical Learning", Second Edition, Springer, 2009.

19IC16E   INFORMATION ETHICS FOR COMPUTER PROFESSIONALS   **L T P C QP**
3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: analyze the asymptotic performance of algorithms. (K3)
CO 2: explain linear data structures for solving computing problems. (K2)
CO 3: choose the concepts and algorithms of tree structure for solving problems. (K2)
CO 4: implement algorithms of various sorting and hashing techniques. (K3)
CO 5: solve computing problems using graph data structures. (K3)

UNIT I   OVERVIEW OF COMPUTER ETHICS   9

Reason, Relativity and responsibility in Computer Ethics – Ethical problems in IT – Ethical Decision Making – Informatics and Professional Responsibility.

UNIT II   ISSUES IN COMPUTER ETHICS   9

Informational Privacy: Concepts Theories and Controversies – Online Anonymity – Ethical Isses in Computer Security: Hacking, Hacktivism and Counterhacking.

UNIT III   PROFESSIONAL ISSUES   9

Information Ethics in Library profession – Ethical issues in free and Open source software – Internet Research Ethics – Health Information Technology – Ethical Issues of Information and Business.

UNIT IV   RESPONSIBILITY ISSUES AND RISK ASSESSMENT   9

Responsibilities for information on the Internet – Virtual reality and Computer Simulation – Genetic Information:Epistemological and Ethical Issues – The Ethics of Cyber conflict – Case Study : A practical Mechanism for Ethical Risk Assessment – A SoDIS Inspection.

UNIT V   REGULATORY ISSUES AND CHALLENGES   9

Regulation and Governance of the Internet – Information Overload – Email Spam – The matter of Plagarism – Intellectual Property: Legal and Moral Challenges of Online File Sharing.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Kenneth E.Himma, Herman T.Tavani, "The Handbook of Information and Computer Ethics", John Wiley & Sons Inc, 2008.
2. Terrell Ward Bynum, Simon Rogerson, "Computer Ethics and Professional Responsibility", BlackWell Publishing ltd, 2004.
3. Herman T.Tavani, "Ethics and Technology Controversies, Questions, and Stratergies for Ethical Computing", Fourth Edition, John Wiley & Sons Inc, 2008.
4. Deborah G. Johnson, "Computer Ethics", Fourth Edition, John Wiley & Sons Inc, 2008.
5. Robert Plotkin, "Computer Ethics – Computers, Internet and Society", First Edition, Checkmark Books, 2011.

19IC17E	DEEP LEARNING	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the student will be able to
- CO1: Understand the basis of Machine Learning (K2)
- CO2: Explore various Deep Learning Networks (K2)
- CO3: Implement Convolutional and Recurrent Neural Algorithms (K3)
- CO4: Analyze optimization and generalization in deep learning (K4)
- CO5: Explore the deep learning applications (K3)

UNIT I MACHINE LEARNING BASICS 9

Introduction to machine learning - Linear models (SVMs and Perceptrons, logistic regression). Learning Algorithms – Capacity, Overfitting and underfitting – Hyperparameters and Validation Sets – Estimators, Bias and Variance – Maximum Likelihood Estimation – Bayesian Statistics – Supervised Learning Algorithms – Unsupervised Learning Algorithms – Stochastic Gradient Descent – Building a Machine Learning Algorithm – Challenges Motivating deep learning.

UNIT II DEEP NETWORKS 9

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and other Differentiation Algorithms – Regularization: Dataset Augumentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks- Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning

UNIT III CONVOLUTION & RECURRENT NETWORKS 9

Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms. Recurrent Neural Networks: Bidirectional RNNs – Deep Recurrent Networks – Recursive Neural Networks.

UNIT IV OPTIMIZATION AND GENERALIZATION 9

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization- Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience

UNIT V CASE STUDY AND APPLICATIONS 9

Imagenet- Object Detection – Object Tracking - Audio WaveNet - Natural Language Processing Word2Vec - Joint Detection - Face Recognition - Scene Understanding - Gathering Image Captions.

L:45; TOTAL: 45 PERIODS

REFERENCES
1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book in preparation, 2016.
2. Dr.Adrian Rosebrock, "Deep Learning for Computer Vision with Python: Starter Bundle", PyImage Search, 1st edition, 2017.
3. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

19IC18E   DIGITAL WATERMARKING AND STEGANOGRAPHY   L T P C QP
3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: Describe the basics of watermarking techniques and importance of Steganography. (K2)
CO 2: Explain different types of watermarking applications and frameworks. (K2)
CO 3: Analyze the models of watermarking (K3)
CO 4: Discuss the concepts of steganography and steganalysis. (K3)
CO 5: Build self-learning and skills to deal with watermarking and steganography (K4)

UNIT I   INTRODUCTION   9

Information Hiding, Steganography, and Watermarking. History of Watermarking. History of Steganography, Importance of Digital Watermarking. Importance of Steganography.

UNIT II   APPLICATIONS AND PROPERTIES OF WATERMARKING AND
STEGANOGRAPHY   9

Applications of watermarking -Applications of steganography –Properties of Watermarking Systems - Evaluating Watermarking Systems - Properties of Steganographic and Steganalysis Systems - Evaluating and Testing Steganographic Systems.

UNIT III   MODELS OF WATERMARKING   9

Notation – Communications – Communication Based Models of Watermarking - Geometric Models of Watermarking - Modeling Watermark Detection by Correlation.

UNIT IV   STEGANALYSIS   9

Steganographic Communication - Notation and Terminology - Information-Theoretic Foundations of Steganography - Practical Steganographic Methods - Minimizing the Embedding Impact - Steganalysis Scenarios - Some Significant Steganalysis Algorithms.

UNIT V   APPLICATIONS   9

Applications of Watermarking, Broadcast Monitoring, Owner Identification ,Proof of Ownership, Transaction Tracking, Content Authentication, Copy Control, Device Control, Legacy Enhancement.Applications of Steganography, Steganography for Dissidents, Steganography for Criminals.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, and Ton Kalker, "Digital Watermarking and Steganography", Morgan Kaufmann Publishers, Second Edition, 2008.
2. Frank Y. Shih., "Digital Watermarking and Steganography: Fundamentals and Techniques", CRC Press.
3. Stefan Katzenbeisser, Fabien, A.P. Petitcolas., "Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.
4. Neil F. Johnson; Zoran Duric; Sushil Jajodia, "Information Hiding: Steganography and Watermarking - Attacks and Countermeasures", Springer.
5. Gregory Kipper, "Investigator's Guide to Steganography", Auerbach Publications.

19IC19E	SOCIAL NETWORK SECURITY	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to
CO1: describe the significance of security in online social networks (K2)
CO2: outline the trust management policies in achieving security (K2)
CO3: gain knowledge on information sharing and identity management actions (K2)
CO4: analyze various privacy and terrorism issues on Online Social Networks (K4)

UNIT I   ONLINE SOCIAL NETWORKS AND SECURITY ISSUES   9

Introduction- Social Networks: The Meaning of Community –Evolution of Online Social Networks – Trust Management – Controlled Information Sharing – Identity Management.

UNIT II   TRUST MANAGEMENT IN ONLINE SOCIAL NETWORKS   9

Trust, Policies and Reputation Systems – Trust properties – Trust Components – Social trust and Social Capital – Trust Evaluation Model.

UNIT III   INFORMATION SHARING IN ONLINE SOCIAL NETWORKS   9

Access control in Data Management System – Access control Models – Relationship – based Access control – Privacy settings in Commercial Online Social Networks – Existing Access control approaches.

UNIT IV   IDENTITY MANAGEMENT IN ONLINE SOCIAL NETWORKS   9

Digital Identity – Identity Management Models – Self-Presentation – Identity Disclosure – Identity Theft.

