BansilalRamnathAgarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Curriculum for

T.Y.B.Tech.

(Pattern 2018)

Department of Information Technology

Vision and Mission of the Department

- **Vision**

"To create professionally competent and globally acceptable IT engineers with social awareness".

- **Mission**
  - Educating budding engineers for, **industry, academia, research** and **entrepreneurial** pursuit through rigorous implementation of IT curriculum
  - Inculcating IT skills to develop **innovative solutions** relevant to **global issues**
  - **Imparting values** to practice social and **professional ethics.**

Program Specific Outcomes (PSOs)

At the end of program, students should be able to

- **PSO a:** An ability to understand, analyze and develop computer programs in the areas related to algorithms, web development and database management
- **PSO b:** An ability to apply knowledge of software engineering principles and practices for multidisciplinary applications to meet the needs of the industry and society

Program Outcomes (POs)

At the end of the program, students should be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safetyand the cultural, social and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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T.Y.B.Tech.

2018 Pattern

Syllabus Structure

BansilalRamnathAgarwal Charitable Trust's

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Department of Information Technology

Third Year B. Tech. Information Technology (TYBT) - Semester V (Pattern 2018)

Course Code	Course		Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	CIE	ISE	SCE	ESE	PR/OR/TW		
ITUA31181	Database Management System*	TH	3	-	2	20	30	20	30	25	125	4
ITUA31182	Operating System *	TH	3	-	2	20	30	20	30	25	125	4
ITUA31183	Theory of Computation	TH	3	-	-	20	30	20	30	-	100	3
ES31184IT	Laws & Ethics for Engineer	TH	3	-	-	20	30	20	30	-	100	3
ITUA31185	Professional Elective-I	TH	3	-	2	20	30	20	30	25	125	4
ITUA31186	Object Oriented System Design	CE	2	-	2	-	-	50	-	25	75	3
M3	Mandatory course	AU	-	-	-	-	-	-	-	-	-	-
	Total	**-**	**17**	**-**	**8**	**100**	**150**	**150**	**150**	**100**	**650**	**21**

Theory: 1Hr. = 1 Credit, Practical: 2Hrs. = 1 Credit, 1 Hr. = 1 Credit, Mandatory course: No Credit

Professional Elective – I: ITUA31185A Artificial Intelligence

ITUA31185B Internet of Things

ITUA31185C Computer Graphics

Mandatory Courses: Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge.

BoS Chairman **Dean Academics** **Director**

V.I.I.T. PUNE-48.

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Vishwakarma Institute of Information Technology, Pune-48

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Department of Information Technology

Third Year B. Tech. Information Technology (TYBT) - Semester VI (Pattern 2018)

Course Code	Course		Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	CIE	ISE	SCE	ESE	PR/OR/TW		
ITUA32181	Professional Elective-II	TH	3	-	2	20	30	20	30	25	125	4
ITUA32182	Professional Elective-III	TH	3	-	2	20	30	20	30	25	125	4
ITUA32183	Design and Analysis of Algorithms*	TH	3	-	2	20	30	20	30	25	125	4
ITUA32184	System Programming	TH	3	-	-	20	30	20	30	-	100	3
IOEUA32185	Open Elective-I	TH	3	-	-	20	30	20	30	-	100	3
ITUA32186	Employability Skills (Mobile App. Development)	CE	2	-	2	-	-	50	-	25	75	3
M3	Mandatory Course	AU	-	-	-	-	-	-	-	-	-	-
	Total	**-**	**17**	**-**	**8**	**100**	**150**	**150**	**150**	**100**	**650**	**21**

Theory: 1Hr. = 1 Credit, Practical: 2Hrs. = 1 Credit, 1 Hr. = 1 Credit, Mandatory course: No Credit

Professional Elective-II:

ITUA32181A Machine Learning

ITUA32181B Information and Network Security System

ITUA32181C Multimedia Technologies

Professional Elective - III:

ITUA32182AHuman Computer Interaction

ITUA32182B Advance Operating

ITUA32182C Advance Database Management system

Open Elective-I:

IOEUA32185A Information and Cyber Security

IOEUA32185B Automotive Electronics

IOEUA32185C Industrial Engineering Analytics

IOEUA32185D Artificial Neural Network in Engineering

IOEUA32185E Social Media

Mandatory Courses: Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge

BoS Chairman **Dean Academics** **Director**

V.I.I.T. PUNE-48.

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T.Y.B.Tech.

