Create and Work with different types of charts

Use pivot tables to summarize and analyse data

Perform data analysis using own formulae and functions

Combine data from multiple worksheets using own formulae and built-in functions to generate results

Export data and sheets to other file formats

Working with macros

Protecting data and Securing the workbook

MS POWERPOINT: **10 Hours**

Select slide templates, layout and themes

Formatting slide content and using bullets and numbering

Insert and format images, smart art, tables, charts

Using Slide master, notes and handout master

Working with animation and transitions

Organize and Group slides

Import or create and use media objects: audio, video, animation

Perform slideshow recording and Record narration and create presentable videos

TOTAL: 30 PERIODS

COURSE OUTCOMES:

 On successful completion the students will be able to

CO1: Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements
CO2:Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding
CO3:Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.

CS3452   **THEORY OF COMPUTATION**   **L T P C**
                                                                                                                   3 0 0 3

COURSE OBJECTIVES:
- To understand foundations of computation including automata theory
- To construct models of regular expressions and languages.
- To design context free grammar and push down automata
- To understand Turing machines and their capability
- To understand Undecidability and NP class problems

UNIT I   AUTOMATA AND REGULAR EXPRESSIONS   9
Need for automata theory - Introduction to formal proof – Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Equivalence between NFA and DFA – Finite Automata with Epsilon transitions – Equivalence of NFA and DFA- Equivalence of NFAs with and without ε-moves- Conversion of NFA into DFA – Minimization of DFAs.

UNIT II   REGULAR EXPRESSIONS AND LANGUAGES   9
Regular expression – Regular Languages- Equivalence of Finite Automata and regular expressions – Proving languages to be not regular (Pumping Lemma) – Closure properties of regular languages.

UNIT III   CONTEXT FREE GRAMMAR AND PUSH DOWN AUTOMATA   9
Types of Grammar - Chomsky's hierarchy of languages -Context-Free Grammar (CFG) and Languages – Derivations and Parse trees – Ambiguity in grammars and languages – Push Down Automata (PDA): Definition – Moves - Instantaneous descriptions -Languages of pushdown automata – Equivalence of pushdown automata and CFG-CFG to PDA-PDA to CFG – Deterministic Pushdown Automata.

UNIT IV   NORMAL FORMS AND TURING MACHINES   9
Normal forms for CFG – Simplification of CFG- Chomsky Normal Form (CNF) and Greibach Normal Form (GNF) – Pumping lemma for CFL – Closure properties of Context Free Languages – Turing Machine : Basic model – definition and representation – Instantaneous Description – Language acceptance by TM – TM as Computer of Integer functions – Programming techniques for Turing machines (subroutines).

UNIT V   UNDECIDABILITY   9
Unsolvable Problems and Computable Functions –PCP-MPCP- Recursive and recursively enumerable languages – Properties - Universal Turing machine -Tractable and Intractable problems - P and NP completeness – Kruskal's algorithm – Travelling Salesman Problem- 3-CNF SAT problems.

COURSE OUTCOMES:
At the end of this course, the students will be able to:
   CO1: Construct automata theory using Finite Automata
   CO2: Write regular expressions for any pattern
   CO3: Design context free grammar and Pushdown Automata
   CO4: Design Turing machine for computational functions
   CO5: Differentiate between decidable and undecidable problems

TOTAL:45 PERIODS

TEXT BOOKS:
1. Hopcroft J.E., Motwani R. & Ullman J.D., "Introduction to Automata Theory, Languages and Computations", 3rd Edition, Pearson Education, 2008.
2. John C Martin , "Introduction to Languages and the Theory of Computation", 4th Edition, Tata McGraw Hill, 2011.

REFERENCES
1. Harry R Lewis and Christos H Papadimitriou , "Elements of the Theory of Computation", 2nd Edition, Prentice Hall of India, 2015.

2. Peter Linz, "An Introduction to Formal Language and Automata", 6th Edition, Jones & Bartlett, 2016.
3. K.L.P.Mishra and N.Chandrasekaran, "Theory of Computer Science: Automata Languages and Computation", 3rd Edition, Prentice Hall of India, 2006.