UNIT V   NETWORK ANALYSIS, PRIVACY AND TERRORISM   9

Privacy in Online Social Networks – Privacy Threats and Defenses – Terrorism Threats and Defenses.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Barbara Carminati, Elena Ferrari,MarcoViviani, "Security and Trust in Online Social Networks", Morgan & Claypool, 2013.
2. Richard Chbeir, Bechara Al Bouna, "Security and Privacy Preserving in Social Networks", Springer- VerlagWein, 2013..
3. Yaniv Altshuler, Yuval Elovici, Armin. B.Cremers, NadavAharony, Alex Pentland, "Security and Privacy in Social Networks", Springer Science Business Media, New York, 2013.

19IC20E	**BIG DATA ANALYTICS**	**L T P C QP**
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

> CO1: Describe the insights of big data and data analytics tools (K2)
> CO2: Explain the functions of Hadoop framework (K2)
> CO3: Apply data by utilizing various statistical and data mining approaches (K3)
> CO4: Perform analytics on real-time streaming data (K3)
> CO5: Describe the components of hadoop Eco systems (K2)

UNIT I   INTRODUCTION TO BIG DATA   9

Big Data – Definition, Characteristic Features – Big Data Applications - Big Data vs Traditional Data - Risks of Big Data - Structure of Big Data - Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Evolution of Analytic Processes, Tools and methods - Analysis vs Reporting - Modern Data Analytic Tools.

UNIT II   HADOOP FRAMEWORK   9

Distributed File Systems - Large-Scale FileSystem Organization – HDFS concepts - MapReduce Execution, Algorithms using MapReduce, Matrix-Vector Multiplication – Hadoop YARN.

UNIT III   DATA ANALYSIS   9

Statistical Methods:Regression modelling, Multivariate Analysis - Classification: SVM & Kernel Methods - Rule Mining - Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High Dimensional Data - Predictive Analytics – Data analysis using R.

UNIT IV   MINING DATA STREAMS   9

Streams: Concepts – Stream Data Model and Architecture - Sampling data in a stream - Mining Data Streams and Mining Time-series data - Real Time Analytics Platform (RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT V   HADOOP ECO SYSTEMS   9

Introduction to NoSQL – Aggregate Data Models – Hbase: Data Model and Implementations – Hbase Clients – Examples – .Cassandra: Data Model – Examples – Cassandra Clients – Hadoop Integration. Pig – Grunt – Pig Data Model – Pig Latin – developing and testing Pig Latin scripts. Hive – Data Types and File Formats – HiveQL Data Definition – HiveQL Data Manipulation – HiveQL Queries.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", Wiley and SAS Business Series, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.
3. Learning R – A Step-by-step Function Guide to Data Analysis, Richard Cotton, O"Reilly Media, 2013.
4. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, Second Edition, 2007.
5. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
6. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.

19IC21E	INTELLECTUAL PROPERTY RIGHTS	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

      CO1: describe the basic terminologies Intellectual property (K2)

      CO2: Explain about trade marks in Intellectual property (K2)

      CO3: Describe the Law of copy rights and Law of patents (K2)

      CO4: Explain about trade secrets in Intellectual property (K2)

      CO5: Describe the new development of intellectual property (K2)

UNIT I   INTRODUCTION   9

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT II   TRADE MARKS   9

Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT III   LAW OF COPY RIGHTS AND LAW OF PATENTS   9

Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.Foundation of patent law, patent searching process, ownership rights and transfer.

UNIT IV   TRADE SECRETS   9

Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade screte litigation. Unfair competition: Misappropriation right of publicity, False advertising.

UNIT V   NEW DEVELOPMENT OF INTELLECTUAL PROPERTY   9

New developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international - trade mark law, copy right law, international patent law and international development in trade secrets law.

L: 45 TOTAL: 45 PERIODS

REFERENCES

1. Siva Vaidhyanathan, Intellectual Property: A Very Short Introduction, Oxford University Press, 2017
2. Deborah, E. Bouchoux, Intellectual Property : The Law of Trademarks, Copyrights, Patents and Trade Secrets, 4 th Edition, Imprint : Delmar, 2013.
3. Intellectual property right - Unleashing the knowledge economy, prabuddha ganguli, Tata Mc Graw Hill Publishing Company Ltd, 2001

19IC22E	DIGITAL FORENSICS	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: explain the role of digital forensics in the business and private world (K2)
CO 2: identify potential sources of electronic evidence and explain the importance. (K2)
CO 3: recognize current techniques and tools for forensic investigations. (K2)
CO 4: explain and perform forensic analysis in various fields. (K2)
CO 5: describe the procedures for virtual, network and mobile device forensics. (K2)

UNIT I   INTRODUCTION TO DIGITAL FORENSICS   9

Overview of Digital Forensics –Digital Evidence preparation – Private Sector High tech investigation – Data recovery Workstation and software – Conducting an investigation.

UNIT II   DIGITAL FORENSIC ACQUISITION AND AUTHENTICATION   9

Storage formats for digital evidence – Image acquisition – acquisition tools – authenticating data acquisition – RAID data acquisition – Remote Network acquisition tools.

UNIT III   CURRENT DIGITAL FORENSICS TOOLS   9

Software Tools: Command-Line – Linux - Other GUI – Hardware Tools: Workstations - Write-Blocker - Validating and Testing Forensics Software.

UNIT IV   DIGITAL FORENSIC ANALYSIS AND VALIDATION   9

Principles of Digital Forensic Data collection and Analysis - Validating Forensic Data - Addressing Data-Hiding Techniques – Case Studies.

UNIT V   VIRTUAL, NETWORK AND MOBILE DEVICE FORENSICS   9

Overview of Virtual Machine Forensics - Network Forensics: Securing a Network- Procedures for Network Forensics - Examining the Honeynet Project - Mobile Device Forensics: Understanding Mobile Device Forensics - Acquisition Procedures for Mobile Devices.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to Computer Forensics and Investigations", Cengage Learning, Fifth Edition, 2016.
2. Eoghan Casey, "Handbook of digital forensics and investigation", Elsevier Academic Press, First Edition, 2009
3. Eoghan Casey, "Digital Evidence and Computer Crime: Forensics Science, Computers and the Internet", Elsevier Academic Press, Second Edition, 2004.

19IC23E	BIOMETRIC SECURITY ANALYSIS	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: explain the key issues and importance of biometric systems for security concerns. (K2)

CO 2: recognize physical and behavior biometric characteristics. (K2)

CO 3: describe the security and privacy aspects of biometric systems. (K2)

CO 4: identify different authentication services along with biometric verification mechanisms. (K2)

CO 5: explain various biometric template protection schemes. (K2)

UNIT I   INTRODUCTION   9

Biometrics- Introduction- benefits of biometrics over traditional authentication systems -benefits of biometrics in identification systems-selecting a biometric for a system –Applications - Key biometric terms and processes - biometric matching methods -Accuracy in biometric systems.

UNIT II   BIOMETRIC RECOGNITION   9

Fingerprint quality assessment-segmentation based metrics-Hand vein patterns-optical methods-PCAnet deep learning-Multispectral palm print-ear recognition-ear biometrics-Data analysis-Case study.

UNIT III   BIOMETRIC SECURITY   9

Introduction - AES Encryption and Decryption - ECG Identification - Hardware Implementation.

UNIT IV   BIO METRIC VERIFICATION   9

Classification: Logistic Regression (LR) - Random Forests - Generalized Linear Models - Evaluation Metrics.

