

**DEPARTMENT OF CSE (CYBER SECURITY) (R21 B. Tech CSC)**

**III YEAR I SEMESTER**

| S. No.               | Course Code              | Course Title                              | Category | L         | T        | P        | Credits   |
|----------------------|--------------------------|---|----------|-----------|----------|----------|-----------|
| 1                    | 21CY3111                 | Cyber Security                            | PC       | 3         | 1        | -        | 4         |
| 2                    | 21CY3112                 | Cryptography and Network Security         | PC       | 3         | -        | -        | 3         |
| 3                    | 21CY3113                 | Formal Languages and Automata Theory      | PC       | 3         | -        | -        | 3         |
| 4                    | 21CY3171                 | Compiler Design                           | PE-1     | 3         | -        | -        | 3         |
|                      | 21BU3172                 | Artificial Intelligence                   |          |           |          |          |           |
|                      | 21CY3173                 | Design and Analysis of Algorithms         |          |           |          |          |           |
|                      | 21CY3174                 | Cloud Computing                           |          |           |          |          |           |
| 5                    | <b>Open Elective - I</b> |   | OE       | 3         | -        | -        | 3         |
| 6                    | 21CY3151                 | Cryptography and Network Security Lab     | PC       | -         | -        | 3        | 1.5       |
| 7                    | 21CY3152                 | Cyber Security Lab                        | PC       | -         | -        | 3        | 1.5       |
| 8                    | 21HS3153                 | Advanced English Communication Skills Lab | HS       | -         | -        | 2        | 1         |
| 9                    | 21CY3181                 | Summer Internship                         | PW       | -         | -        | -        | 1         |
| 10                   | 21MC0006                 | Aptitude & Logical Reasoning              | BS       | 3         | -        | -        | 0         |
| <b>Total Credits</b> |                          |   |          | <b>18</b> | <b>1</b> | <b>8</b> | <b>21</b> |

**\*Note: Summer Internship to be carried out during summer break after II yr II semester**

**III YEAR II SEMESTER**

| S. No.               | Course Code               | Course Title  | Category | L         | T        | P         | Credits   |
|----------------------|---------------------------|---|----------|-----------|----------|-----------|-----------|
| 1                    | 21CY3211                  | Ethical Hacking   | PC       | 3         | 1        | -         | 4         |
| 2                    | 21CY3212                  | Cyber Crime Investigation & Digital Forensics           | PC       | 3         | 1        | -         | 4         |
| 3                    | 21CS3213                  | Machine Learning  | PC       | 3         | -        | -         | 3         |
| 4                    | 21CY3271                  | Mobile Application Security                             | PE-II    | 3         | -        | -         | 3         |
|                      | 21CY3272                  | Cyber Security Tools, Techniques & Counter Measurements |          |           |          |           |           |
|                      | 21DS3272                  | DevOps  |          |           |          |           |           |
|                      | 21BU3274                  | Mobile Application Development                          |          |           |          |           |           |
| 5                    | <b>Open Elective - II</b> |   | OE       | 3         | -        | -         | 3         |
| 6                    | 21CY3251                  | Ethical Hacking Lab                                     | PC       | -         | -        | 3         | 1.5       |
| 7                    | 21CY3252                  | Cyber Crime Investigation & Digital Forensics Lab       | PC       | -         | -        | 3         | 1.5       |
| 8                    | 21CS3253                  | Machine Learning Lab                                    | PC       | -         | -        | 2         | 1         |
| 9                    | 21MC0003                  | Environmental Science*                                  | MC       | 3         | -        | -         | 0         |
| 10                   | 21MC0007                  | Yoga and Indian Philosophy                              | MC       | -         | -        | 3         | 0         |
| <b>Total Credits</b> |                           |   |          | <b>18</b> | <b>2</b> | <b>11</b> | <b>21</b> |

**\*Note: Environmental Science – Should be registered by lateral entry students only.**

## 21CY3111: Cyber Security

**B.Tech. III Year I Sem.**

**L T P C**  
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**Prerequisites:** Course on Computer Networks.

**Course objectives:**

1. To understand various types of cyber-attacks and cyber-crimes
2. To learn threats and risks within context of the cyber security
3. To have an overview of the cyber laws & concepts of cyber forensics
4. To study the defensive techniques against these attacks
5. To understand the security challenges presented by mobile devices and information systems access in the cybercrime world.

**Course Outcomes:**

1. Analyze and evaluate the cyber security needs of an organization.
2. Understand Cyber Security Regulations and Roles of International Law
3. and Learn, analyze and validate Forensics Data
4. Understand web threats, security and privacy implications of an organization.
5. Design and develop a security architecture for an organization.

**UNIT - I**

**Introduction to Cyber Security:** Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Cyberintelligence Vs. CyberCounterintelligence, Comprehensive Cyber Security Policy.

**UNIT - II**

**Cyberspace and the Law & Cyber Forensics:** Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics

**UNIT - III**

**Cybercrime: Mobile and Wireless Devices:** Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.

**UNIT- IV**

**Cyber Security: Organizational Implications:** Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, Security Intelligence, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

**UNIT - V**

**Privacy Issues:** Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

**Cybercrime: Examples and Mini-Cases**

**Examples:** Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. **MiniCases:** The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

**TEXT BOOKS:**

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B.B. Gupta, D.P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335,2018.

**REFERENCE BOOKS:**

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.
3. B.Malathi, S.Ravi Kumar, "Adaptive Cyberpolicing Management to Defuse the Fake Government of India-Fake Government of Telangana(FGoIFGoT) & Cybercriminal Legacy for Secure Digital India",NMSRC2021 procds., pp.29-31. <https://sites.google.com/view/pgovernanceforum/patnaconferencesubmissiondec2021docs>

## 21CY3112: Cryptography and Network Security

B.Tech. III Year I Sem.

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### Prerequisites:

Should have knowledge of computer networks

### Course Objectives:

1. Understand the objectives of information security and the importance and application of each of confidentiality, integrity, authentication and availability and the basic categories of threats to computers and networks.
2. Understand various modern cryptographic encryption algorithms
3. Understand the design of hash functions, MACs and Digital Signatures and their significance
4. Understand the various Transport layer protocols and Wireless network protocols
5. Understand Email security and IP security protocols and case studies of cryptographic algorithms.