CO's-PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	3	2	3	-	-	-	-	1	1	2	3	1	3	2
2	2	2	3	2	1	-	-	-	3	3	2	3	3	1	2
3	2	2	3	2	1	-	-	-	1	3	1	2	1	2	2
4	2	2	2	1	-	-	-	-	1	3	3	2	1	3	2
5	2	2	2	1	1	-	-	-	1	1	3	2	3	1	3
AVg.	2	2	2	2	1	-	-	-	1	2	2	2	2	2	2

1 - low, 2 - medium, 3 - high, '-"- no correlation

CS3491   **ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**   **L T P C**
                                                                                                      3 0 2 4

COURSE OBJECTIVES:
The main objectives of this course are to:
- Study about uninformed and Heuristic search techniques.
- Learn techniques for reasoning under uncertainty
- Introduce Machine Learning and supervised learning algorithms
- Study about ensembling and unsupervised learning algorithms
- Learn the basics of deep learning using neural networks

UNIT I   PROBLEM SOLVING   9
Introduction to AI - AI Applications - Problem solving agents – search algorithms – uninformed search strategies – Heuristic search strategies – Local search and optimization problems – adversarial search – constraint satisfaction problems (CSP)

UNIT II   PROBABILISTIC REASONING   9
Acting under uncertainty – Bayesian inference – naïve bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.

UNIT III   SUPERVISED LEARNING   9
Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random forests

UNIT IV   ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING   9
Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization

UNIT V NEURAL NETWORKS 9

Perceptron - Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

45 PERIODS

PRACTICAL EXERCISES: **30 PERIODS**
1. Implementation of Uninformed search algorithms (BFS, DFS)
2. Implementation of Informed search algorithms (A*, memory-bounded A*)
3. Implement naïve Bayes models
4. Implement Bayesian Networks
5. Build Regression models
6. Build decision trees and random forests
7. Build SVM models
8. Implement ensembling techniques
9. Implement clustering algorithms
10. Implement EM for Bayesian networks
11. Build simple NN models
12. Build deep learning NN models

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Use appropriate search algorithms for problem solving
CO2: Apply reasoning under uncertainty
CO3: Build supervised learning models
CO4: Build ensembling and unsupervised models
CO5: Build deep learning neural network models

TOTAL: 75 PERIODS

TEXT BOOKS:
1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.

REFERENCES:
1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Pearson Education,2007
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013 (http://nptel.ac.in/)
5. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
6. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition,1997.
7. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014
8. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.
9. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016

CO's-PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	3	3	-	-	-	-	1	3	3	3	1	2	2
2	1	1	1	3	1	-	-	-	1	2	1	3	2	3	2
3	2	1	2	1	1	-	-	-	2	1	1	3	1	1	1
4	3	1	3	1	-	-	-	-	2	1	2	1	2	2	2
5	3	1	1	2	2	-	-	-	3	1	2	3	2	1	2
AVg.	2	1	2	2	1	-	-	-	2	2	2	3	2	2	2

1 - low, 2 - medium, 3 - high, '-"- no correlation

CS3492	DATABASE MANAGEMENT SYSTEMS	L T P C
		3 0 0 3

COURSE OBJECTIVES:
- To learn the fundamentals of data models, relational algebra and SQL
- To represent a database system using ER diagrams and to learn normalization techniques
- To understand the fundamental concepts of transaction, concurrency and recovery processing
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design
- To have an introductory knowledge about the Distributed databases, NOSQL and database security

UNIT I   RELATIONAL DATABASES   10
Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL

UNIT II   DATABASE DESIGN   8
Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT III   TRANSACTIONS   9
Transaction Concepts – ACID Properties – Schedules – Serializability – Transaction support in SQL – Need for Concurrency – Concurrency control –Two Phase Locking- Timestamp – Multiversion – Validation and Snapshot isolation– Multiple Granularity locking – Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update – Shadow paging – ARIES Algorithm

UNIT IV   IMPLEMENTATION TECHNIQUES   9
RAID – File Organization – Organization of Records in Files – Data dictionary Storage – Column Oriented Storage– Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for Selection, Sorting and join operations – Query optimization using Heuristics - Cost Estimation.