UNIT V   BIOMETRIC TEMPLATE PROTECTION   9

Evolution of Biometric Template Protection Schemes - Systematic Literature Review Technique - Classification of Approaches for BTP - Biometric Cryptosystems - Homomorphic Encryption - Research Implications and Future Directions.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Richard Jiang, Somaya Al-maadeed, Ahmed Bouridane, Danny Crookes, Azeddine Beghdadi Editors, "Biometric Security and Privacy", Springer International Publishing Switzerland, 2017.
2. Abhijit Belapurkar, Anirban Chakrabarti, Harigopal Ponnapalli, Niranjan Varadarajan, Srinivas Padmanabhuni and Srikanth Sundarrajan, "Distributed Systems Security: Issues, Processes and Solutions", Wiley publications, 2009.
3. Rachid Guerraoui and Franck Petit, "Stabilization, Safety, and Security of Distributed Systems", Springer, 2010.

19IC24E	PATTERN RECOGNITION	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: apply the mathematical foundations for recognition of patterns. (K3)
CO 2: identify the pattern Recognition models. (K1,K6)
CO 3: apply the non parametric techniques and clustering techniques in pattern
      Recognition in real time applications. (K3)

UNIT I   INTRODUCTION   8

Introduction: Basics of pattern recognition – Design principles of pattern recognition system – Learning and adaptation – Pattern recognition approaches. Mathematical foundations: Linear algebra – Probability theory – Expectation – Mean and Covariance – Normal distribution – Multivariate normal densities – Chi square test of hypothesis.

UNIT II   STATISTICAL PATTERN RECOGNITION   7

Statistical Patten Recognition: Bayesian Decision Theory – Classifiers – Normal density and discriminant functions.

UNIT III   MODELS   10

Parameter estimation methods: Maximum-Likelihood estimation – Bayesian Parameter estimation – Dimension reduction methods – Principal Component Analysis (PCA) – Fisher Linear discriminant analysis – Expectation – maximization (EM) – Hidden Markov Models (HMM) – Gaussian mixture models.

UNIT IV   NON PARAMETRIC TECHNIQUES   10

Nonparametric Techniques: Density Estimation – Parzen Windows – K-Nearest Neighbor Estimation – Nearest Neighbor Rule – Fuzzy classification.

UNIT V   CLUSTERING TECHNIQUES   10

Unsupervised Learning and Clustering: Criterion functions for clustering – Clustering Techniques: Iterative square – Error partitional clustering – K-Means – agglomerative hierarchical clustering – Cluster validation.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", Second Edition, John Wiley, 2006.
2. Bishop, Christopher M., "Pattern Recognition and Machine Learning", First Edition, Springer, 2009.
3. S. Theodoridis, K. Koutroumbas, "Pattern Recognition", Fourth Edition, Academic Press, 2009.
4. Keinosuke Fukunaga, "Introduction to Statistical Pattern Recognition", Second Edition, Academic Press, 2003.
5. Sergios Thedoridis, Konstantinos Koutroumbas, "Pattern Recognition", Fourth Edition, Academic Press, 2009.

19IC25E   **NETWORK AND WIRELESS SECURITY**   **L T P C QP**
                                                                3 0 0 3 A

COURSE OUTCOMES
 Upon completion of this course, the students will be able to
   CO1: describe the fundamentals of wireless networks. (K2)
   CO2: analyze the security issues in wireless LAN and MAN. (K4)
   CO3: explain the security architecture and protocols in Bluetooth and VANET. (K2)
   CO4: describe the security vulnerabilities in wireless mesh network. (K3)
   CO5: analyze the security architecture and routing protocols for wireless sensor networks. (K4)

UNIT I   SECURE WIRELESS NETWORK   9
Overview of security issues in wireless networks - Security architecture of cellular communication networks- Security technique in GSM, 3G, LTE networks - Security issues in femto cell - Mobile devices.

UNIT II   SECURITY IN WIRELESS LAN AND WIRELESS MAN   9
Introduction to wireless LAN -current state of WLAN security- communication security- Access point security- other issues- Introduction to wireless man- Wimax- Security goals and solutions - Security vulnerabilities, Threads and counter measures.

UNIT III   SECURITY IN BLUERTOOTH AND VANET   9
Bluetooth- Introduction- primer-security solutions-security vulnerabilities, threads and counter measures- VANET- introduction - Security architecture framework- Secure communication protocol- Privacy enhancing and secure positioning.

UNIT IV   SECURITY IN WIRELESS MESH N/W AND RFID   9
Wireless mesh networks- characteristics- security vulnerabilities-defense mechanisms-security standards and products- RFID- network primer-security requirements- hardware and protocol based solutions- Advanced protocol based security- Commercial security.

UNIT V   SECURITY IN WIRELESS SENSOR NETWORKS   9
Introduction- key management- secure routing protocol- location privacy protection- Secure data aggregation- security architecture- cryptographic approach- Trust management- location privacy.

                                                        L: 45; TOTAL: 45 PERIODS

REFERENCES
   1. Lei Chen"Wireless Network Security-Theories and Applications" Springer, 2013.
   2. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.
   3. William Stallings, "Wireless Communications and networks" Pearson / Prentice Hall of India, Second Edition, 2007.
   4. Simon Haykin & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.
   5. Behrouz A. Fourcuzan, "Cryptography and Network security", Tata McGraw-Hill, 2008.

19IC26E	VULNERABILITY ASSESSMENT	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: explain the features of Vulnerability and security tools.(K2)

CO2: outline the importance of Assessment methodology and risk analysis. (K2)

CO3: gain knowledge on Vulnerability Management Tools and configuration Management. (K2)

CO4: discuss various threats, attacks and countermeasure in software elements. (K2)

CO5: explain varios risks involved in regulating Assessments and Vulnerability management methodology. (K2)

UNIT I   WINDOWS OF VULNERABILITY AND TOOLS   9

Introduction- Vulnerability Assessment- Understanding the Risks Posed by Vulnerabilities- Detecting Vulnerabilities via Security Technologies- Deciphering VA Data- Leveraging Configuration Tools to Assess Vulnerabilities- Features of vulnerability Assessment Tool- Classifying networks- Scanning networks.

UNIT II   NETWORK VULNERABILITY ASSESSMENT   9

Project Scoping-Assessing Vulnerability assessment timeline-NVAT-Prioritizing risks and threats- Assessment Methodology-Top down and Bottom Up Examination-Case study with assessment report.

UNIT III   VULNERABILITY AND CONFIGURATION MANAGEMENT   9

Vulnerability Management Plan- Six Stages of Vulnerability Management- Vulnerability Management Tools- eEye Digital Security- Symantec (BindView)- Still Secure- Open Source and Free Vulnerability Management Tools- Configuration and Patch Scanning- Patch Management- Patch Distribution and Deployment- Configuration Management.

UNIT IV   VULNERABILITY THREATS   9

Threats - attacks - Impersonation - Identification versus authentication - Biometrics counter measure - Recurring threads and Usability - Flaw in space craft software - Race condition -Time of check and time of use – Counter measure - secure software elements.

UNIT V   REGULATING ASSESSMENTS AND PEN TESTS   9

Introduction- The Payment Card Industry (PCI) Standard- The Health Insurance Portability- Drafting an Information Security Program- The Sarbanes-Oxley Act of 2002 (SOX)– HIPAA- Vulnerability Management Methodology-Categorizing, Baseline scan and penetration testing- Remediate Vulnerabilities and Risk- Vulnerability Assessment Schedule- Monitor for New Risks.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Steve Manzuik, Andre Gold, Chris Gatford,"Network Security Assessment from Vulnerability to Patch", Syngress Publishing Incorporation, 2007.
2. Thomas R. Peltier, Justin Peltier ,john A.Blackeley,"Managing A Network Vulnerability Assessment",AuerbachPublications,CRC Press,2003.
3. Charles P. Pfleeger, Shari Lawrence Pfleeger,"Analyzing Computer Security: A Threat / Vulnerability / Countermeasure Approach", First Edition, Kindle Edition, 2012.
4. Mary Lynn Garcia,"Vulnerability Assessment of Physical Protection Systems", Elsevier Butterworth-Heinemann Publisher, 2006.
5. John McDonald, Mark Down,Justin Schuh," The Art of Software Security Assessment: Identifying and Preventing Software Vulnerabilities", Pearson Education, 2007.