2018 Pattern

Semester - V

Syllabus Curriculum

BansilalRamnathAgarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

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Department of Information Technology

Database Management System (ITUA31181)

Teaching Scheme	**Examination Scheme**						
Credits: 4 Lecture (L): 3 hrs./week Tutorial (T): 2hr. Practical (P): 2hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	25	-	125

Prerequisite course(s): Discrete Mathematics, Data Structure & Files

Course Objective(s):

- To understand the fundamental concepts of database management.
- To provide a strong formal foundation in database concepts, technology.
- To give systematic database design approaches covering conceptual design, logical design and an overview of physical design.
- To learn basic issues of transaction management and concurrency control.
- To learn and understand various Database Architectures and Applications.
- To learn a powerful, flexible and scalable general purpose database to handle big data

Course Outcomes:

Upon completion of the course, students will be able to

1. Understand and Design E-R Model for given requirements and convert the same into database tables.
2. Apply database techniques such as SQL & PL/SQL
3. Demonstrate database design concept such as normalization.
4. Demonstrate transaction management techniques in relational database System.
5. Understand different database architectures in real time environment.
6. Apply advanced database Programming concepts in Big Data.
7. Design and develop a database application system as part of a team.

Unit I – Introduction to DBMS

Introduction to Database Management Systems, Advantages of a DBMS over file-processing Systems, Database-System purpose and applications, Levels of Database Systems, Database Languages, Data Models, Components of a DBMS and overall structure of a DBMS, Database Design and ER Model: Entity, Attributes, Relationships, Constraints, types of Keys, Design Process, Entity Relationship Model, ER Diagram, Design Issues, Extended E-R Features, converting E-R & EER diagram into tables.

Unit II -Relational Algebra, SQL and PL/SQL

Introduction to Relational Algebra and Calculus, SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, DCL, TCL, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updating using Views, Indexes, SQL DML Queries: SELECT Query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries. PL/SQL:

Concept of Stored Procedures and Functions, Cursors, Triggers, Roles and Privileges, Embedded SQL, Dynamic SQL.

Unit III – Relational Database Design

Relational Model: Basic concepts, Attributes and Domains, CODD's Rules, Functional Dependencies: Basic concepts, closure of set of functional dependencies, closure of attribute set,canonical cover, Decomposition: lossless join decomposition and dependency preservation, The Process of normalization, 1NF, 2NF, 3NF ,BCNF, 4NF, 5NF.

Unit IV - Database Transactions and Query Processing

Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Testing conflict and view serializability, Recoverable and Non-recoverable Schedules, Concurrency Control: Need, Locking Methods, Deadlocks, Time stamping Methods, Different Crash Recovery methods such as Shadow-Paging and Log-Based Recovery: Deferred and Immediate, Checkpoints, Introduction to Query Processing and Query Optimization, Performance Tuning in SQL

Unit V – Database architecture

Introduction to Database Architectures: Multi-user DBMS Architectures, Parallel Databases: Speedup and Scale up, Architectures of Parallel Databases. Distributed Databases: Architecture of Distributed Databases, Distributed Database Design, Distributed Data Storage, Distributed Transaction: Basics, Failure modes, Commit Protocols, Concurrency Control in Distributed Database.

Unit VI - Advances in Databases and Big Data

Introduction to Database Architectures: Multi-user DBMS Architectures, Parallel Databases: Speedup and Scale up, Architectures of Parallel Databases. Distributed Databases: Architecture of Distributed Databases, Distributed Database Design, Distributed Data Storage, Distributed Transaction: Basics, Failure modes, Commit Protocols, Concurrency Control in Distributed Database.

Textbooks:

1. Abraham Silberschatz ,Henry Korth , S.Sudarshan,"Database System concepts",5 th Edition, McGraw Hill International Edition.
2. Elmasri R., Navathe S., "Fundamentals of Database Systems", 4* Edition, Pearson Education, 2003, ISBN 8129702282.
3. Pramod J. Sadalage and Martin Fowler, ―NoSQL Distilled‖, Addison Wesley, ISBN10: 0321826620, ISBN-13: 978-0321826626
4. "Managing and Using MySQL", Reese G., Yarger R., King T., Williums H, 2nd Edition, Shroff Publishers and Distributors Pvt. Ltd., ISBN 81 - 7366 - 465 – X
5. MongoDB: The Definitive Guide by Kristina Chodorow

Reference Books:

1. Ramkrishna R., Gehrke J., "Database Management Systems", 3rd Edition, McGraw-Hill, 2003, ISBN 0-07- 123151 –X.
2. C J Date, ―An Introduction to Database Systems‖, Addison-Wesley, ISBN: 0201144719 Connally T., Begg C., "Database Systems", 3rd Edition, Pearson Education, 2002, ISBN 81-7808-861-4
3. MongoDB , O'Reilly Publications.
4. Hadoop, O'Reilly Publications.http://docs.mongodb.org/manual.

Assignments : Database Management System Laboratory	
Part-I: SQL and PL/SQL	
1	Design any database with at least 3 entities and relationships between them. Apply DCL and DDL commands. Draw suitable ER/EER diagram for the system.
2	Design and implement a database and apply at least 10 different DML queries for the following task. For a given input string display only those records which match the given pattern or a phrase in the search string. Make use of wild characters and LIKE operator for the same. Make use of Boolean and arithmetic operators wherever necessary.
3	Execute the aggregate functions like count, sum, avg etc. on the suitable database. Make use of built in functions according to the need of the database chosen. Retrieve the data from the database based on time and date functions like now (), date (), day (), time () etc. Use group by and having clauses.
4	Implement nested sub queries. Perform a test for set membership (in, not in), set comparison (<some, >=some, <all etc.) and set cardinality (unique, not unique).
5	Write and execute suitable database triggers .Consider row level and statement level triggers.
6	Write and execute PL/SQL stored procedure and function to perform a suitable task on the database. Demonstrate its use.
7	Write a PL/SQL block to implement all types of cursor.
8	Execute DDL statements which demonstrate the use of views. Try to update the base table using its corresponding view. Also consider restrictions on updatable views and perform view creation from multiple tables.