### Course Outcomes:

1. Able to differentiate the types of attacks and identify the mechanisms required to achieve security objectives and implement classical ciphers
2. Able to apply fundamentals of mathematics and computer science to understand modern cryptographic algorithms like DES, AES, RSA etc and analyze them
3. Able to Apply fundamentals of mathematics and computer science to understand and analyze the hashing algorithms, MACs, Digital Signatures, Key Management Protocols
4. Able to understand and analyze the security requirements, various protocols at Transport layer, Network Layer, Session Layer and Application layer
5. Able to apply the cryptographic algorithms and tools to solve problems related to data and network in different areas and evaluate them.

### UNIT - I

**Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security.

**Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

### UNIT - II

**Symmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

**Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

### UNIT - III

**Cryptographic Hash Functions:** Message Authentication, Secure Hash Algorithm (SHA-512)

**Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

**Key Management and Distribution:** Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

#### **UNIT - IV**

**Transport-level Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH).

**Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security.

#### **UNIT - V**

**E-Mail Security:** Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, encapsulating security payload, combines security associations, Internet Key Exchange.

**Case Studies on Cryptography and security:** Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

#### **TEXT BOOKS:**

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6<sup>th</sup> Edition.
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3<sup>rd</sup> Edition.

#### **REFERENCE BOOKS:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1<sup>st</sup> Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3<sup>rd</sup> Edition.
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

## 21CY3113: Formal Languages and Automata Theory

B.Tech. III Year I Sem.

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### Course Objectives

1. To provide introduction to some of the central ideas of theoretical computer science from the perspective of formal languages.
2. To introduce the fundamental concepts of formal languages, grammars and automata theory.
3. Classify machines by their power to recognize languages and employ finite state machines to solve problems in computing.
4. To understand deterministic and non-deterministic machines.
5. To understand the differences between decidability and undecidability.

### Course Outcomes

1. Able to understand the concept of abstract machines and their power to recognize the languages.
2. Able to employ finite state machines for modeling and solving computing problems.
3. Able to design context free grammars for formal languages.
4. Able to distinguish between decidability and undecidability.
5. Able to gain proficiency with mathematical tools and formal methods.

### UNIT - I

**Introduction to Finite Automata:** Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

**Nondeterministic Finite Automata:** Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

**Deterministic Finite Automata:** Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with  $\epsilon$ -transitions to NFA without  $\epsilon$ -transitions. Conversion of NFA to DFA, Moore and Melay machines

### UNIT - II

**Regular Expressions:** Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

**Pumping Lemma for Regular Languages:** Statement of the pumping lemma, Applications of the Pumping Lemma.

**Closure Properties of Regular Languages:** Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

### UNIT - III

**Context-Free Grammars:** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Trees, applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

**Push Down Automata:** Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata. From CFG to PDA, From PDA to CFG.

### UNIT - IV

**Normal Forms for Context- Free Grammars:** Eliminating useless symbols, Eliminating  $\epsilon$ -Productions. Chomsky Normal form Griebach Normal form.

**Pumping Lemma for Context-Free Languages:** Statement of pumping lemma, Applications  
**Closure Properties of Context-Free Languages:** Closure properties of CFL's, Decision Properties of CFL's

**Turing Machines:** Introduction to Turing Machine, Formal Description, Instantaneous description, the language of a Turing machine

#### **UNIT - V**

**Types of Turing machine:** Turing machines and halting

**Undecidability:** Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines.

#### **TEXT BOOKS:**

1. Introduction to Automata Theory, Languages, and Computation, 3<sup>rd</sup> Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekar, 2nd edition, PHI.

#### **REFERENCE BOOKS:**

1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3<sup>rd</sup> edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.

**21CY3171: Compiler Design**  
**(Program Elective-I)**

**B.Tech. III Year I Sem.**

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**Prerequisites:**

- A course on “Computer Organization and architecture”.
- A course on “Computer Programming and Data Structures”.

**Course Objectives:**

1. Introduce the major concepts of language translation and compiler design.
2. To impart the knowledge of practical skills necessary for constructing a compiler.
3. Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, code optimization techniques, intermediate code generation, code generation and data flow analysis.
4. Compare top down with bottom-up parsers, and develop appropriate parser to produce parse tree representation of the input.
5. To provide an overview to students regarding different considerations and phases of compilation.

**Course Outcomes:**

1. Demonstrate the ability to design a compiler given a set of language features.
2. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
3. Acquire skills in using lex tool & yacc tool for developing a scanner and parser.
4. Design and implement LL and LR parsers
5. Design algorithms to do code optimization in order to improve the performance of a program in terms of space and time complexity and also design algorithms to generate machine code.

**UNIT - I**

**Introduction:** The structure of a compiler, the science of building a compiler, programming language basics.

**Lexical Analysis:** The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

**UNIT - II**

**Syntax Analysis:** Introduction, Context-Free Grammars, writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars and Parser Generators.

**UNIT - III**

**Syntax-Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

**Intermediate-Code Generation:** Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures.



#### **UNIT - IV**

**Run-Time Environments:** Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.

**Code Generation:** Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

#### **UNIT - V**

**Machine-Independent Optimization:** The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

#### **TEXT BOOK:**

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman.

#### **REFERENCE BOOKS:**

1. Lex & Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly.  
Compiler Construction, Loudon, Thomson.

## 21BU3172 - Artificial Intelligence

(Professional Elective – I)

B.Tech. III Year I Sem.

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### Pre-requisites:

A course on “Computer Programming and Data Structures”

A course on “Advanced Data Structures”

A course on “Design and Analysis of Algorithms”

A course on “Mathematical Foundations of Computer Science”

Some background in linear algebra, data structures and algorithms, and probability will all be helpful.

### Course Objectives: The objective of this course is to:

1. Learn the distinction between optimal reasoning Vs. human like reasoning
2. Understand the concepts of state space representation, exhaustive search, and heuristic search together with the time and space complexities.
3. Learn different knowledge representation techniques.
4. Understand the applications of AI, namely game playing, theorem proving, and machine learning.
5. Know about the various applications of AI.