19IC27E	DATA AND CLOUD SECURITY	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: describe the fundamentals of cloud computing and its security. (K2)
CO2: analyze risk issues and legal aspects in cloud computing. (K3)
CO3: illustrate various data security methods in cloud computing. (K2)
CO4: explore security controls and monitoring in cloud computing. (K2)
CO5: investigate security and evaluation criteria in internal and external cloud. (K3)

UNIT I   INTRODUCTION TO CLOUD COMPUTING ARCHITECTURE AND SECURITY   9

Understanding Cloud Computing –The IT foundation for Cloud – A Brief Primer on Security – Security Architecture – Cloud Reference Architecture - Control over Security in the Cloud Model – Making sense of Cloud Deployment – Real world Cloud Usage Scenarios.

UNIT II   SECURITY CONCERNS RISK ISSUES AND LEGAL ASPECTS   9

Cloud Computing: Security Concerns -   Assessing your risk tolerance in Cloud Computing – Legal and Regulatory issues- Securing the Cloud: Architecture – Security Requirements for the Architecture - Security Patterns and Architectural elements – Cloud Security Architecture - Planning   Key Strategies for Secure Operation.

UNIT III   DATA SECURITY   9

Overview of Data Security in Cloud Computing - Data Encryption: Applications and Limits – Cloud Data Security: Sensitive Data Categorization - Cloud Data Storage.

UNIT IV   KEY STRATEGIES AND BEST PRACTICES   9

Overall Strategy: Effectively Managing Risk -   Overview of Security Controls - Limits of Security Controls - Security Monitoring.

UNIT V   SECURITY AND EVALUATION CRITERIA   9

Building an Internal Cloud - Private Clouds: Motivation and Overview - Security Criteria for Ensuring a Private Cloud – Selecting an External Cloud Provider - Evaluating Cloud Security: An Information Security Framework –Checklists for Evaluating Cloud Security.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. J.R. ("Vic") Winkler, "Securing the Cloud: Cloud Computer Security Techniques and Tactics", Syngress, 2011.
2. Greg Schulz, "Cloud and Virtual Data Storage Networking", CRC Press, 2012.
3. Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A Comprehensive Guide to Secure Cloud Computing", Wiley Publishiing, 2010.
4. Tim Mather, SubraKumaraswamy, ShahedLatif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly Media, First edition, 2009.
5. Lee Newcombe, "Securing Cloud Services", IT Governance Publishing, 2012.

19IC28E	INTERNET OF THINGS	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of the course, the student should be able to:

CO1: Describe various protocols for IoT(K2)
CO2: Develop web services to access/control IoT devices(K3)
CO3: Design a portable IoT using Rasperry Pi(K3)
CO4: Deploy an IoT application and connect to the cloud(K3)
CO5: Describe applications of IoT in real time scenario(K2)

UNIT I   INTRODUCTION TO IoT   9

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.

UNIT II   IoT ARCHITECTURE   9

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture.

UNIT III   IoT PROTOCOLS   9

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security.

UNIT IV   BUILDING IoT WITH RASPBERRY PI & ARDUINO   9

Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

UNIT V   CASE STUDIES AND REAL-WORLD APPLICATIONS   9

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

L: 45; TOTAL :45 PERIODS

REFERENCES

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
3. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
4. Jan Ho¨ ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of intelligence", Elsevier, 2014.
5. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

19IC29E	MOBILE APPLICATION DEVELOPMENT	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: Explore the differences between mobile based application and conventional application (K2)

CO2: Design UI in the context of mobile application(k2)

CO3: Develop mobile applications for Android(k2)

CO4: Write Android application involving integration of sensors, connectivity to database, etc.(k2)

CO5: Write simple App for IOS, blackberry and Windows phone (k2)

UNIT I   INTRODUCTION   8

Brief History of Mobile Software Development - Mobile Web Vs. Mobile App - Hardware and Software for different Mobile frameworks - Difference between Mobile and Desktop applications.

UNIT II   USER INTERFACE DESIGN   9

Mobile Application users - Basic Design principles - Mobile Information Design - Mobile Platforms: Android, IOS, BlackberryOS, WindowsPhone.

UNIT III   APPLICATION DEVELOPMENT FOR ANDROID-I   10

Android Platform - Different SDKs and their growth - Android Architecture - Android Development Environment Setup - Anatomy of Android Application - Views & Layouts - List View - Adapters - HTTP Connection initiation.

UNIT IV   APPLICATION DEVELOPMENT FOR ANDROID-II   10

Database Integration - Android Preferences - Broadcast Receivers - Content providers - Usage of different sensors – Services - intent filters.

UNIT V   OTHER MOBILE FRAMEWORKS   8

IOS - Objective C Basics - a simple App in IOS - Windows Phone basics - Simple Application in Windows Phone - Blackberry basics - Simple Application in Blackberry - Introduction to Cross-platform Mobile Application development.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox,2012
2. Joseph Annuzzi, Jr.,LaurenDarcey, Shane Conder "Introduction to Android™ Application Development, Addision-Wesley, Fourth Edition, 2014
3. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012
4. Professional Cross-Platform Mobile Development in C#, By Scott Olson, John Hunter, Ben Horgen, Kenny Goers, wrox, 2012
5. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, "Programming Android", O"Reilly, 2011.
6. Reto Meier, Wrox Wiley, "Professional Android 2 Application Development", 2010.
7. Alasdair Allan, "iPhone Programming", O"Reilly, 2010.
8. Wei-Meng Lee, "Beginning iPhone SDK Programming with Objective-C", Wrox Wiley, 2010.

19IC30E   **INFORMATION SECURITY AND CRYPTOGRAPHY**   **L T P C QP**
                                                                  3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: define key terms and critical concepts of information security. (K2)

CO2: explain risk management and professional issues in Information security (K2)

CO3: describe the various security technologies and security tools. (K2)

CO4: explain the basic principles of cryptography and algorithms. (K2)

CO5: describe technical strategies and models for implementing a project plan. (K2)

UNIT I   NEEDS FOR SECURITY   9

Information Security: Introduction- Components of Information System - Approaches to Information Security Implementation - The Security Systems Development Life Cycle-Security professionals and organization –Needs for Security: Threats, Attacks, Secure Software development.

UNIT II   PROFESSIONAL ISSUES IN INFORMATION SECURITY & RISK MANAGEMENT   9

Law & Ethics in Information Security - Risk Management: Risk Identification-Risk Assessment-Risk Control Strategies- Planning for security: Information Security planning and Governance-Information Security Policy, Standards, and Practices.

UNIT III   SECURITY TECHNOLOGIES   9

Security Technologies: Firewall and VPNs – Intrusion Detection -Prevention systems – Security tools.

UNIT IV   CRYPTOGRAPHY   9

Cryptology Terminology - Cipher methods – Cryptographic Algorithms – Cryptographic tools – Protocol for secure communications - Attacks on cryptosystems - Physical Security.

UNIT V   IMPLEMENTATION OF INFORMATION SECURITY   9

Implementing Information Security: Information Security Project Management – Technical and Non-Technical Aspects of Implementation - Security Certification and Accreditation - Security and personnel: Credentials of Information Security Professionals – Employment Policy and Practices.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Michael E. Whitman, Herbert J. Mattord, "Principles of Information Security", Fourth Edition, Cengage Learning, 2012.
2. William Stallings, "Cryptography and Network Security", Fourth Edition, Pearson Education, 2011.
3. ForouzanMukhopadhyay, "Cryptography and Network Security", Fourth Edition, McGraw Hill, 2010
4. C K Shyamala, N Harini, Dr T R Padmanabhan, "Cryptography and Network Security", First Edition, Wiley, India
5. Bernard Menezes, "Network Security and Cryptography", First Edition, Cengage Learning, 2010.