UNIT V   ADVANCED TOPICS   9
Distributed Databases: Architecture, Data Storage, Transaction Processing, Query processing and optimization – NOSQL Databases: Introduction – CAP Theorem – Document Based systems – Key value Stores – Column Based Systems – Graph Databases. Database Security: Security issues – Access control based on privileges – Role Based access control – SQL Injection – Statistical Database security – Flow control – Encryption and Public Key infrastructures – Challenges

COURSE OUTCOMES:
Upon completion of this course, the students will be able to
CO1: Construct SQL Queries using relational algebra
CO2: Design database using ER model and normalize the database
CO3: Construct queries to handle transaction processing and maintain consistency of the database
CO4: Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database
CO5: Appraise how advanced databases differ from Relational Databases and find a suitable database for the given requirement.

TOTAL:45 PERIODS
TEXT BOOKS:
1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017

REFERENCES:
1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

CO's-PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	3	2	1	-	-	-	2	1	1	1	2	1	3
2	3	1	1	1	1	-	-	-	2	3	3	3	3	1	2
3	3	2	3	2	1	-	-	-	2	1	1	2	2	3	3
4	1	2	3	2	-	-	-	-	3	2	3	3	1	2	3
5	1	1	3	3	2	-	-	-	1	3	3	1	2	2	2
AVg.	2	2	3	2	1	-	-	-	2	2	2	2	2	2	3

1 - low, 2 - medium, 3 - high, '-"- no correlation

IT3401   **WEB ESSENTIALS**   **L T P C**
                                                                          3 0 2 4
COURSE OBJECTIVES:
- To comprehend and analyze the basic concepts of web programming and internet protocols.
- To describe how the client-server model of Internet programming works.
- To demonstrate the uses of scripting languages
- To write simple scripts for the creation of web sites

- To create database applications

UNIT I WEBSITE BASICS 9
Internet Overview - Fundamental computer network concepts - Web Protocols - URL – Domain Name- Web Browsers and Web Servers- Working principle of a Website –Creating a Website - Client-side and server-side scripting

UNIT II WEB DESIGNING 9
HTML – Form Elements - Input types and Media elements - CSS3 - Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Multiple Column Layout, User Interface.

UNIT III CLIENT-SIDE PROCESSING AND SCRIPTING 9
JavaScript Introduction – Variables and Data Types-Statements – Operators - Literals-Functions-Objects-Arrays-Built-in Objects- Regular Expression, Exceptions, Event handling, Validation - JavaScript Debuggers.

UNIT IV SERVER SIDE PROCESSING AND SCRIPTING – PHP 9
PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - File Uploading – Email Basics - Email with attachments - PHP and HTML - Simple PHP scripts - Databases with PHP

UNIT V SERVLETS AND DATABASE CONNECTIVITY 9
Servlets: Java Servlet Architecture – Servlet Life cycle- Form GET and POST actions -Sessions – Cookies – Database connectivity - JDBC
Creation of simple interactive applications - Simple database applications

45 PERIODS

PRACTICAL EXERCISES: **30 PERIODS**
1. Creation of interactive web sites - Design using HTML and authoring tools
2. Form validation using JavaScript
3. Creation of simple PHP scripts
4. Handling multimedia content in web sites
5. Write programs using Servlets:
    i. To invoke servlets from HTML forms
    ii. Session tracking using hidden form fields and Session tracking for a hit count
6. Creation of information retrieval system using web, PHP and MySQL
7. Creation of personal Information System

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO 1: Apply JavaScript, HTML and CSS effectively to create interactive and dynamic websites.
CO 2: Create simple PHP scripts
CO 3: Design and deploy simple web-applications.
CO 4: Create simple database applications.
CO 5: Handle multimedia components

TOTAL:75 PERIODS

TEXT BOOKS
1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'Reilly publishers, 2014.

2. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web - How to Program", 5th

   edition, Pearson Education, 2012.

REFERENCES:
1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2. James F. Kurose, "Computer Networking: A Top-Down Approach", Sixth Edition, Pearson Education, 2012
3. Steven Holzener , "PHP – The Complete Reference", 1st Edition, Mc-Graw Hill, 2017
4. Fritz Schneider, Thomas Powell , "JavaScript – The Complete Reference", 3rd Edition, Mc-Graw Hill Publishers, 2017
5. Bates, "Developing Web Applications", Wiley Publishers, 2006

CO's-PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	3	2	3	2	0	0	2	2	2	3	3	2	1
2	3	3	3	3	3	2	0	0	2	0	2	3	3	2	1
3	3	3	3	2	3	2	0	0	2	2	2	3	3	2	1
4	3	3	3	3	3	1	0	0	1	1	2	3	3	2	1
5	3	3	3	3	3	1	0	0	0	0	2	3	3	2	1
AVg.	3	3	3	3	3	2	0	0	2	1	2	3	3	2	1