### Course Outcomes: At the end of the course, student will be able to:

1. Ability to formulate an efficient problem space for a problem expressed in natural language.
2. Select a search algorithm for a problem and estimate its time and space complexities.
3. Possess the skill for representing knowledge using the appropriate technique for a given problem.
4. Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.
5. Apply AI techniques to real-world problems to develop intelligent systems.

### UNIT - I

Problem Solving by Search - I: Introduction to AI, Intelligent Agents

Problem Solving by Search - II: Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A\* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment.

### UNIT - II

Problem Solving by Search - II and Propositional Logic

Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems. Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

### UNIT - III

Logic and Knowledge Representation

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

#### **UNIT - IV**

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

Planning and Acting in the Real World: Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

#### **UNIT - V**

Uncertain knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

#### **TEXT BOOK:**

Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

#### **REFERENCE BOOKS:**

Artificial Intelligence, 3rd Edn, E. Rich and K.Knight (TMH)

Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.

Artificial Intelligence, Shivani Goel, Pearson Education.

Artificial Intelligence and Expert systems – Patterson, Pearson Education

## 21CY3173: Design and Analysis of Algorithms (Program Elective-I)

B.Tech. III Year I Sem.

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### Prerequisites:

A course on “Computer Programming and Data Structures”

### Course Objectives:

1. Introduces the notations for analysis of the performance of algorithms.
2. Introduces the data structure disjoint sets.
3. Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate.
4. Describes how to evaluate and compare different algorithms using worst-, average-, and best case analysis.
5. Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

### Course Outcomes:

1. Ability to analyze the performance of algorithms
2. Ability to choose appropriate data structures and algorithm design methods for a specified application
3. Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs
4. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
5. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm.

### UNIT - I

**Introduction:** Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.

**Divide and conquer:** General method, Applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

### UNIT - II

**Disjoint Sets:** Disjoint set operations, union and find algorithms

**Backtracking:** General method, applications, n-queen's problem, sum of subsets problem, graph coloring

### UNIT - III

**Dynamic Programming:** General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

### UNIT - IV

**Greedy method:** General method, Applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

### UNIT - V

**Branch and Bound:** General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

**NP-Hard and NP-Complete problems:** Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

**TEXT BOOK:**

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University Press.

**REFERENCE BOOKS:**

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

## 21CY3174: Cloud Computing (Program Elective-I)

B.Tech. III Year I Sem.

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**Pre-requisites:** courses on Computer Networks, Operating Systems.

### Course Objectives:

1. This course provides an insight into cloud computing.
2. Topics covered include- distributed system models, different cloud service models, service-oriented architectures, cloud programming and software environments, resource management.
3. The fundamental ideas behind Cloud Computing
4. The evolution of the paradigm, its applicability benefits, as well as current and future challenges
5. The basic ideas and principles in data center design; cloud management techniques and cloud software deployment considerations

### Course Outcomes:

1. Explain the core concepts of the cloud computing paradigm
2. Ability to understand various service delivery models of a cloud computing architecture.
3. Ability to understand the ways in which the cloud can be programmed and deployed.
4. Understanding cloud service providers.
5. Analyze various cloud programming models and apply them to solve problems on the cloud.

### UNIT - I

**Computing Paradigms:** High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

### UNIT - II

**Cloud Computing Fundamentals:** Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

### UNIT - III

**Cloud Computing Architecture and Management:** Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

### UNIT - IV

**Cloud Service Models:** Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

### UNIT V

**Cloud Service Providers:** EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform

**TEXT BOOK:**

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

**REFERENCE BOOKS:**

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

## 21CY3151: Cryptography and Network Security Lab

B.Tech. III Year I Sem.

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### Course Objectives:

1. Explain the objectives of information security.
2. To understand basics of Cryptography and Network Security.
3. To be able to secure a message over insecure channel by various means
4. Explain the importance and application of each of confidentiality, integrity, authentication and availability.
5. Understand various cryptographic algorithms.

### Course Outcomes:

1. Understand basic cryptographic algorithms, message and web authentication and security issues.
2. Get an overview of cryptographic algorithms
3. Hands on experience on c/java programming languages.
4. Identify information system requirements for both of them such as client and server.
5. Understand the current legal issues towards information security.

### List of Experiments:

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
  - a) Ceaser cipher
  - b) Substitution cipher
  - c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA.

### TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition.
2. Cryptography and Network Security: Atul Kahate, McGraw Hill, 3rd Edition.

### REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, McGraw Hill, 3rd Edition.



3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

## 21CY3152: Cyber Security Lab

**B.Tech. III Year I Sem.**

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**Prerequisites:** A course on “Network Security and Cryptography”.

### **Course Objective:**

1. To understand NMAP for network discovery and services.
2. To lure cyber attackers and detect, deflect and study hacking attempts to gain unauthorized access to information systems. (Pentbox)
3. To learn foot-printing to gather target information using Dmitry.
4. To understand network communication using Wireshark.
5. To understand firewall filtering rules.

### **Course Outcome:**

1. Get the skill to identify cyber threats/attacks.
2. Get the knowledge to solve security issues in day to day life.
3. Able to use Autopsy tools
4. Perform Memory capture and analysis
5. Demonstrate Network analysis using Network miner tools

### **List of Experiments**

1. Perform an Experiment for port scanning with nmap
2. Set Up a honeypot and monitor the honeypot on the network
3. Install Jscript/Cryptool tool (or any other equivalent) and demonstrate Asymmetric, Symmetric crypto algorithm, Hash and Digital/PKI signatures.
4. Generate minimum 10 passwords of length 12 characters using open SSL command
5. Perform practical approach to implement Footprinting-Gathering target information using Dmitry-Dmagic, UAtester
6. Working with sniffers for monitoring network communication (Wireshark).
7. Using Snort, perform real time traffic analysis and packet logging.
8. Perform email analysis using the Autopsy tool.
9. Perform Registry analysis and get boot time logging using process monitor tool
10. Perform File type detection using Autopsy tool
11. Perform Memory capture and analysis using FTK imager tool
12. Perform Network analysis using the Network Miner tool
13. Firewall filtering techniques using IP tables on Linux.