Part-II: Mini Project / Database Application Development
Student group of size 3 to 4 students should decide the statement and scope of the project which will be refined and validated by the faculty considering number of students in the group. Draw and normalize the design up to at ER Diagram least 3NF in case of back end as RDBMS. Suggested Directions for development of the mini project. ● Build a suitable GUI by using forms and placing the controls on it for any application. (E.g Student registration for admission, railway reservation, online ticket booking etc.). Proper data entry validations are expected. ● Develop two tier architecture and use ODBC/JDBC connections to store and retrieve data from the database. Make a user friendly interface for system interaction. You may consider any applications like employee management system, library management system etc. Implement the basic CRUD operations and execute a transaction that ensures ACID properties. Make use of commands like commit, save point, and rollback. You may use examples like transfer of money from one account to another, cancellation of e-tickets etc.

Operating System (ITUA31182)

Teaching Scheme	Examination Scheme						
Credits: 4 Lecture (L): 3 hrs./week Tutorial (T): 2hr. Practical (P): 2hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	25	-	125

Prerequisites: Computer Organization and Architecture, Fundamentals of Data Structures.

Course Objectives :

- To introduce basic concepts and functions of modern operating systems.
- To understand the concept of process and thread management.
- To understand the scheduling of processes and threads & understand the concept of concurrency control.
- To understand the concept of I/O and File management.
- To understand various Memory Management techniques.
- To study and understand compiler design

Course Outcomes :

After studying this course, students will be able to:

1. Understand of the role of Operating Systems in Computer System.
2. Understand & implement the concept of a process and thread.
3. Demonstrate the concept of process/threads, process synchronization, mutual exclusion and the deadlock.
4. Realize the concept of I/O management and File system.
5. Understand the various memory management techniques.
6. Understand Linux Operating System.

Unit I-Overview of Operating System

Operating System Objectives and Functions, The Evolution of Operating Systems, Developments Leading to Modern Operating Systems, Virtual Machines. BASH Shell scripting: Basic shell commands, shell as a scripting language.

Unit II- Process Description and Control

Process: Concept of a Process, Process States, Process Description, Process Control (Process creation, Waiting for the process/processes, Loading programs into processes and Process Termination), Execution of the Operating System. Threads: Processes and Threads, Concept of Multithreading, Types of Threads, Thread programming Using Pthreads. Scheduling: Types of Scheduling, Scheduling Algorithms, and Thread Scheduling.

Unit III- Concurrency Control

Process/thread Synchronization and Mutual Exclusion: Principles of Concurrency, Requirements for Mutual Exclusion, Mutual Exclusion: Hardware Support, Operating System Support (Semaphores and

Mutex), Programming Language Support (Monitors). Classical synchronization problems: Readers/Writers Problem, Producer and Consumer problem, Interprocess communication (Pipes, shared memory: system V). Deadlock: Principles of Deadlock, Deadlock Modeling, Strategies to deal with deadlock: The Ostrich Algorithm, Deadlock Prevention, Deadlock Avoidance, Deadlock detection and recovery, An Integrated Deadlock Strategy, Example: Dining Philosophers Problem.
Unit IV- Memory Management
Memory Management: Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Segmentation. Virtual Memory: Hardware and Control Structures, Operating System Software.
Unit V-Input / Output And File Management
I/O Management and Disk Scheduling: I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling(FIFO, SSTF, SCAN, C-SCAN, LOOK, C-LOOK), Disk Cache. File Management: Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management.
Unit VI – Study of Linux Operating System
Linux Design Principles, Linux Booting Process, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output, Inter-process Communication.

Text books :	1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, ISBN-10: 0-13- 380591-3, ISBN-13: 978-0-13-380591-8, 8th Edition 2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, WILEY, ISBN 978-1-118-06333-0 , 9th Edition 3. Andrew S. Tanenbaum & Herbert Bos, Modern Operating System, Pearson, ISBN-13: 9780133592221, 4th Edition 4. D. M. Dhamdhere, Systems Programming and Operating Systems, Tata McGraw-Hill, ISBN 13:978-0-07-463579-7, Second Revised Edition.
Reference Books :	1. Tom Adelstein and Bill Lubanovic, Linux System Administration, O'Reilly Media, ISBN-10: 0596009526, ISBN-13: 978-0596009526 2. Harvey M. Deitel, Operating Systems, Prentice Hall, ISBN-10: 0131828274, ISBN-13: 978-0131828278 3. Thomas W. Doeppner, Operating System in depth: Design and Programming, WILEY, ISBN: 978-0- 471-68723-8

