SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA3354	Discrete Mathematics	BSC	3	1	0	4	4
2.	CS3351	Digital Principles and Computer Organization	ESC	3	0	2	5	4
3.	CS3352	Foundations of Data Science	PCC	3	0	0	3	3
4.	CD3291	Data Structures and Algorithms	PCC	3	0	0	3	3
5.	CS3391	Object Oriented Programming	PCC	3	0	0	3	3
PRACTICALS								
6.	CD3281	Data Structures and Algorithms Laboratory	PCC	0	0	4	4	2
7.	CS3381	Object Oriented Programming Laboratory	PCC	0	0	3	3	1.5
8.	CS3361	Data Science Laboratory	PCC	0	0	4	4	2
9.	GE3361	Professional Development[$]	EEC	0	0	2	2	1
			TOTAL	**15**	**1**	**15**	**31**	**23.5**

[$] Skill Based Course

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	CS3452	Theory of Computation	PCC	3	0	0	3	3
2.	CS3491	Artificial Intelligence and Machine Learning	PCC	3	0	2	5	4
3.	CS3492	Database Management Systems	PCC	3	0	0	3	3
4.	IT3401	Web Essentials	PCC	3	0	2	5	4
5.	CS3451	Introduction to Operating Systems	PCC	3	0	0	3	3
6.	GE3451	Environmental Sciences and Sustainability	BSC	2	0	0	2	2
7.		NCC Credit Course Level 2[#]	-	3	0	0	3	3 [#]
PRACTICALS								
8.	CS3461	Operating Systems Laboratory	PCC	0	0	3	3	1.5
9.	CS3481	Database Management Systems Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**20**	**0**	**10**	**30**	**22**

[#] NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

CS3361	DATA SCIENCE LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To understand the python libraries for data science
- To understand the basic Statistical and Probability measures for data science.
- To learn descriptive analytics on the benchmark data sets.
- To apply correlation and regression analytics on standard data sets.
- To present and interpret data using visualization packages in Python.

LIST OF EXPERIMENTS:

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
2. Working with Numpy arrays
3. Working with Pandas data frames
4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
    a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
    b. Bivariate analysis: Linear and logistic regression modeling
    c. Multiple Regression analysis
    d. Also compare the results of the above analysis for the two data sets.
6. Apply and explore various plotting functions on UCI data sets.
    a. Normal curves
    b. Density and contour plots
    c. Correlation and scatter plots
    d. Histograms
    e. Three dimensional plotting
7. Visualizing Geographic Data with Basemap

List of Equipments:(30 Students per Batch)

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

Note: Example data sets like: UCI, Iris, Pima Indians Diabetes etc.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of this course, the students will be able to:

CO1: Make use of the python libraries for data science

CO2: Make use of the basic Statistical and Probability measures for data science.

CO3: Perform descriptive analytics on the benchmark data sets.

CO4: Perform correlation and regression analytics on standard data sets

CO5: Present and interpret data using visualization packages in Python.

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.

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

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

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.

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

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.

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

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.

TOTAL: 30 PERIODS

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.

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.

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

List of Equipments:(30 Students per Batch)
MYSQL / SQL : 30 Users

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.