### **TEXT BOOKS:**

1. Real Digital Forensics for Handheld Devices, E. P. Dorothy, Auerback Publications, 2013.
2. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J. Sammons, Syngress Publishing, 2012

### **REFERENCE BOOKS:**

1. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010.
2. Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides, C. H. Malin, E. Casey and J. M. Aquilina, Syngress, 2012.
3. The Best Damn Cybercrime and Digital Forensics Book Period, J. Wiles and A. Reyes, Syngress, 2007.

## 21HS3153: Advanced English Communication Skills Lab

**B.Tech. III Year I Sem.**

**L T P C**

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### **Introduction**

A course on Advanced English Communication Skills (AECS) Lab is considered essential at the third year level of B.Tech and Pharmacy courses. At this stage, the students need to prepare themselves for their career which requires them to listen to, read, speak and write in English both for their professional and interpersonal communication. The main purpose of this course is to prepare the students of Engineering for their placements.

### **Course Objectives**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. To improve students' fluency in spoken English
2. To enable them to listen to English spoken at normal conversational speed and to help them develop their vocabulary
3. To read and comprehend texts in different contexts and to communicate their ideas relevantly and coherently in writing
4. To make students industry-ready
5. To help students acquire behavioural skills for their personal, professional life and respond appropriately in different socio-cultural and professional contexts

### **Course Outcomes**

**Students will be able to:**

1. Acquire vocabulary and use it contextually
2. Listen and speak effectively
3. Develop proficiency in academic reading and writing
4. Increase possibilities of job prospects
5. Communicate confidently in formal and informal contexts

### **UNIT-I**

Inter-personal Communication and Building Vocabulary –Starting a Conversation–Responding Appropriately and Relevantly –Using Appropriate Body Language –Role Play in Different Situations – Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.

### **UNIT-II**

Reading Comprehension –General Vs Local Comprehension, Reading for Facts, Guessing Meanings from Context, Skimming, Scanning, Inferring Meaning.

### **UNIT-III**

Writing Skills –Structure and Presentation of Different Types of Writing –Letter Writing/Resume Writing/ e-correspondence/ Technical Report Writing.

### **UNIT-IV**

Presentation Skills –Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ emails/Assignments...etc.

### **UNIT-V**

Group Discussion and Interview Skills –Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas and Rubrics of Evaluation-Concept and Process, Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

**REFERENCES:**

1. Kumar, Sanjay and Pushp Lata. English for Effective Communication, Oxford University Press, 2015.
2. Konar, Nira. English Language Laboratories –A Comprehensive Manual, PHI Learning Pvt. Ltd., 2011

**21CY3181: SUMMER INTERNSHIP**

**B.Tech. III Year I Sem.**

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## **21MC0006: Aptitude and Logical Reasoning**

**B.Tech. III Year I Sem.**

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### **Course Objectives:**

1. Student learns the techniques to solve all the problems in his real life.
2. It can improve the numerical ability.
3. The quicker methods are useful to solve the problems within the time and it is helpful in his duties.
4. Quantitative Aptitude helps in solving the practical life problems.
5. Students can use Quantitative Aptitude in everyday life to figure out mathematically.
6. Student can improve his mental capacity.
7. It helps in sharpening their minds.

### **UNIT I**

Number System, Percentages, Profit And Loss, Simple Interest - Compound Interest, Partnership Ratio And Proportion, Chain Rule, Time And Work - Pipes And Cistern, Time And Distance - Problems On Trains, Boats And Streams, Races And Games Of Skill

### **UNIT II**

Average, Alligation And Mixture, Permutation-Combination, Probability, Geometry (Co-Ordinate, Solid-2d Areas & 3d Volumes), D I (Tabulation, Bar Graphs, Pie Charts & Line Graphs), Elementary Statistics

### **UNIT III:**

Series Completion, Analogy, Classification / Odd One Out, Coding – Decoding, Blood Relations, Deciphering Jumbled up Descriptions,

### **UNIT IV:**

Relation Puzzle, Direction sense test, Number, Ranking & Time Sequence Test, Puzzle Test, Seating Arrangements Comparison Type Questions, Sequential Order of Things, Selection Based on given conditions,

### **UNIT V**

Family – Based Puzzles, Jumbled Problems. Logical Venn Diagrams  
Alpha Numeric Sequence Puzzle, Cubes, Dice, Clocks, Calendar, Data Sufficiency, Syllogism.

### **TEXT BOOKS:**

1. Quantitative Aptitude by R.S. Agarwal
2. Quantitative Aptitude by Abhijit Guha
3. Quantitative Aptitude for Competitive Examinations, U. Mohan Rao, Scitech Publication.

## 21CY3211: Ethical Hacking

**B.Tech. III Year II Sem.**

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**Prerequisites:** Basic concepts in programming and networking

### **Course Objectives:**

1. To have an overview of Ethical Hacking and its types.
2. To study the basic concepts of Foot printing and Reconnaissance.
3. To study about Scanning, Enumeration tools and techniques.
4. To learn Vulnerability Analysis and System Hacking
5. To understand Web Application and Wireless Network Hacking.

### **Course Outcomes:**

1. Understand Ethical Hacking and its types.
2. Apply concepts of Footprinting and Reconnaissance.
3. Apply Scanning, Enumeration tools and techniques.
4. Analyze Vulnerability and System Hacking.
5. Analyze different Tools and Techniques for Web Application and Wireless Network Hacking .

### **Unit 1: Introduction to Ethical Hacking**

Terminology, concepts, and history of hacking, need, Ethics and legal considerations in ethical hacking. Different types of hackers and their motivations, Steps involved in the ethical hacking process. Common hacking tools and their purposes, Techniques for protecting networks and systems. Linux Fundamentals: Linux operating system, Features of an Operating system, Functions of an Operating System, Linux Distributions, Architecture, Commands, File System, Users and Group Management, Process management.

### **Unit 2: Foot printing and Reconnaissance**

Information gathering techniques and tools, Foot printing methodology and tools, OSINT (Open-Source Intelligence) gathering techniques, Google hacking and other search engine-based reconnaissance, social engineering reconnaissance techniques, Analysing information gathered during reconnaissance.