19IC31E   **VULNERABILITY ASSESSMENT LABORATORY**   **L T P C**
                                                                                             0 0 4 2

COURSE OUTCOMES
Upon completion of this course, the students will be able to
   CO1: investigate the various forensics in the detection of crime in disk, network and device.
      (K2)
   CO2: identify and analyses the stages an ethical hacker requires to take in order to
      compromise a target system. (K2)
   CO3: critically evaluate security techniques used to protect system and user data in windows
      and web based forum. (K3)

LIST OF EXPERIMENTS
   1. Disk Forensics, Network Forensics, Device Forensics
   2. Web Based Email Attacks & Security
   3. Windows OS Hacking
   4. Malwares Working and Detection
   5. Networking Attacks and Security
   6. Web Server Attacks and Security
   7. VOIP and Mobile hacking
   8. Penetration Testing and justification of penetration testing through risk analysis

SUGGESTED SOFTWARE TOOLS/UTILITIES:
   - CyberCheck 4.0 - Academic Version
   - CyberCheckSuite
   - MobileCheck
   - Network Session Analyser
   - Win-LiFT
   - TrueImager
   - TrueTraveller
   - PhotoExaminerVer 1.1
   - CDRAnalyzer

P: 60; TOTAL: 60 PERIODS

19IC32E   MOBILE APPLICATION DEVELOPMENT LABORATORY   L T P C
                                                                                                                       0 0 4 2

COURSE OUTCOMES
Upon completion of this course, the students will be able to
        CO1: Design and develop mobile applications for Android and IOS. (K2)

LIST OF EXERCISES
  1. Develop Android Programs using Layout
  2. Android Programs using views
  3. Develop Android Programs with intent filters, broadcast receivers
  4. Develop Android Programs with data integration
  5. Develop an Android App for multimedia applications
  6. Develop an android App for Email and SMS applications
  7. Simple applications in IOS, Windows and cross platforms

P: 60; TOTAL: 60 PERIODS

19GD01E	BUSINESS ANALYTICS	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO1: Understand the importance of business analytics in an organization and understand relationships between business analytics process and organization decision making process. (K1)

CO2: Study the data analytics process and issues   (K2)

CO3: Study the descriptive analytics and predictive analytics for business data (K2)

CO4: Use decision-making models for formulation of decision theory. (K2)

UNIT I   BUSINESS ANALYTICS   9

Overview of Business analytics- Scope of Business Analytics- Business Analytics Process-Relationship of Business Analytics Process and organization- competitive advantages of Business Analytics. Statistical Tools: Statistical Notation- Descriptive Statistical methods-Review of probability distribution and data modeling- Statistical Testing.

UNIT II   DATA ANALYTICS PROCESS AND ISSUES   9

Organization/sources of data, Importance of data quality, Dealing with missing or incomplete data Data Mining Process Introduction to Data Mining, Data Classification: Decision trees, Association Analysis: Market Basket Analysis – Data mining tools.

UNIT III   DESCRIPTIVE ANALYTICS   9

Introduction, Visualizing and Exploring business data, Descriptive Statistics, Sampling and Estimation: Sampling Methods, Sampling Estimation, Introduction to Probability Distributions, Marketing/Planning Case Study on Descriptive Analytics model.

UNIT IV   PREDICTIVE ANALYTICS   9

Introduction, Predictive Modeling: Logic-Driven Models, Data-Driven Models, Data mining for Types of Variation in Time Series Data, Regression Model, Smoothing, Fitting models to Data, Marketing/Planning Case Study on Predictive Analytics model.

UNIT V   DECISION THEORY   9

Introduction, Decision Theory Model Elements for business process, Types of Decision Environments, Decision Theory Formulation, Decision-Making Under Certainty, Decision-Making Under Risk, Decision-Making under Uncertainty, Expected Value of Perfect Information, Sequential Decisions and Decision Trees, The Value of Imperfect Information: Bayes's Theorem, Decision Theory Practice Problems.

L: 45; TOTAL: 45 PERIODS

REFERENCES

1. Marc J. Schniederjans, Dara G.Schniederjans, Christopher M. Starkey, Business analytics Principles, Concepts, and Applications, Pearson FT Press, 1st Edition, 2014.
2. James R Evans, "Business Analytics", Pearson Education, 2nd Edition, 2017

19GD02E	INDUSTRIAL SAFETY	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

CO 1: list out important legislations related to health, Safety and Environment. (K1)

CO 2: list out requirements mentioned in factories act for the prevention of accidents. (K1)

CO 3: understand the health and welfare provisions given in factories act. (K2)

CO 4: understand the statutory requirements for an Industry on registration, license and its renewal. (K2)

CO 5: prepare onsite and offsite emergency plan. (K2)

UNIT I   INTRODUCTION   9

Industrial safety: Accident-causes- types- results and control- mechanical and electrical Hazards-types-causes and preventive steps/procedure- describe salient points of factories act 1948 for health and safety- wash rooms- drinking water layouts- light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes- Fire prevention and firefighting-equipment and methods.

UNIT II   FIRE HAZARDS AND PREVENTION   9

Sources of ignition – fire triangle – principles of fire extinguishing – active and passive fire protection systems – various classes of fires – A, B, C, D, E – types of fire extinguishers – fire stoppers –hydrant pipes – hoses – monitors – fire watchers – lay out of stand pipes – fire station-fire alarms and sirens – maintenance of fire trucks – foam generators – escape from fire rescue operations – fire drills– notice-first aid for burns. Sprinkler-hydrants-stand pipes – special fire suppression systems like deluge and emulsifier, selection criteria of the above installations, reliability, maintenance, evaluation and standards – alarm and detection systems. Other suppression systems – CO2 system, foam system, dry chemical powder(DCP) system, halon system – need for halon replacement – smoke venting. Portable extinguishers –flammable liquids – tank farms – indices of inflammability-fire fighting systems.

UNIT III   BIOLOGICAL AND ERGONOMICAL HAZARDS   9

Classification of Biohazardous agents – examples, bacterial agents, rickettsial and chlamydial agents, viral agents, fungal, parasitic agents, infectious diseases - Biohazard control program, employee health program-laboratory safety program-animal care and handling-biological safety cabinets - building design. Work Related Musculoskeletal Disorders –carpal tunnel syndrome CTS- Tendon pain-disorders of the neck- back injuries..

UNIT IV   CHEMICAL HAZARDS AND PREVENTION   9

Recognition of chemical hazards-dust, fumes, mist, vapour, fog, gases, types, concentration, Exposure vs. dose, TLV - Methods of Evaluation, process or operation description, Field Survey, Sampling methodology, Industrial Hygiene calculations, Comparison with OSHAS Standard. Air Sampling instruments, Types, Measurement Procedures, Instruments Procedures, Gas and Vapour monitors, dust sample collection devices, personal sampling Methods of Control - Engineering Control, Design maintenance considerations, design specifications - General Control Methods - training and education

UNIT V   INDUSTRIAL ACTS   9

Statutory authorities – inspecting staff, health, safety, provisions relating to hazardous processes,welfare, working hours, employment of young persons – special provisions – penalties and procedures-Tamilnadu Factories Rules 1950 under Safety and health chapters of Factories Act 1948 , Occupational Safety and Health act of USA (The Williames - Steiger Act of 1970) –

Health and safety work act (HASAWA 1974, UK) – OSHAS 18000 – ISO 14000 – American National Standards Institute (ANSI).