1 - low, 2 - medium, 3 - high, '-"- no correlation

CS3451   **INTRODUCTION TO OPERATING SYSTEMS**   **L T P C**
                                                                            3 0 0 3

COURSE OBJECTIVES:
- To understand the basics and functions of operating systems.
- To understand processes and threads
- To analyze scheduling algorithms and process synchronization.
- To understand the concept of deadlocks.
- To analyze various memory management schemes.
- To be familiar with I/O management and file systems.
- To be familiar with the basics of virtual machines and Mobile OS like iOS and Android**.**

UNIT I   **INTRODUCTION**   **7**
Computer System - Elements and organization; Operating System Overview - Objectives and Functions - Evolution of Operating System; Operating System Structures – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods.

UNIT II   **PROCESS MANAGEMENT**   **11**
Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads - Multithread Models – Threading issues; Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization -

Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III   MEMORY MANAGEMENT   10
Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing.

UNIT IV   STORAGE MANAGEMENT   10
Mass Storage system – Disk Structure - Disk Scheduling and Management; File-System Interface - File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.

UNIT V   VIRTUAL MACHINES AND MOBILE OS   7
Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.

TOTAL:45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1 : Analyze various scheduling algorithms and process synchronization.
CO2 : Explain deadlock prevention and avoidance algorithms.
CO3 : Compare and contrast various memory management schemes.
CO4 : Explain the functionality of file systems, I/O systems, and Virtualization
CO5 : Compare iOS and Android Operating Systems.

TEXT BOOKS :
1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018.
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition,2022 New Delhi.

REFERENCES :
1. Ramaz Elmasri, A. Gil Carrick, David Levine, " Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.

CO's-PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	2	2	-	-	-	-	3	2	3	1	1	2	2
2	2	2	3	1	1	-	-	-	2	1	1	2	2	1	2
3	1	3	2	2	1	-	-	-	2	2	1	1	1	2	2
4	1	3	3	3	-	-	-	-	1	2	1	2	1	3	2
5	3	1	2	1	1	-	-	-	3	2	3	2	2	2	1
AVg.	2	2	2	2	1	-	-	-	2	2	2	2	1	2	**2**

1 - low, 2 - medium, 3 - high, '-"- no correlation

GE3451   **ENVIRONMENTAL SCIENCES AND SUSTAINABILITY**   **L T P C**
                                                                       2 0 0 2

COURSE OBJECTIVES:
- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

UNIT I   **ENVIRONMENT AND BIODIVERSITY**   **6**
Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT II   **ENVIRONMENTAL POLLUTION**   **9**
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts .

UNIT III   **RENEWABLE SOURCES OF ENERGY**   **6**
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT IV   **SUSTAINABILITY AND MANAGEMENT**   **6**
Development , GDP ,Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT V   **SUSTAINABILITY PRACTICES**   **6**
Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles-carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio-economical and technological change.

COURSE OUTCOMES:
CO1: To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
CO2:To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
CO3:To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
CO4:To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
CO5:To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

TEXT BOOKS:
1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCES :
1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38 . edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

CO's-PO's & PSO's MAPPING

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	-	-	-	2	3	-	-	-	-	2	-	-	-
2	3	2	-	-	-	3	3	-	-	-	-	2	-	-	-
3	3	-	1	-	-	2	2	-	-	-	-	2	-	-	-
4	3	2	1	1	-	2	2	-	-	-	-	2	-	-	-
5	3	2	1	-	-	2	2	-	-	-	-	1	-	-	-

| Avg. | 2.8 | 1.8 | 1 | 1 | - | 2.2 | 2.4 | - | - | - | - | 1.8 | - | - | - |

1 - low, 2 - medium, 3 - high, '-"- no correlation

NCC Credit Course Level 2*

NX3451   **(ARMY WING) NCC Credit Course Level - II**   **L T P C**
    3 0 0 3

PERSONALITY DEVELOPMENT   **9**
PD 3   Group Discussion: Change your mindset, Time Management, Social Skills   6
PD 5   Public Speaking   3

LEADERSHIP   **7**
L 2   Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty,
Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965   7