Assignments : Operating System Laboratory	
1	Shell programming Write a program to implement an address book with options given below: a) Create address book. b) View address book. c) Insert a record. d) Delete a record. e) Modify a record. f) Exit.
2	Process control system calls: The demonstration of *FORK*, EXECVE and *WAIT* system calls along with zombie and orphan states. Implement the C program in which main program accepts an integer array. Main program uses the *FORK* system call to create a new process called a child process. Parent process sorts an integer array and passes the sorted array to child process through the command line arguments of *EXECVE* system call. The child process uses *EXECVE* system call to load new program that uses this sorted array for performing the binary search to search the particular item in the array.
3	Thread management using pthread library. Implement matrix multiplication using multithreading. Application should have pthread_create, pthread_join, pthread_exit. In the program, every thread must return the value and must be collected in pthread_join in the main function. Final sum of row column multiplication must be done by main thread (main function).
4	Thread synchronization using counting semaphores and mutual exclusion using mutex. Application to demonstrate: producer-consumer problem with counting semaphores and mutex.
5	Reader Writer Problem solution with Mutex , Semaphore.
6	Deadlock Avoidance Using Semaphores: Implement the deadlock-free solution to Dining Philosophers problem to illustrate the problem of deadlock and/or starvation that can occur when many synchronized threads are competing for limited resources.
7	Inter process communication in Linux using following. a. **Pipes: Full** duplex communication between parent and child processes. Parent process writes a pathname of a file (the contents of the file are desired) on one pipe to be read by child process and child process writes the contents of the file on second pipe to be read by parent process and displays on standard output.
8	Inter-process Communication using Shared Memory using System V. Application to demonstrate: Client and Server Programs in which server process creates a shared memory segment and writes the message to the shared memory segment. Client process reads the message from the shared memory segment and displays it to the screen.
	***All assignments to be implemented using C++ on Linux platform.**

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Department of Information Technology

Theory of Computation (ITUA31183)

Teaching Scheme	Examination Scheme						
Credits: 3 Lecture (L): 3 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	-	100

Prerequisites : Basic Mathematics, Discrete Structure

Course Objectives :

- Understand fundamentals of computer mathematics.
- Study the various abstract computing models.
- Study the Regular expression.
- Study the different types of languages& their relationships.
- Study the different types of grammar & ambiguity in the grammar
- Study the recursive & recursively enumerable languages.

Course Outcomes :

After completion of the course, student will be able to :

1. Use the mathematical preliminaries with the help of proofs and lemmas for language derivation.
2. Understand Regular expression, its conversion to automata and its applications.
3. Understand different types of languages, grammars and removal of ambiguity in the grammar.
4. Construct pushdown automata for formal language and its applications.
5. Understand the concept of language acceptability by Turing machine and types of Turing machine.
6. Understand the recursive & recursively enumerable languages.

Unit I - Theory of Automata:

Basic Mathematical Objects: Sets, Logic, functions, Relations, Strings.
Definition of Finite Automata (FA), Description of FA, Transition Systems, Acceptability of a String by a FA, Non deterministic FA, Equivalence of DFA and NFA, FA with output: Moore and Mealy machines-Definitions, Models, inter-conversion, minimization of FA.

Unit II - Regular Expressions (RE) and Languages

Recursive definition of regular expression, regular set, identities of regular expressions, Conversion of NFA With epsilon moves to DFA, Conversion-RE to DFA , Conversion-DFA to RE, Equivalence of R.E, Equivalence of FA, Pumping lemma for regular languages, Closure properties of regular languages, Applications of R.E

Unit III – Grammar

Grammar- Definition, representation of grammar, Chomsky hierarchy, Context Free Grammar-Definition, Derivation, sentential form, parse tree, inference, derivation, parse tree, ambiguity in grammar and language, Simplifications of context free Grammar-Eliminating unit productions, useless symbols, and Null-productions, Normal Forms for CFG- Chomsky normal form, Greibach normal form .

Regular Grammar- Definition, left linear, right linear grammar, Inter conversion between left linear and right linear regular grammar	
Unit IV - Push Down Automata	
Push Down Automata- Definition, Notation, acceptance by final state, acceptance by empty stack, Equivalence of PDA and CFG- Grammar to PDA, PDA to Grammar, Deterministic PDA and Non Deterministic PDA. Closure Properties of CFLs.	
Unit V – Turing machines	
Turing machine Model, Representation of Turing machine, Language acceptability by Turing machine, Design of Turing machine, Types of TM, Halting Problem	
Unit VI - Recursively Enumerable Languages	
Recursively Enumerable and Recursive, Properties of recursive and recursively enumerable languages, Post correspondence problem, **Undecidability:** Reducing one problem to another, Other unsolvable Problems. Tractable and In Tractable Problems	
Text books :	1. Mishra K., Chandrasekaran N., 'Theory of Computer Science (Automata, Languages and Computation)", Second Edition, Prentice Hall of India 2. John C Martin. "Introduction to Language and Theory of Computation", Third edition, Tata McGraw- Hill.
Reference Books :	1. Hopcroft J., Motwani R., Ullman J., "Introduction to Automata Theory, Languages and Computations", Third edition, Pearson Education Asia.