L: 45; TOTAL: 45 PERIODS

REFERENCES
1. Practical Industrial Safety, Risk Assessment and Shutdown Systems, 1st Edition, Dave Macdonald, Elsevier publications, 2003
2. Occupational Ergonomics: Practical Approach, Theresa Stack, Lee T.Ostrom, Cheryl A. Wilhelmsen, Wiley Publications, 2016
3. The Handbook of Safety Engineering: Principles and Applications, Frank R. Spellman and Nancy E. Whiting, Government Institutes, 2009
4. Benjamin O.Alli, "Fundamental Principles of Occupational Health and Safety", ILO Geneva, 2nd Edition, 2008.
5. Danuta Koradecka, Handbook of Occupational Health and Safety, CRC, 2010.
6. National seminar on hazardous waste management organized by National Safety council, Ministry of environment and forests, Government of India, United States – Asia environmental partnership, Tamilnadu pollution control board and Indian chemical manufacturers association, April 2001.

19GD03E   **OPERATIONS RESEARCH**   **L T P C QP**
                                                                3 0 0 3 A

COURSE OUTCOMES
Upon completion of this course, the students will be able to
   CO1: apply the dynamic programming to solve problems of discrete and continuous variables. (K2)
   CO2: apply the concept of non-linear programming. (K2)
   CO3: carry out sensitivity analysis.(K2)
   CO4: model the real world problem and simulate it. (K2)

UNIT I   INTRODUCTION   9
Optimization Techniques- Model Formulation- models, General L.R Formulation- Simplex Technique-Sensitivity Analysis

UNIT II   LINEAR PROGRAMMING   9
Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming-Transportation and Assignment problems

UNIT III   NONLINEAR PROGRAMMING PROBLEM   9
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT.

UNIT IV   SCHEDULING AND INVENTORY CONTROL MODELS   9
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT V   FINITE AND INFINITE QUEUING MODELS   9
Finite Queuing Models: Introduction, Finite Queuing Models, nfinite Queuing Models: Introduction, Queuing Theory, Operating Characteristics of a Queuing System, Constituents of a Queuing System, Service Facility, Queue Discipline

L: 45; TOTAL: 45 PERIODS

REFERENCES
 1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
 2. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
 3. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
 4. Pannerselvam, Operations Research: Prentice Hall of India 2010
 5. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

19GD04E   COST MANAGEMENT OF ENGINEERING PROJECTS   L T P C QP
                                                           3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

   CO 1: Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.   (K1)

   CO2: Students should able to apply the concept of non-linear programming Students should able to carry out sensitivity analysis. (K2)

   CO 3: Student should able to model the real world problem and simulate (K2)

UNIT 1   9

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

UNIT II   9

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project

UNIT III   9

Execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities.Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts.Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

UNIT IV   9

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems.Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector.Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints.Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis.Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets.Measurement of Divisional profitability pricing decisions including transfer pricing.

UNIT V   9

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory

L: 45;TOTAL: 45 PERIODS

REFERENCES

   1. Charles T. Horngren, Srikant M. Datar, "Cost Accounting A Managerial Emphasis", Prentice Hall of India, 14thEdition,New Delhi. 2011
   2. Charles T. Horngren and George Foster,"Advanced Management Accounting". Pearson Education India; 16thEdition,2013.
   3. Ashish K. Bhattacharya, "Principles & Practices of Cost Accounting" A. H. Wheeler publisher,Delhi
   4. N.D. Vohra," Quantitative Techniques in Management", Tata McGraw Hill Book Co. Ltd.

19GD05E   **COMPOSITE MATERIALS**   **L T P C QP**
                                                                          3 0 0 3 A

COURSE OUTCOMES

Upon completion of this course, the students will be able to

   CO 1: Identify, describe and evaluate the properties of fibre reinforcements polymer matrix materials and commercial composites. (K1)

   CO 2: Develop competency in one or more common composite manufacturing techniques, and be able to select the appropriate technique for manufacture of fibre-reinforced composite products.(K1)

   CO 3: Analyse the elastic properties and simulate the mechanical performance of composite laminates; and understand and predict the failure behaviour of fibre-reinforced composite products. (K2)

   CO 4: Apply knowledge of composite mechanical performance and manufacturing methods to a composites design project. (K2)

UNIT I   INTRODUCTION   9

Definition – Classification and characteristics of Composite materials. Advantages and application of composites- Types of reinforcements and matrices-Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT II   REINFORCEMENTS   9

Preparation-layup, curing- properties and applications of glass fibers-carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures-Inverse rule of mixtures-Isostrain and Isostress conditions.

UNIT III   MANUFACTURING OF METAL MATRIX COMPOSITES   9

Casting – Solid State diffusion technique,Cladding – Hot isostatic pressing. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT IV   MANUFACTURING OF POLYMER MATRIX COMPOSITES   9

Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT V   DESIGN AND ANALYSIS OF COMPOSITE MATERIALS   9

Strength: Laminar Failure Criteria-strength ratio- maximum stress criteria-maximum strain criteria-interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength;Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots;stress concentrations.

                                                        L: 45; TOTAL: 45 PERIODS

REFERENCES

   1. Mechanics of Composite Materials, Autor K Kaw,Taylor & Francis, 2nd Edition, 2006
   2. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany,1993
   3. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

19GD06E	WASTE TO ENERGY	L T P C QP
		3 0 0 3 A

COURSE OUTCOMES
Upon completion of this course, the students will be able to

CO1: analyze the various aspects of Waste to Energy Management Systems (K2)
CO2: understand biochemical conversion of biomass for energy application, bioenergy systems and process integration.(K2)
CO3: understand the management of e-waste (K2)

UNIT I   INTRODUCTION TO WASTE AND WASTE PROCESSING   9
Solid waste sources solid waste sources, types, composition, properties, global warming; Municipal solid waste: Physical, chemical and biological properties, waste collection and, transfer stations, waste minimization and recycling of municipal waste, segregation of waste, size reduction, managing waste, status of technologies for generation of energy from waste treatment and disposal aerobic composting, incineration, furnace type and design, medical waste / pharmaceutical waste treatment technologies, incineration, environmental impacts, measures to mitigate environmental effects due to incineration

UNIT II   WASTE TRATMENT AND DISPOSAL   9
Land fill method of solid waste disposal land fill classification, types, methods and sitting consideration, Layout and preliminary design of landfills: Composition, characteristics, generation, movement and control of landfill leach ate and gases, environmental monitoring system for land fill gases.

UNIT III   BIO-CHEMICAL CONVERSION   9
Energy generation from waste bio-chemical conversion: Sources of energy generation, anaerobic digestion of sewage and municipal waste, direct combustion of MSW-refuse derived solid fuel. Industrial waste, agro residues and anaerobic digestion.

UNIT IV   THERMO-CHEMICAL CONVERSION   9
Biogas production, land fill gas generation and utilization, thermo-chemical conversion: Sources of energy generation, gasification of waste using gasifies briquetting, utilization and advantages of briquetting, environmental benefits of bio-chemical and thermo- chemical conversion.

UNIT V   E- WASTE MANAGEMENT   9
E-waste: E-waste in the global context: Growth of electrical and electronics industry in India, environmental concerns and health hazards; Recycling e-waste: A thriving economy of the unorganized sector, global trade in hazardous waste, impact of hazardous e-waste in India; Management of e-waste: E-waste legislation, government regulations on e-waste management, international experience, need for stringent health safeguards and environmental protection laws of India.

L: 45; TOTAL: 45 PERIODS

REFERENCES
1. Nicholas P Cheremisinoff, "Handbook of Solid Waste Management and Waste Minimization Technologies", An Imprint of Elsevier, New Delhi, 2003.
2. Paul Breeze, "Energy from Waste", An Imprint of Elsevier, New Delhi, 2018.
3. P Aarne Vesilind, William A Worrell and Debra R Reinhart, "Solid Waste Engineering", 2nd Edition 2002.
4. C Parker and T Roberts (Ed), "Energy from Waste", An Evaluation of Conversion Technologies, Elsevier Applied Science, London, 1985.