Website foot printing, Email foot printing, who is foot printing, DNS foot printing, Network foot printing, Countermeasures.

### **Unit 3: Scanning and Enumeration**

Types scanning, Network scanning tools and techniques, Port scanning and service discovery, Network mapping techniques, Banner grabbing and service fingerprinting.

**Enumeration:** Introduction to enumeration, enumeration techniques, services to enumerate, User and group enumeration, automated enumeration tools.

### **Unit 4: Vulnerability Analysis and System Hacking**

Need of vulnerability analysis, Vulnerability scanning tools and methodologies, Vulnerability types and their impact, Manual and automated vulnerability assessment techniques, vulnerability management life cycle, Vulnerability assessment Solutions, Vulnerability Scoring system.

Password cracking, privilege escalation, and backdoor installation, Common exploit types and their effects, Exploit development, Techniques for escalating privileges and maintaining access, Malware analysis and reverse engineering.

## **Unit 5: Web Application and Wireless Network Hacking**

Web application concepts, Web application vulnerabilities, and Web application attack techniques. Web application countermeasures, Web application attack tools.

Wireless networking concepts, Wireless networking vulnerabilities, Wireless networking attack techniques, Wireless networking countermeasures, Wireless networking tools.

### **TEXTBOOKS:**

1. "CEH v11: Certified Ethical Hacker Version 11 Study Guide" by Ric Messier.(Unit-I, V)
2. "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy" by Patrick Engebretson. (Unit-II)
3. "Nmap Network Scanning: The Official Nmap Project Guide to Network Discovery and Security Scanning" by Gordon Lyon (Unit-III)
4. "Metasploit: The Penetration Tester's Guide" by David Kennedy.(Unit-IV)

### **REFERENCES:**

1. Data and Computer Communications -- W. Stallings.
2. Data Communication and Networking -- B. A. Forouzan
3. TCP/IP Protocol Suite -- B. A. Forouzan
4. UNIX Network Programming -- W. R. Stallings
5. Introduction to Computer Networks and Cybersecurity -- C-H. Wu and J. D. Irwin
6. Cryptography and Network Security: Principles and Practice -- W. Stallings



## 21CY3212: Cyber Crime Investigation & Digital Forensics

B.Tech. III Year II Sem.

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**Prerequisites:** course on Computer Networks, Cryptography and Network Security, and cyber laws.

### Course Objectives:

1. To have an overview of cybercrime and its types.
2. To study the basic concepts of cybercrime issues.
3. To study investigation tools and techniques.
4. To learn digital forensics tools and technology
5. To understand cybercrime laws and acts, evidence handling procedures.

### Course Outcomes:

1. Analyze cybercrime issues and types.
2. Understand the fundamentals of cybercrime and issues.
3. Understand different investigation tools for cybercrime.
4. Understand basics of Forensic Technology and Practices.
5. Analyze different laws, ethics and evidence handling procedures.

### UNIT - I

**Introduction:** Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

### UNIT - II

**Cyber Crime Issues:** Unauthorized Access to Computers, Degree of cybercrime, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Software Piracy, Intellectual Property, Mail Bombs, Exploitation, Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses.

### UNIT - III

**Investigation:** Introduction to Cyber Crime Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

### UNIT - IV

**Digital Forensics:** Introduction to Digital Forensics, Forensic Software and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

### UNIT - V

**Laws and Acts:** Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and CrPC, Electronic Communication Privacy ACT, IT ACT 2000 66C-Identity theft, Legal Policies.

### TEXT BOOKS:

1. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
2. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2006.

**REFERENCE BOOKS:**

1. Robert M Slade,” Software Forensics”, Tata McGraw - Hill, New Delhi, 2005.
2. Bernadette H Schell, Clemens Martin, “Cybercrime”, ABC – CLIO Inc, California, 2004.
3. “Understanding Forensics in IT “, NIIT Ltd, 2005.
4. K. Chandra Sekharaiah et. al., Cyber Intelligence Alternatives to Offset Online Sedition by in-Website Image Analysis Through WebCrawler Cyberforensics, ICSCSP 2018, Volume 1 procds., pp.187-199, ISBN 978-981-13-3599-0.

## 21CS3213: Machine Learning

**B.Tech. III Year II Sem.**

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### Prerequisites:

- Data Structures
- Knowledge on statistical methods

### Course Objectives

- Define Machine Learning and understand the basic theory underlying machine learning.
- Understand the basic concepts of learning and decision trees.
- Understand neural networks and Bayesian techniques for problems appear in machine learning
- Understand the instance based learning and reinforced learning
- Perform statistical analysis of machine learning techniques

**Course Outcomes:** After the completion of the course student should be able to

- Choose the learning techniques and investigate concept learning
- Identify the characteristics of decision tree and solve problems associated with Decision tree Learning
- Apply effectively Neural Networks for appropriate applications
- Apply Bayesian techniques and derive effectively learning rules
- Evaluate hypothesis and investigate instance based learning, reinforced learning and Analytical Learning

### UNIT - I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias, Gradient Descent Algorithm and its variants.

### UNIT – II

Supervised Learning- Regression: Linear-Simple, Multiple, Logistic Regression.

Classification- Naive Bayes Classifier, k-NN classifier, Support Vector Machines -Linear, Non Linear

**Ensemble Techniques** I-Decision Trees-ID3(Iterative Dichotomiser3), CART(Classification and Regression Tree)

### UNIT – III

Ensemble Techniques II- C4.5, CHAID (Chi-Square Automatic Interaction Detection), Random Forest Algorithm.

Unsupervised Learning-Clustering: Measures of distance, k-means, Gaussian Mixture Model Clustering, Hierarchical Learning- Divisive, Agglomerative Clustering

### UNIT- IV

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

### UNIT - V

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Reinforcement Learning – Introduction, the learning task, Q-learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

**TEXT BOOK:**

1. Machine Learning – Tom M. Mitchell, - MGH.
2. Introduction to Machine Learning with Python, Author – Andreas C. Müller, Sara h Guido, Edition – First Edition, Publisher – O'Reilly Media, Inc.