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Department of Information Technology

Laws & Ethics for Engineer (ES31184IT)

Teaching Scheme	**Examination Scheme**						
Credits: 3 Lecture (L): 3 hrs./week Practicals/week: 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	-	100

Prerequisites :NA

Course Objectives :

- Awareness about fundamental rights and human rights.
- Profound Knowledge about intellectual property law.
- Educate about right to information and gender inequality.
- Realization of labour and Corporate law
- Ethical issues for engineers.

Course Outcomes :

After completion of the course, student will be able to :

1. Understand fundamental and human rights.
2. Comprehend intellectual Property law.
3. Realize importance of right to information and gender inequality.
4. Understand labour and corporate law.
5. Understand fundamental concept in engineering ethics.
6. Understand the responsibilities of Engineers to environment.

Unit I – Fundamental Rights& Human Rights:

Constitutional Law - the Preamble; Fundamental Rights - Life and Personal Liberty with reference to Judicial Activism; Directive principles of State policy; Relationship between Fundamental rights and Directive Principle; Enforcement of rights, Fundamental Duties;
International Human Rights Instruments – UDHR, ICCPR, ICESCR
Human Rights Enforcement mechanism in India – Human Rights Act including National and State Human Rights Commission and their role

Unit II -Intellectual Property Law

Intellectual Property Law - Meaning and Definition of Intellectual property, Types of IP- Copyright, Trademarks, Patents, Undisclosed Information or Trade Secrets and Industrial Designs, Layouts and Integrated circuits, Other new forms such as plant varieties and geographical indications;
International instruments on IP -Conventions-Bern, Rome, Paris and TRIPS, International organizations relating IPRs, WIPO, WTO etc;
Laws in India- Copy Rights Act, 1957–meaning, works that can be copyrighted including computer Programmes (difference between Indian and US law), Infringement and remedies;
Trademark Act, 1999 – Trademarks Registration, procedures, Distinction between trademark and property mark, Doctrine of deceptive similarity, Passing off an infringement and remedies, Patents Act,

1970 – Patentable and Non-Patentable subject matters- difference between invention and discovery, infringement and remedies.
Unit III – Right to Information and Gender Inequality:
Right to Information Act, 2005 - Evolution and concept; Procedures; RTI and relevant provisions of - Official Secret Act, 1923, Indian Evidence Act, 1872, Information Technology Act 2000– data protection and right to privacy Gender Studies - Meaning of Gender-international and national perspective, international legal frameworks and institutions; National perspective - Laws relating to women in India; National and State Women Commission, Judicial approach and responses(landmark cases)
Unit IV - Labour Laws & Corporate Law
Labour Laws- Industrial Disputes Act, 1947- definition of Industry, dispute settlement mechanism, Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923. Corporate Law - Meaning of company – company as a person; Types of Companies, The Company Act, 2013, Corporate liability - civil and criminal.
Unit V –Introduction
Introduction to ethical reasoning and professional ethics, Professional practices in ethics, Central professional responsibility, workplace right and responsibility, Ethics as design doing justice to moral problem.
Unit VI –Ethics for Engineer's
Responsibility to environment, Engineer as social experimentation, Research ethics, Engineer as manager, leader and consultant.

Text books :	1. D.D. Basu (1996), Shorter Constitution of India, Prentice Hall of India 2. P. S. Narayan (2000), Intellectual Property Rights, Gogia Law Agency 3. Bare text (2005), Right to Information Act. 4. Agnes Flavia(1999), Law and Gender Inequality - The Politics of Women's Rights in India, OU Press. 5. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act
Reference Books :	1. M.P. Singh (1998), Constitutional Law of India, Eastern Book Co. 2. Agarwal H.O.(2008), International Law and Human Rights, Central Law Publications. 3. Cornish W. R. (2008), Intellectual Property Rights, Patents, Trademarks, Copyrights & Allied Rights, Sweet & Maxwell. 4. Shobha Saxena, Crimes against Women and Protective Laws, Deep & Deep Publications. 5. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers

Professional Elective-I (ITUA31185)
Artificial Intelligence (ITUA31185A)

Teaching Scheme	**Examination Scheme**						
Credits: 4 Lecture (L): 3 hrs./week Practicals/week: 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisites : Discrete Mathematics, Data Structures, basic probability theory and statistics, Knowledge of any programming language

Course Objectives :

- To understand the various characteristics of Intelligent agents and AI domain.
- To learn the different search strategies in AI.
- To learn how to represent knowledge in solving AI problems.
- To introduce the concepts of Expert Systems and Machine Learning.
- To know about the various applications of AI.