5. KL Shah, "Basics of Solid and Hazardous Waste Management Technology", Prentice Hall, Reprint Edition, 2000.
6. M Datta, "Waste Disposal in Engineered Landfills", Narosa Publishing House, 1997.

M.Tech. – INFORMATION AND CYBER WARFARE
AUDIT COURSES

19AC01E	ENGLISH FOR RESEARCH PAPER WRITING	L T P C QP
		2 0 0 0 D

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO1: Understand that how to improve your writing skills and level of readability (K2)

CO2: Learn about what to write in each section (K1)

CO3: Understand the skills needed when writing a title and ensure the good quality of paper at very first-time submission (K2)

UNIT I **5**

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

UNIT II **5**

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT III **5**

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT IV **5**

Key skills are needed when writing a Title; key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

UNIT V **5**

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

UNIT VI **5**

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

L: 30; TOTAL:30 PERIODS

REFERENCES

1. Using English for Academic Purposes. A guide for students in higher education, comprises a large collection of links, including writing materials: http://www.uefap.com/.
2. British Association of Lecturers in English for Academic Purposes: http://www.baleap.org.uk/.
3. Goldbort R, Writing for Science, Yale University Press, 2006
4. Day R How to Write and Publish a Scientific Paper, Cambridge University Press, 2011
5. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook, 1998.
6. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht

19AC02E   **DISASTER MANAGEMENT**   **L T P C QP**

2 0 0 0 D

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO1: Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and manitarian response.(K2)

CO2: Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives. (K2)

CO3: Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations. (K2)

CO4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in (K2)

UNIT I   INTRODUCTION   4

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

UNIT II   REPERCUSSIONS OF DISASTERS AND HAZARDS   6

Economic Damage: Loss Of Human And Animal Life, Destruction Of Ecosystem-Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods ,Droughts and Famines, Landslides and Avalanches- Man-made disaster- Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III   DISASTER PRONE AREAS IN INDIA   6

Study Of Seismic Zones: Areas Prone To Floods And Droughts-Landslides and Avalanches-Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami- Post-Disaster Diseases and Epidemics.

UNIT IV   DISASTER PREPAREDNESS AND MANAGEMENT   6

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard-Evaluation Of Risk- Application Of Remote Sensing- Data from Meteorological and other Aaencies-Media Reports-Governmental and Community Preparedness**.**

UNIT V   RISK ASSESSMENT AND DISASTER MITIGATION   8

Disaster Risk: Concept and Elements- Disaster Risk Reduction- Global and National Disaster Risk Situation-Techniques of Risk Assessment-Global Co-Operation In Risk Assessment and Warning, People's Participation In Risk Assessment- Strategies for Survival**.**

Meaning: Concept And Strategies Of Disaster Mitigation-Emerging Trends In Mitigation-Structural Mitigation and Non-Structural Mitigation-Programs of Disaster Mitigation In India.

L: 30; TOTAL: 30 PERIODS

REFERENCES

1. Singhal J.P. "Disaster Management", Laxmi Publications, ISBN-10: 9380386427 ISBN-13: 978-9380386423, 2010.
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., ISBN-10: 1259007367, ISBN-13: 978-125900736, 2012.
3. Gupta Anil K, Sreeja S. Nair, "Environmental Knowledge for Disaster Risk Management", NIDM, New Delhi, 2011.

4. Kapur Anu, "Vulnerable India: A Geographical Study of Disasters", IIAS and Sage Publishers, New Delhi, 2010.

5. National Disaster Management Plan, 2018, https://ndma.gov.in/images/pdf/NDMP-2018-Revised-Draft-1-2018OCT16-A.pdf

6. National Disaster Management Authority, Government of India, 2018, https://ndma.gov.in/images/pdf/Draft-Guidelines-thunderstorm-final.pdf

19AC03E	SANSKRIT FOR TECHNICAL KNOWLEDGE	L T P C QP
		2 0 0 0 D

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO1: Learn the Sanskrit sources of technical knowledge (K1)
CO2: Drawing their attention to a different dimension of Sanskrit literary tradition (K3)
CO3: Create awareness of the contemporary relevance of the Sanskrit sources of traditional wisdom (K3)

UNIT I   INTRODUCTION   7

Scope and meaning of study of technical literature in Sanskrit. Different disciplines-interdisciplinary approach-dimensions-contemporary relevance- important works in this direction-scientific methodology in ancient India.

UNIT II   AYURVEDA   7

Beginnings of Ayurveda in Atharvaveda-Ayurvedic literature-basic principles of Ayurveda-Pancabhutasiddhanta-Tridosasiddhanta-eight anga-s of Ayurveda- Rasacikitsa-contribution of Kerala to Ayurveda

UNIT III   ASTRONOMY AND MATHEMATICS   8

Major texts in Vedic and classical period-Vedangajyotisa-Sulbasutra-s-Aryabhatiya- Aryabhata's contribution-Varahamihira-Brahmagupta-Lalla-etc. Suryasiddhanta- Kerala school Parahita and drk systems-Later astronomical works commentaries.

UNIT IV   VASTUSASTRA AND ARTHASASTRA   8

Principles of Vastusastra-Basic texts-Vastuvidya and Ecology-Iconography and sculpture-Kerala tradition of Vastusastra. Arthasastra, a historical and sociaological perspective-structure and contents of the text-emphasis to aspects of agriculture and architecture.

L: 30; TOTAL: 30 PERIODS

REFERENCES

1. Ramakrishna Mission Institute ,"Cultural Heritage of India", (Vol. i and iii), Calcutta,2010
2. Dr. P. C. Muraleemadhavan and Dr. N. K.Sundareswaran," Sanskrit in Technological Age, (Ed.) ", New Bharatiya Book Corporation, Delhi, 2006
3. https://sanskritdocuments.org/articles/ScienceTechSanskritAncientIndiaMGPrasad.pdf
4. http://www.vedanta.gr/wp-content/uploads/2012/03/3_GlossaryOfCommonSanskrit Terms.pdf

19AC04E   **VALUE EDUCATION**   **L T P C QP**
                                                             2 0 0 0 D

COURSE OUTCOMES
Upon completion of this course, the student will be able to
  CO1: Understand the need of values and its classification in contemporary society (K2)
  CO2: Become aware of role of education in building value as dynamic social reality. (K1)
  CO3: Know the importance of value education towards personal, national and global development. (K1)

UNIT I   **10**
Values and self-development –Social values and individual attitudes- Work ethics- Indian vision of humanism-Moral and non- moral valuation- Standards and principles-Value judgements.
Importance of cultivation of values-Sense of duty- Devotion- Self-reliance- Confidence-Concentration -Truthfulness-Cleanliness- Honesty- Humanity- Power of faith- National Unity-Patriotism-Love for nature- Discipline.

UNIT II   **10**
Personality and Behavior Development - Soul and Scientific attitude- Positive Thinking -Integrity and discipline-Punctuality- Love and Kindness-Avoid fault Thinking-Free from anger- Dignity of labour-Universal brotherhood and religious tolerance-True friendship-Happiness Vs suffering- love for truth-Aware of self-destructive habits-Association and Cooperation- Doing best for saving nature.

UNIT III   **10**
Character and Competence –Holy books vs Blind faith- Self management and Good health-Science of reincarnation- Equality- Nonviolence- Humility-Role of Women- All religions and same message-Mind your Mind-Self-control-Honesty- Studying effectively.