**REFERENCE BOOK:**

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.
2. Mathematics for Machine learning, Author – Marc Peter Deisenroth, Edition – First Edition, Publisher – Cambridge University Press.

## 21CY3271: Mobile Application Security (Professional Elective-II)

B.Tech. III Year II Sem.

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### Course Objectives:

1. This course provides a thorough understanding of issues facing mobile devices, platforms and mobile development strategies.
2. The course objective focus will be on wireless Application Protocol (WAP) and Mobile HTML security on PDAs/Smartphone.
3. The course objective focus on Bluetooth's functionality and ubiquity on mobile devices provides some exciting opportunities for mobile application developers.
4. This course objective provides knowledge on SMS security from an attacker's point of view.
5. This course objective discusses the enterprise security features, support, and applications available on four major mobile platforms—BlackBerry OS, Windows Mobile, iPhone OS, and Google Android.

### Course Outcomes:

1. Understand the issues and technologies involved in designing a wireless and mobile system that is robust against various attacks.
2. Gain knowledge and understand the security controls of multiple mobile operating systems
3. Understand and analyze the issues and technologies involved in Bluetooth Technology.
4. Analyze and understand the Security of Short Message Service
5. Understand and analyze Enterprise security on the Mobile OS Device.

### UNIT - I

**Top Mobile Issues and Development Strategies:** Top Issues Facing Mobile Devices, Physical Security, Secure Data Storage (on Disk), Strong Authentication with Poor Keyboards , Multiple-User Support with Security, Safe Browsing Environment , Secure Operating Systems, Application Isolation, Information Disclosure, Virus, Worms, Trojans, Spyware, and Malware , Difficult Patching/Update Process, Strict Use and Enforcement of SSL, Phishing , Cross-Site Request Forgery (CSRF), Location Privacy/Security, Insecure Device Drivers, Multi Factor Authentication, Tips for Secure Mobile Application Development.

### UNIT - II

WAP and Mobile HTML Security WAP and Mobile HTML Basics, Authentication on WAP/Mobile HTML Sites, Encryption, Application Attacks on Mobile HTML Sites, Cross-Site Scripting, SQL Injection, Cross-Site Request Forgery, HTTP Redirects, Phishing, Session Fixation, Non-SSL Login, WAP and Mobile Browser Weaknesses, Lack of HTTPOnly Flag Support, Lack of SECURE Flag Support, Handling Browser Cache, WAP Limitations.

### UNIT - III

Bluetooth Security Overview of the Technology , History and Standards , Common Uses , Alternatives, Future, Bluetooth Technical Architecture , Radio Operation and Frequency, Bluetooth Network Topology , Device Identification , Modes of Operation , Bluetooth Stack ,Bluetooth Profiles, Bluetooth Security Features , Pairing , Traditional Security Services in Bluetooth, Security “Non-Features” , Threats to Bluetooth Devices and Networks, Bluetooth Vulnerabilities, Bluetooth Versions Prior to v1.2, Bluetooth Versions Prior to v2.1.

### UNIT - IV

SMS Security Overview of Short Message Service, Overview of Multimedia Messaging Service, Wireless Application Protocol (WAP), Protocol Attacks, Abusing Legitimate Functionality, Attacking Protocol

Implementations, Application Attacks, iPhone Safari, Windows Mobile MMS, Motorola RAZR JPG Overflow, Walkthroughs, Sending PDUs, Converting XML to WBXML.

#### **UNIT - V**

Enterprise Security on the Mobile OS Device Security Options, PIN, Remote, 346 Secure Local Storage, Apple iPhone and Keychain, Security Policy Enforcement, Encryption, Full Disk Encryption, Email Encryption, File Encryption, Application Sandboxing, Signing, and Permissions, Application Sandboxing, Application Signing, Permissions, Buffer Overflow Protection, Windows Mobile, iPhone, Android, BlackBerry, Security Feature Summary.

#### **TEXT BOOK:**

1. Alex Alexandrou, Cybercrime and Information Technology: The Computer Network Infrastructure and Computer Security, Cybersecurity Laws, Internet of Things (IoT), and Mobile Devices, CRC Press, 2021
2. Mobile Application Security, Himanshu Dwivedi, Chris Clark, David Thiel, TATA McGraw Hill.

#### **REFERENCE BOOKS:**

1. Mobile and Wireless Network Security and Privacy, Kami S. Makki, et al, Springer.
2. Android Security Attacks Defenses, Abhishek Dubey, CRC Press

**21CY3272: Cyber Security Tools, Techniques & Counter Measurements**  
**(Professional Elective-II)**

**B.Tech. III Year II Sem.**

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**Course Objectives:**

1. To have an overview of cyber security essentials.
2. To study the basic concepts of Firewalls and Tools.
3. To study the basics concepts of Web attack and Security.
4. To learn about different security frameworks.
5. To learn cybercrime laws and acts, Intellectual property in the Cyber world.

**Course Outcomes:**

1. Understand cyber security essentials.
2. Understand the basic concepts of Firewalls and Tools.
3. Understand basic concepts of Web attack and Security.
4. Understand about different security frameworks.
5. Analyze different laws and acts, Intellectual property in the Cyber world.

**Unit-I:**

**Cyber Security:**

Cyber Security Essentials, Attack Vectors, Threat, Risk and Vulnerability, Advanced Persistent Threat and Cyber Kill Chain, Cyber Security Framework

**Unit-II:**

**Firewalls and Tools:** Firewall and packet Filters, Introduction to windows and Linux firewall, Attacks on wireless networks, Scanning for web vulnerabilities Tools and HTTP Utilities, Application Inspection Tools, Password cracking and Brute-Force Tools.

**Unit-III**

**Web attack and Security:**

Web attack, Information Security basics to policy, Intrusion detection system, IT Assets and wireless security.

**Unit-IV:**

Cyber Security assurance Framework, Desktop security and malware, E-commerce and web-application Security.

**Unit-V:**

Social engineering, Internet crime and Act, Intellectual property in the cyber world.