Course Outcomes :

After completion of the course, students will be able to:

1. Understand different types of AI Agents and environment.
2. Apply various AI search algorithms to typical AI problems.
3. Understand fundamentals of knowledge representation and planning.
4. Explain working knowledge of reasoning in presence of incomplete and or uncertain information.
5. Design the Expert Systems, Game development, NLP.
6. Explore the Applied AI in various fields.

Unit I – Introduction To AI And Intelligent Agents

Introduction–Human Intelligence, comparison between Man and Machine,
Definition -The Turing Test – Characteristics of Intelligent Agents–Typical Intelligent Agents – Environment, Environment Types, Problem Solving Approach to Typical AI problems, Domains of AI, Brief of Application of AI. Introduction to Basic concept of Machine Learning (ML), Deep Learning (DL)and Data Science.(DS). AI vs ML vs DL vs DS,
Case Study- 1 : AI for everyone/ Building AI Projects
Case Study- 2 : AI and Society / Ethics for AI

Unit II - Heuristics Search And Game Playing

Defining the problem as a state space search, problem characteristics,
Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search.
(**Uninformed Search Strategies:** Breadth-first search, Uniform-cost search, Depth-first search, depth-first search, **Informed (Heuristic) Search Strategies:** Greedy best first search, A* search, Minimizing the total estimated solution cost, Heuristic search techniques- Generate and test, Hill Climbing, Best-First Search, Constraint satisfaction problems (CSP),
Game Playing – Alpha Beta Pruning, Minimax search procedure.
Case Study - 3 : State of Art Game Programs and Analysis

Unit III – Knowledge Representation

Knowledge representation, Approach & Issues in knowledge representation, Structured representation of knowledge, Propositional logic, Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, First order logic, unification and lifting.
Weak-slot and filler structure, Strong slot and filler structures.

Unit IV - Knowledge Inference And Planning

Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster – Shafer theory.
Planning – Block world problem, components of a planning systems, Goal stack planning, Non-linear planning, Hierarchical planning, least commitment strategy

Unit V -Learning And Expert System

Definition of learning, Forms of learning, Rote learning, learning by taking advice, Learning in problem solving, Induction leaning, Explanation based learning, Formal learning theory. Connectionist models- learning in Neural network
Expert systems - Intelligent System Vs Expert system, Architecture of expert systems, Roles of expert systems - Knowledge Acquisition –Meta Expert systems shells, Typical expert systems - MYCIN, DART, XOON, RI,.

Unit VI- AI Applications And Advanced AI

Natural Language Processing- Introduction, Steps in the process, Spell checking, Language Models – Information Retrieval- Information Extraction - Machine Translation – Speech Recognition ,
Image formation, Image processing operations, Extracting 3D information, Object Recognition, Using visionfor manipulation and navigation.
Robot – Hardware – Perception – Planning – Moving
Case Study 4 : Applications of AI

Text books :	1. Artificial Intelligence: A Modern Approach by Peter and Norvig ISBN-0-13103805-2, Reference Books: 2. Artificial Intelligence by Elaine Rich, Kevin Knight and Nair ISBN-978-0-07008770-5, TMH 3. Artificial Intelligence by Patrick Henry Winston, Addison-Wesley Publishing Company,ISBN 0-201-53377-4
Reference Books :	1. Prolog Programming for A.I. by Bratko, TMH 3. Artificial Intelligence by Saroj Kausik ISBN:- 978-81-315-1099-5, Cengage Learning 2. Artificial Intelligence and Intelligent Systems by Padhy, Oxforfd University Press 3. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Education(India), 2013, ISBN : 978-1-25-902998-1 4. Deepak Khemani —Artificial Intelligence, Tata Mc Graw Hill Education 2013

Assignments : Professional Elective –I (AI) Laboratory	
1	Assignment on Heuristic Search Techniques: Implement Best first search (Best-Solution but not always optimal)
2	Implementation of A* algorithm (Always gives optimal solution) for solving Puzzle problems.
3	Implementation of MinMax Search Procedure with alpha beta pruning for finding the solutions of games.
4	Assignment on Constraint Satisfaction Problem: Implement graph coloring problem. **OR** Implementation of Constraint Satisfaction Problem for solving Crypt-arithmetic Problems.
5	Implementation of Unification algorithm by considering Resolution concept.
6	Mini-project on any one of the following concept (PBL): 1. Expert system 2. Game development 3. NLP 4. Solving problem with AI

Internet of Things (ITUA31185B)

Teaching Scheme	Examination Scheme						
Credits: 3 Lecture (L): 3 hrs./week Practicals/week: 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisites : Data Communication (CN fundamentals in DC)

Course Objectives :

- To understand fundamentals of IoT
- To implementing small IoT systems using building blocks of IoT
- To gain knowledge of IoT protocols
- To comprehend fundamentals of security in IoT
- To learn how secure infrastructure for IoT is implemented
- To learn real world application scenarios of IoT along with its societal and economic impact using case studies

Course Outcomes :

After studying this course, students will be able to:

1. Demonstrate the fundamentals of IoT.
2. Understand Things in IoT.
3. Identify the way of communication with the help small IoT modules.
4. Write pseudocode for IoT.
5. Analyze the security issues in IoT.
6. Model the real-world applications of IoT.