DISASTER MANAGEMENT   **13**
DM 1   Disaster Management Capsule: Organisation, Types of Disasters, Essential Services,
Assistance, Civil Defence Organisation   3
DM 2   Initiative Training, Organising Skills, Do's & Don't's,
    Natural Disasters, Man Made Disasters   9
DM 3   Fire Service & Fire Fighting   1

ENVIRONMENTAL AWARENESS & CONSERVATION   **3**
EA 1   Environmental Awareness and Conservation   3

GENERAL AWARENESS   **4**
GA 1   General Knowledge   4

ARMED FORCES   **6**
AF 1   Armed Forces, Army, CAPF, Police   6

ADVENTURE   **1**
AD 1   Introduction to Adventure Activities   1
BORDER & COASTAL AREAS   **2**
BCA 1   History, Geography & Topography of Border/Coastal areas   2

    TOTAL: 45 PERIODS

NCC Credit Course Level 2*

NX3452   **(NAVAL WING) NCC Credit Course Level - II**   **L T P C**
    3 0 0 3

PERSONALITY DEVELOPMENT   **9**
PD 3   Group Discussion: Change your mindset, Time Management, Social Skills   6
PD 5   Public Speaking   3

LEADERSHIP   **7**

L 2   Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty,
           Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965   7

DISASTER MANAGEMENT   **13**

DM 1   Disaster Management Capsule: Organisation, Types of Disasters, Essential Services,
Assistance, Civil Defence Organisation   3
DM 2   Initiative Training, Organising Skills, Do's & Don't's,
Natural Disasters, Man Made Disasters   9
DM 3   Fire Service & Fire Fighting   1

ENVIRONMENTAL AWARENESS & CONSERVATION   **3**

EA 1   Environmental Awareness and Conservation   3

GENERAL AWARENESS   **4**

GA 1   General Knowledge   4

NAVAL ORIENTATION   **6**

AF 1   Armed Forces and Navy Capsule   3
EEZ 1   EEZ Maritime Security and ICG   3

ADVENTURE   **1**

AD 1   Introduction to Adventure Activities   1

BORDER & COASTAL AREAS   **2**

BCA 1   History, Geography & Topography of Border/Coastal areas   2

                                                                            TOTAL: 45 PERIODS

NCC Credit Course Level 2*
NX3453   (AIR FORCE WING) NCC Credit Course Level - II   **L T P C**
                                                                                        3 0 0 3

PERSONALITY DEVELOPMENT   **9**

PD 3   Group Discussion: Change your mindset, Time Management, Social Skills   6
PD 5   Public Speaking   3

LEADERSHIP   **7**

L 2   Case Studies: APJ Abdul Kalam, Deepa Malik, Maharana Pratap, N Narayan Murty,
Ratan Tata, Rabindra Nath Tagore, Role of NCC cadets in 1965   7

DISASTER MANAGEMENT   **13**

DM 1   Disaster Management Capsule: Organisation, Types of Disasters, Essential Services,
Assistance, Civil Defence Organisation   3
DM 2   Initiative Training, Organising Skills, Do's & Don't's,
Natural Disasters, Man Made Disasters   9
DM 3   Fire Service & Fire Fighting   1

ENVIRONMENTAL AWARENESS & CONSERVATION | 3
EA 1   Environmental Awareness and Conservation   3

GENERAL AWARENESS | 4
GA 1   General Knowledge   4

GENERAL SERVICE KNOWLEDGE | 6
GSK 1   Armed Forces & IAF Capsule   2
GSK 2   Modes of Entry in IAF, Civil Aviation   2
GSK 3   Aircrafts - Types, Capabilities & Role   2

ADVENTURE | 1
AD 1   Introduction to Adventure Activities   1

BORDER & COASTAL AREAS | 2
BCA 1   History, Geography & Topography of Border/Coastal areas   2

TOTAL: 45 PERIODS

CS3461   **OPERATING SYSTEMS LABORATORY**   **L   T   P   C**
     0   0   3   1.5

COURSE OBJECTIVES:

- To install windows operating systems.
- To understand the basics of Unix command and shell programming.
- To implement various CPU scheduling algorithms.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To implement Page Replacement Algorithms
- To implement various memory allocation methods.
- To be familiar with File Organization and File Allocation Strategies.