**BOOKS AND REFERENCES**

**BOOKS:**

1. Principles of Cyber Security Course Code: PGDCS-101 Published by Dr. Babasaheb Ambedkar Open University
2. Cyber Security Techniques: PGDCS-103 Published by Dr. Babasaheb Ambedkar Open University

**REFERENCES:**

1. Cyber Security – Understanding Cyber Crimes, Computer Forensics and Legal Perspectives Author: Nina Godbole, SunitBelapure, Publisher: Wiley India

2. Information Systems Security – Security Management, Metrics, Frameworks and Best Practices Author: Nina Godbole, Publisher: Wiley India



**21DS3272: DevOps**  
**(Professional Elective-II)**

**B.Tech. III Year II Sem**

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**Course Objectives:** The main objectives of this course are to

1. Describe the agile relationship between development and IT operations.
2. Make the learner identify components of Devops environment
3. Understand the skill sets and high-functioning teams involved in DevOps
4. Understand related methods to reach a continuous delivery capability
5. Implement automated system update and DevOps lifecycle

**Course Outcomes:** On successful completion of this course, students will be able to:

1. Identify components of Devops environment
2. Describe Software development models and architectures of DevOps
3. Apply different project management, integration, testing and code deployment tool
4. Investigate different DevOps Software development models
5. Collaborate and adopt Devops in real-time projects

**UNIT-I**

**Introduction:** Introduction, Agile development model, DevOps, and ITIL.DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottle necks, examples

**UNIT-II**

**Software development models and DevOps:** DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.

**DevOps influence on Architecture:** Introducing software architecture, the monolithic scenario, Architecture rules of thumb, these parathion of concerns, Handling database migrations, Micro services, and the data tier, DevOps, architecture, and resilience.

**UNIT-III**

**Introduction to project management:**

The need for source code control, The history of sourcecodemanagement, Rolesandcode,sourcecodemanagementsystemandmigrations,Sharedauthentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

**UNIT-IV**

**Integrating the system:** Build systems, Jenkins build server, Managing build dependencies, Jenkinsplgins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Buildphases, Alternativebuildservers, Collatingqualitymeasures.

**UNIT-V**

**Testing Tools and automation:** Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration

points, Test-driven development, REPL-driven development

**Deployment of the system:** Deployment systems, Virtualization stacks, code execution at the client, Puppetmaster and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker.

**TEXTBOOKS:**

1. Joakim Vena. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
2. Deepak Gawad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

**REFERENCEBOOK:**

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10

**21BU3274: Mobile Application Development**  
(Professional Elective – II)

**B. Tech III Year II Semester Prerequisites**

|  |          |          |          |          |
|--|----------|----------|----------|----------|
| 1. Acquaintance with JAVA programming. | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| 2. A Course on DBMS.                   | <b>3</b> | -        | -        | <b>3</b> |

**Course Objectives**

1. Demonstrate their understanding of the fundamentals of Android operating systems.
2. Improves their skills of using Android software development tools.
3. Demonstrate their ability to develop software with reasonable complexity on mobile platform.
4. Demonstrate their ability to deploy software to mobile devices.
5. Demonstrate their ability to debug programs running on mobile devices.

**Course Outcomes**

1. Student understands the working of Android OS Practically.
2. Student will be able to develop Android user interfaces
3. Understand the use of various Layouts and Widgets in Android Applications.
4. Student will be able to develop, deploy and maintain the Android Applications.
5. Able to develop embedded software for Mobile phones with SQLite.

**UNIT - I**

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes.

**UNIT - II**

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - sLayouts – Linear, Relative, Grid and Table Layouts  
User Interface (UI) Components –Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers  
Event Handling – Handling clicks or changes of various UI components  
Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

### **UNIT - III**

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

### **UNIT - IV**

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

### **UNIT - V**

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

#### **TEXT BOOKS:**

Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.

Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.

#### **REFERENCE BOOK:**

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

## 21CY3251: Ethical Hacking Lab

**B.Tech. III Year II Sem.**

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**Prerequisites:** Basic concepts in programming and networking

### **Course Objectives**

1. The aim of the course is to introduce the methodologies framework tools of ethical hacking to get awareness in enhancing the security
2. To get knowledge on various attacks and their detection

### **Course Outcomes**

1. Gain the knowledge of the use and availability of tools to support an ethical hack
2. Gain the knowledge of interpreting the results of a controlled attack

### **List of Experiments:**

1. Set Up a honey pot and monitor the honey pot on network
2. Write a script or code to demonstrate SQL injection attacks
3. Create a social networking website login page using phishing techniques
4. Write a code to demonstrate DoS attacks
5. Install rootkits and study variety of options
6. Study of Techniques used for Web Based Password Capturing.
7. Install jcrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric Crypto algorithm, Hash and Digital/PKI signatures studied in theory Network Security And Management
8. Implement Passive scanning, active scanning, session hijacking, cookies extraction using Burp suite tool

## 21CY3252: Cyber Crime Investigation & Digital Forensics Lab

**B.Tech. III Year II Sem.**

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### **Course Objectives:**

1. To provide students with a comprehensive overview of collecting, investigating, preserving, and presenting evidence of cybercrime left in digital storage devices, emails, browsers, mobile devices using different Forensics tools.
2. To Understand file system basics and where hidden files may lie on the disk, as well as how to extract the data and preserve it for analysis.
3. Understand some of the tools of e-discovery.
4. To understand the network analysis, Registry analysis and analyze attacks using different forensics tools.
5. To gather data from mobile devices with the goal of analysis using forensic tools.