Unit I – Introduction to IoT

IoT: Definition and characteristics of IoT, Internet of Things: Vision, Emerging Trends, Economic Significance, Technical Building Blocks, Physical design of IoT, Things of IoT, IoT Protocols, Logical design of IoT, IoT functional blocks, IoT communication models, IoT Communication APIs, IoT enabling technologies, IoT levels and deployment templates, IoT Issues and Challenges, Applications.

Unit II - IOT Things Layer

Basic electronics (Current, circuit, registers, connectors), Sensors, Actuators, and Smart Objects, Classification of thins.
Open Source computing hardware's: Arduino, Raspberry Pi. Electronic Communication Protocols (Device Interfacing) Protocols: I2C, SPI, UART, USRT, CAN.

Unit III - Network Communication Layer
M2M Protocols, IoT Protocols Stack, IoT Protocols overview: CoAP, MQTT, IPv6, ZigBee, Bluetooth, Wifi. IoT Gateway Sensor Networks, Connecting Smart Objects: Communications Criteria, IoT Access Technologies: IEEE 802.15.4
Unit IV – IoT and M2M and Embedded Programming
Difference between IoT and M2M, IoT Physical Devices and Endpoints: Basic building blocks and IoT device, Interoperability in IoT, IoT Middleware. Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino Introduction to Raspberry Pi, Raspberry Pi interfaces, Programming Raspberry Pi with Python.
Unit V–Data Layer and Security in IoT
IoT Security: Vulnerabilities of IoT, Security Requirements, Challenges for Secure IoT, Threat Modelling, Key elements of IoT Security: Identity establishment, Access control, Data and message security, Non repudiation and availability, Security model for IoT. Data Layer: Data Processing/Data Analytics/BIG Data. Introduction to Cloud Computing, Cloud of Things
Unit VI - IoT Case Studies
Case Studies: Home Intrusion Detection, Weather Monitoring, System, Air Pollution Monitoring, Smart Irrigation, Smart cities, Health Care. RFID technology. IOT design affair: Introduction to soldering techniques and its types, Mounting of electronic components on PCB. Introduction and applications of Raspberry pi and Arduino architecture.

Text books:	1. Internet of Things: A Hands-On Approach ArshdeepBahga, Vijay Madisetti VPT – Paperback 2015 978- 0996025515 628/- 2. 2. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things David Hanes, Gonzalo Salgueiro, Patrick Grossetete Cisco Press – Paperback – 16 Aug 2017 978-1- 58714-456- 1 599.
Reference books:	1. Smart Internet of things projects AgusKurniawanPackt - Sep 2016 978-1- 78646-651-8 2 The Internet of Things Key Olivier Willy Publication 2nd Edition 978 2. Applications and protocols Hersent s 119- 99435-0, 3 The Internet of Things Connecting Objects to the Web HakimaChaouchi, Willy Publications 978-1-84821- 140-7.

Assignments : Professional Elective –I (IoT) Laboratory	
1	Study of basic Electronic components, Raspberry-Pi, Arduino , Beagle board .
2	Study of different operating systems for Raspberry-Pi/Beagle board/Arduino. Understanding the process of OS installation on Raspberry-Pi.
3	Prepare a circuit and write a simple program digital read/write using LED and Switch
4	Prepare a circuit and write a program to simulate a traffic signal.
5	Prepare a circuit and write a simple program Digital/Analog read/write using sensor and actuators.(It can cover 3-4 assignments with variety of sensors.)
6	Prepare a circuit and write a program to sense the value using analog/digital sensors and display it on LCD/record it locally in database.
7	Introduction to MQTT and sending sensor data to cloud using Raspberry-Pi/Beagle board/Arduino.
8	Develop a mini project.

Computer Graphics (ITUA31185C)

Teaching Scheme	Examination Scheme						
Credits: 4 Lecture (L): 3 hrs./week Practicals/week: 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisites : Data Structures and algorithms , Basic Mathematics, Geometry, linear algebra, vectors and matrices

Course Objectives:

- Gain knowledge about graphics hardware devices and software used.
- Understand the two dimensional graphics and their transformations.
- Understand the three dimensional graphics and their transformations.
- Appreciate animation, illumination and color models.
- Understand OPENGL techniques.

Course Outcomes:

After studying this course, students will be able to:

1. Understand two dimensional graphics.
2. Use OpenGL for 2D and 3D graphics programming.
3. Differentiate between seed fill and scan line algorithm for polygon filling.
4. Apply standard clipping algorithms on lines and polygons.
5. Apply transformations on 2D and 3D objects.
6. Design animation sequences.
7. Distinguish between Illumination and color models.