L: 30; TOTAL: 30 PERIODS

REFERENCES
  1. Sharma, S.P., "Moral and Value Education: Principles and Practices", Kanishka publishers, 2013.
  2. Kiruba Charles & V.Arul Selvi.," Value Education", Neelkamal Publications, New Delhi, 2012.
  3. Passi, B.K. and Singh, P.,"Value Education", National Psychological Corporation, Agra. 2004.
  4. http://cbseportal.com/exam/e-books/download-free-ncert-e-book-education-for-values-in-school-a-framework/
  5. http://cbseacademic.in/web_material/ValueEdu/Value%20Education%20Kits.pdf

19AC05E	CONSTITUTION OF INDIA	L T P C QP
		2 0 0 0 D

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO1: understand the premises informing the twin themes of liberty and freedom from a civil rights perspective. (K2)

CO2: address the growth of Indian opinion regarding modern Indian intellectuals constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism. (K2)

CO3: address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution. (K1)

UNIT I   HISTORY AND PHILOSOPHY OF INDIAN CONSTITUTION   6

History-Drafting Committee, (Composition & Working). - Preamble- Salient Features.

UNITII   CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES   6

Fundamental Rights - Right to Equality-Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy- Fundamental Duties.

UNIT III   ORGANS OF GOVERNANCE   6

Parliament- Composition-Qualifications and Disqualifications- Powers and Functions- Executive- President-Governor-Council of Ministers- Judiciary- Appointment and Transfer of Judges- Qualifications-Powers and Functions**.**

UNIT IV   LOCAL ADMINISTRATION   6

District's Administration head: Role and Importance- Municipalities: Introduction, Mayor and role of Elected Representative-CEO of Municipal Corporation-Pachayati raj: Introduction, PRI:ZilaPachayat- Elected officials and their roles,-CEO ZilaPachayat: Position and role- Block level: Organizational Hierarchy (Different departments)-Village level: Role of Elected and Appointed officials- Importance of grass root democracy.

UNIT V   ELECTION COMMISSION   6

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

L: 30; TOTAL: 30 PERIODS

REFERENCES

1. Subhash .C, kashyap "Our Constitution", 5th Edition, 2017
2. www.ieagreements.org/IEA-Grad-Attr-Prof-Competencies.pdf
3. The Constitution of India, 1950 (Bare Act), Government Publication.
4. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
5. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
6. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

19AC06E	PEDAGOGY STUDIES	L T P C QP
		2 0 0 0 D

COURSE OUTCOMES
Upon completion of this course, the student will be able to

CO1: Describe the pedagogical practices used by teachers in formal and informal classrooms (K3)

CO2: Understand the effectiveness of these pedagogical practices, in what conditions, and with what population of learners (K2)

CO3: Analyze how teacher education (curriculum and practicum) and the school curriculum with guidance materials support effective pedagogy (K3)

UNIT I   INTRODUCTION AND METHODOLOGY   8
Aims and rationale, Policy background, Conceptual framework and terminology-Theories of learning, Curriculum, Teacher education.Conceptual framework, Research questions. Overview of methodology and Searching. Thematic overview- Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries- Curriculum- Teacher education.

UNIT II   EFFECTIVENESS OF PEDAGOGICAL PRACTICES   8
Evidence on the effectiveness of pedagogical practices-Methodology for the in depth stage: quality assessment of included studies- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy- Theory of change- Strength and nature of the body of evidence for effective pedagogical Practices- Pedagogic theory and pedagogical approaches- Teachers attitudes and beliefs and Pedagogic strategies.

UNIT III   PROFESSIONAL DEVELOPMENT   7
Alignment with classroom practices and follow-up support- Peer support-Support from the head teacher and the community-Curriculum and assessment-Barriers to learning: limited resources and large class sizes.

UNIT IV   RESEARCH GAPS AND FUTURE DIRECTIONS   7
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

L: 30; TOTAL:30 PERIODS

REFERENCES
1. Dr.S.K.Bhatia and Dr.Sonia Jindal, "A Text Book Of Curriculum, Pedagogy And Evaluation",Paragon International Publications, 2016.
2. Ackers J, Hardman F Classroom interaction in Kenyan primary schools, Compare, 31 (2):245-261, 2001.
3. Agrawal M ,"Curricular reform in schools: The importance of evaluation", Journal of Curriculum Studies, 36 (3): 361-379,2004.
4. Akyeampong K ," Teacher training in Ghana - does it count?", Multi-site teacher education research project (MUSTER) country report 1. London: DFID,2003.
5. Akyeampong K, Lussier K, Pryor J, Westbrook J ," Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count?", International Journal Educational Development, 33 (3): 272–282,2013.
6. Alexander RJ,"Culture and pedagogy: International comparisons in primary education",Oxford and Boston: Blackwell,2001.
7. Chavan M, "Read India: A mass scale, rapid, 'learning to read'", campaign, 2003.
8. www.pratham.org/images/resource%20working%20paper%202.pdf.

19AC07E   STRESS MANAGEMENT BY YOGA   L T P C QP
2 0 0 0 D

COURSE OUTCOMES
Upon completion of this course, the student will be able to
CO1: achieve overall health of body and mind (K1)
CO2: overcome stress (K2)

UNIT I   INTRODUCTION   10
Introduction to Stress-Concept of Stress-Solutions through Mandukya karika - Relaxation and stimulation combined as the core for stress management-Practice of Stimulation and relaxation.

UNIT II   ASAN AND PRANAYAM   10
Definitions of Eight parts of yoga. (Ashtanga)-Various yoga poses and their benefits for mind & body-Regularization of breathing techniques and its effects-Types of pranayam.

UNIT III   YOGA AND STRESS MANAGEMENT   10
Concepts and Techniques of Stress Management in Ashtanga Yoga of Patanjali - specific practices for stress management-breathe awareness.

L: 30; TOTAL:30 PERIODS

REFERENCES
1. Swami Vivekananda, Advaita Ashrama ,"Rajayoga or conquering the Internal Nature", 2016.
2. K.N.Udupa**, "**Stress and Its Management by Yoga", Edited by R.C.Prasad, Motilal Banarashidass Publishers, Delhi, 2010.
3. Lisa Shea,"Yoga for Stress Relief and Forgiveness", Kindle Edition, 2015.
4. BKS Iyengar, "Yoga: The path to Holstic Health", DK Publication, 2019
5. https://www.longdom.org/open-access/stress-and-yoga-2157-7595.1000109.pdf

19AC08E	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L T P C QP
		2 0 0 0 D

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO1: learn to achieve the highest goal happily (K1)
CO2: become a person with stable mind, pleasing personality and determination (K1)
CO3: awaken wisdom in students (K1)

UNIT I   INTRODUCTION TO PERSONALITY DEVELOPMENT   10

The concept of personality - Dimensions of personality – Theories of Freud & Erickson-Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure-SWOT analysis.

UNIT II   LIFE ENLIGHTENMENT SKILLS   10

Neetisatakam-Holistic development of personality, Verses 19,20,21,22 (wisdom), Verses 29,31,32 (pride & heroism), Verses 26,28,63,65 (virtue), Verses 52,53,59 (dont's), Verses 71,73,75,78 (do's).Approach to day to day work and duties, Shrimad Bhagwad Geeta, Chapter 2-Verses 41, 47,48, Chapter 3 Verses 13, 21, 27, 35, Chapter 6 Verses 5,13,17, 23, 35, Chapter 18 Verses 45, 46, 48.

UNIT III   SHRIMAD BHAGWAD GEETA STATEMENTS   10

Statements of basic knowledge, Shrimad Bhagwad Geeta: Chapter2 Verses 56, 62, 68, Chapter 12 Verses 13, 14, 15, 16,17, 18, Personality of Role model. Shrimad Bhagwad Geeta, Chapter2 Verses 17, Chapter3 Verses 36,37,42, Chapter4 Verses 18, 38,39, Chapter18 Verses 37,38,63

L:30; TOTAL:30 PERIODS

REFERENCES

1. Swami Swarupananda Advaita Ashram ,"Srimad Bhagavad Gita" , Publication Department, Kolkata.
2. P.Gopinath, Rashtriya Sanskrit Sansthanam, " Bhartrihari's Three Satakam (Niti-sringar-vairagya) ", New Delhi.