### **Course Outcomes:**

1. Learn the importance of a systematic procedure for investigation of data found on digital storage media that might provide evidence of wrong-doing.
2. To learn the file system storage mechanisms and retrieve files in hidden format.
3. Learn the use of computer forensics tools used in data analysis.
4. Learn how to find data that may be clear or hidden on a computer disk, find out the open ports for the attackers through network analysis, Registry analysis.
5. Understand how to do data acquisition from mobile phones for investigation purpose

### **List of Experiments**

1. **Perform email analysis** using the tools like Exchange EDB viewer, MBOX viewer and View user mailboxes and public folders, Filter the mailbox data based on various criteria, Search for particular items in user mailboxes and public folders
2. **Perform Browser history analysis** and get the downloaded content, history, saved logins, searches, websites visited etc using Foxtton Forensics tool, Dumpzilla.
3. **Perform mobile analysis** in the form of retrieving call logs, SMS log, all contacts list using the forensics tool like SAFT
4. **Perform Registry analysis** and get boot time logging using process monitor tool
5. **Perform Disk imaging and cloning the** using the X-way Forensics tools
6. **Perform Data Analysis i.e** History about open file and folder, and view folder actions using Listview activity tool
7. **Perform Network analysis** using the Network Miner tool.
8. **Perform information for incident response** using the crowd Response tool
9. **Perform File type detection using** Autopsy tool
10. **Perform Memory capture and analysis** using the Live RAM capture or any forensic tool.
11. Password cracking
  1. Crack Linux password using the John the ripper tool
  2. Crack the password using The Hydra tool by performing Brute force attack.
  3. Crack Wi-Fi password using Aircrack-ng tool
12. Perform Encrypted disk detection by using Magnet encrypted disk detector tool

13. Perform log files analysis using any log monitoring tool.
14. PGF Cyber Policing case study: Cyber Policing Fake GoTFGoI cyber crimes.
15. Wayback machine:A Cyberforensic tool.

**TEXT BOOKS:**

1. Real Digital Forensics for Handheld Devices, E. P. Dorothy, Auerbach Publications, 2013.
2. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics, J. Sammons, Syngress Publishing, 2012.

**REFERENCE BOOKS:**

1. Handbook of Digital Forensics and Investigation, E. Casey, Academic Press, 2010.
2. Malware Forensics Field Guide for Windows Systems: Digital Forensics Field Guides, C. H. Malin, E. Casey and J. M. Aquilina, Syngress, 2012.
3. The Best Damn Cybercrime and Digital Forensics Book Period, J. Wiles and A.Reyes, Syngress, 2007.
4. B.Malathi, S.Ravi Kumar, "Adaptive Cyber Policing Management to Defuse the Fake Government of India-Fake Government of Telangana(FGoIFGoT) & Cybercriminal Legacy for Secure Digital India",NMSRC2021 procds., pp.29-31.  
<https://sites.google.com/view/pgovernanceforum/patnaconferencesubmissiondec2021docs>

## 21CS3253: Machine Learning Lab

**B.Tech. III Year II Sem.**

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### Course Description

1. Machine learning is concerned with computer programs that automatically
2. Improve their performance through experience.
3. This course covers theory and practical algorithms for machine learning from a variety of perspectives.
4. This course covers topics such as FIND-S candidate elimination algorithm, Decision tree (ID3 ALGORITHM), Back propagation algorithm, Bayesian classifier, Bayesian Network, K-means algorithm, K-Nearest Neighbors algorithm, Locally Weighted Regression algorithm.

### Course Objective:

1. Make use of Data sets in implementing the machine learning algorithms
2. Implement the machine learning concepts and algorithms in any suitable language of choice.

### Course Outcomes:

1. Understand the implementation procedure for the machine learning algorithms.
2. Design Java/Python for various Learning algorithms.
3. Apply appropriate data sets to the Machine Learning algorithms.
4. Identify and apply Machine Learning algorithms to solve real world problems.

### List of Experiments

1. Implement and demonstrate the FIND-S algorithms for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm. and test the same using appropriate data sets.
5. Write a program to implement the naive Bayesian classifier for a sample training data set stored as a CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naive Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this



model to demonstrate the diagnosis of heart patients using standard Heart Disease Data set .You can use Java/Python ML library library classes API.

8. Apply EM algorithm to cluster a set data stored in a .CSV file.Use the same data set for clustering using K-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering .You can add Java/Python ML library classes /API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set.Print both correct and wrong predictions.Java /Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points .Select appropriate data set for your experiment and draw graphs.

## 21MC0003: Environmental Science

B.Tech. III Year II Sem.

L T P C

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### Course Objectives

Develop ability to

1. Identify the importance of ecosystem and its functions.
2. Understand the natural resources and their usage in day to day life.
3. Understand the concept of bio-diversity, its values and conservation.
4. Be aware of the causes of different types of pollution and its control.
5. Understand various environmental impacts, requirement of various policies and legislations towards environmental sustainability.

### Course Outcomes

After the completion of the course, the student would be able to –

1. Explain ecosystem and its functions namely, food chain, ecological pyramids etc.
2. Acquire knowledge about different types of natural resources such as land, water, minerals, non-renewable energy and their excessive usage leading to detrimental effects on environment.
3. Comprehend ecosystem diversity, its values and importance of hot spots to preserve the same.
4. Explain different types of pollution, its control and impact on global environment.
5. Recognize various environmental impacts and the importance of various acts and policies towards environmental sustainability.

### UNIT - I

**Ecosystems:** Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

### UNIT - II

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems.

**Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources,

**Land resources:** Forest resources,

**Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

### UNIT - III

**Biodiversity And Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

## **UNIT - IV**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution,

**Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards.

**Water pollution:** Sources and types of pollution, drinking water quality standards.

**Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil.

**Noise Pollution:** Sources and Health hazards, standards,

**Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management.

**Pollution Control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation.

**Global Environmental Problems and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

## **UNIT - V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socioeconomical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

**Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

### **TEXT BOOKS:**

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

### **REFERENCE BOOKS:**

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4<sup>th</sup> Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications

## **21MC0007: Yoga and Indian Philosophy**

**B.Tech. III Year II Sem.**

**L T P C**  
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### **Unit-1**

Bhagavad Gita, chapter 2 Sankhya Yoga slokas 54-72 about emotional intelligence(Stitaprajnata)

### **Unit-2**

Bhagavad Gita, chapters 3-7

### **Unit-3**

Bhagavad Gita, chapters 8-11

### **Unit-4**

Bhagavad Gita, chapters 12-15

### **Unit-5**

Bhagavad Gita, chapters 16-18

10 quotes from each chapter of ref.(2)

### **References:**

- 1) Bhagavad Gita By Swami Swarupananda, R K Math Publication
- 2) Vivekananda-His Call to the Nation, R K Math Publication