LIST OF EXPERIMENTS:

1. Installation of windows operating system

2. Illustrate UNIX commands and Shell Programming

3. Process Management using System Calls : Fork, Exit, Getpid, Wait, Close

4. Write C programs to implement the various CPU Scheduling Algorithms

5. Illustrate the inter process communication strategy

6. Implement mutual exclusion by Semaphore

7. Write C programs to avoid Deadlock using Banker's Algorithm

8. Write a C program to Implement Deadlock Detection Algorithm

9. Write C program to implement Threading

10. Implement the paging Technique using C program

11. Write C programs to implement the following Memory Allocation Methods

         a. First Fit   b. Worst Fit   c. Best Fit

12. Write C programs to implement the various Page Replacement Algorithms

13. Write C programs to Implement the various File Organization Techniques

14. Implement the following File Allocation Strategies using C programs

      a. Sequential   b. Indexed   c. Linked

15. Write C programs for the implementation of various disk scheduling algorithms
16. Install any guest operating system like Linux using VMware.

TOTAL:45 PERIODS

COURSE OUTCOMES:
At th end of this course, the students will be able to:
   CO1 : Define and implement UNIX Commands.
   CO2 : Compare the performance of various CPU Scheduling Algorithms.
   CO3 : Compare and contrast various Memory Allocation Methods.
   CO4 : Define File Organization and File Allocation Strategies.
   CO5 : Implement various Disk Scheduling Algorithms.

CO's-PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	1	3	1	1	-	-	-	1	3	3	3	2	1	3
2	3	1	1	2	2	-	-	-	3	2	1	1	3	1	2
3	3	3	2	1	2	-	-	-	3	3	1	2	2	2	2
4	1	2	2	3	2	-	-	-	3	1	3	1	1	2	1
5	2	2	1	1	3	-	-	-	1	2	2	3	1	3	3
AVg.	2	2	2	2	2	-	-	-	2	2	2	2	2	2	**2**

1 - low, 2 - medium, 3 - high, '-"- no correlation

CS3481   **DATABASE MANAGEMENT SYSTEMS LABORATORY**   **L T P C**
                                                                0 0 3 1.5

COURSE OBJECTIVES:
- To learn and implement important commands in SQL.
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To be familiar with the use of a front end tool for GUI based application development.

LIST OF EXPERIMENTS:
1. Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create a set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.
5. Query the database tables and explore natural, equi and outer joins.
6. Write user defined functions and stored procedures in SQL.
7. Execute complex transactions and realize DCL and TCL commands.

8. Write SQL Triggers for insert, delete, and update operations in a database table.
9. Create View and index for database tables with a large number of records.
10. Create an XML database and validate it using XML schema.
11. Create Document, column and graph based data using NOSQL database tools.
12. Develop a simple GUI based database application and incorporate all the above-mentioned features
13. Case Study using any of the real life database applications from the following list
    a) Inventory Management for a EMart Grocery Shop
    b) Society Financial Management
    c) Cop Friendly App – Eseva
    d) Property Management – eMall
    e) Star Small and Medium Banking and Finance
        • Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.
        • Apply Normalization rules in designing the tables in scope.
        • Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features.
        • Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.
● Ability to showcase ACID Properties with sample queries with appropriate settings

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Create databases with different types of key constraints.
CO2: Construct simple and complex SQL queries using DML and DCL commands.
CO3: Use advanced features such as stored procedures and triggers and incorporate in GUI based application development.
CO4: Create an XML database and validate with meta-data (XML schema).
CO5: Create and manipulate data using NOSQL database.

CO's-PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	3	-	-	-	-	3	1	3	2	2	3	2
2	2	2	3	2	2	-	-	1	2	3	3	2	1	2
3	3	3	2	1	1	-	-	1	1	1	3	2	3	3
4	1	3	3	3	1	-	-	-	1	1	3	2	3	1	3
5	3	2	1	1	1	-	-	-	2	2	3	1	3	1	2
AVg.	2	3	2	2	1	-	-	-	2	1	3	2	2	2	2

 1 - low, 2 - medium, 3 - high, '-"- no correlation

CS3591   **COMPUTER NETWORKS**   **L T   P C**
                                                                       3 0 2 4

COURSE OBJECTIVES:
    • To understand the concept of layering in networks.
    • To know the functions of protocols of each layer of TCP/IP protocol suite.
    • To visualize the end-to-end flow of information.