Unit I – Basics of Computer Graphics

Basic of Computer Graphics, Applications of computer graphics, pixel, frame buffer, resolution, aspect ratio. Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – points and lines, line drawing algorithms-Digital Differential Analyzer (DDA), Bresenham line algorithms, Line styles: thick, dotted and dashed. Circle drawing algorithm: DDA, Bresenham. Character generating methods: stroke and bitmap method

Unit II - Graphics Programming using OPENGL

Why OpenGL, Features in OpenGL, OpenGL operations, Abstractions in OpenGL – GL, GLU & GLUT, 3D viewing pipeline, viewing matrix specifications, a few examples and demos of OpenGL programs

Unit III – Polygons and Clipping Algorithms

Introduction to polygon, types: convex, concave and complex. Representation of polygon, Inside test, polygon filling algorithms – flood fill, seed fill, scan line fill and filling with patterns. Windowing and clipping: viewing transformations, 2-D clipping: Cohen – Sutherland algorithm, Polygon clipping: Sutherland Hodgeman algorithm

Unit IV -2D and 3D Transformations	
Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; widow-to-viewport coordinate transformation, Transformations and Matrices, Transformation Conventions, 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Translations and Homogeneous Coordinates, Rotation, Reflection, Scaling, Shear transformation Combined Transformation, Transformation of Points, Transformation of The Unit Square, Solid Body Transformations, Rotation About an Arbitrary Point 3-D transformations: introduction, 3-D geometry, primitives, Stages in 3D viewing ,3-D transformations and matrix representation, rotation about an arbitrary axis, 3-D viewing transformations Parallel (Oblique: Cavalier, Cabinet and orthographic: isometric, diametric, trimetric) and Perspective (Vanishing Points – 1 point, 2 point and 3 point)	
Unit V – Segment and Animation	
Segment: Introduction, Segment table, Segment creation, closing, deleting and renaming, Visibility. Animation: Introduction, Design of animation sequences, Animation languages, Keyframe, Morphing,	
Unit VI- Illumination and Shading	
Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection. Shading Models-Constant, Phong's model, Gouraud shading	
Text books :	1. S. Harrington, ―Computer Graphics‖, 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 – 100472 – 6. 2. D. Rogers, ―Procedural Elements for Computer Graphics‖, 2nd Edition, Tata McGraw-Hill Publication, 2001, ISBN 0 – 07 – 047371 – 4. 3. Donald D. Hearn, ―Computer Graphics with Open GL‖, 4th Edition, ISBN13: 9780136053583.
Reference Books :	1. J. Foley, V. Dam, S. Feiner, J. Hughes, ―Computer Graphics Principles and Practice‖, 2nd Edition, Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9. 2. D. Rogers, J. Adams, ―Mathematical Elements for Computer Graphics‖, 2nd Edition, Tata McGrawHill Publication, 2002, ISBN 0 – 07 – 048677 – 8

Assignments : Professional Elective –I (CG) Laboratory	
1	Implement basic OPENGL primitives.
2	Implement DDA algorithm for line drawing. a. Implement DDA using Mouse. b. Draw any shape or pattern. c. Draw Dotted, Dashed and Das-Dot-Dash line.
3	Implement Bresenham's algorithm for line drawing. a. Draw given pattern. b. Draw Dotted, Dashed and Das-Dot-Dash line
4	Implement Midpoint and Bresenham's Circle drawing algorithm.
5	Draw the polygons by using the mouse. (Use DDA algorithm for line drawing).Fill the polygon with Boundary fill and Flood fill method.
6	Implement 2D translation, sheer, rotation, reflection and scaling transformations on equilateral triangle or rhombus.
7	Implement Sutherland Hodgman algorithm to clip any given polygon. Provide the vertices of the polygon to be clipped and pattern of clipping interactively.
8	Implement 3D Cube translation, scaling and rotation. Translations in x, y, z directions Rotation by angle 450 about z axis, rotation by 600 about y-axis in succession. Scaling in x-direction by a factor of 2, scaling in y- direction by a factor of 3.
9	Project based Learning -Animation: Implement any animation.

OBJECT ORIENTED SYSTEM DESIGN (ITUA31186)

Teaching Scheme	**Examination Scheme**						
Credits: 3 Lecture (L): 3 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	-	50	-	-	25	75

Prerequisites : Software Engineering, Object Oriented Programming, proficiency in Java

Course Objectives :

- To understand the object oriented concepts for designing object oriented models.
- To understand the use of UML (Unified Modeling Language) for object oriented analysis and design.
- To describe the step by step object oriented methodology of software development from problem statement through analysis, system design, and class design.
- To understand the issues for implementing object oriented designs or models.

Course Outcomes :

After studying this course, students will be able to:

1. Demonstrate the ability to apply the knowledge of object oriented analysis and design concepts for solving system modeling and design problems using UML.
2. Design and implement object oriented models using UML appropriate notations.
3. Design object oriented structural model by developing class diagrams.
4. Apply the concept of domain and application analysis for designing UML Diagrams.

Unit I – Software Development Views and UML

Views of Software Developments: Traditional System Development Methodology and Object Oriented Analysis and Design
Unified Approach: Object Oriented Analysis, Object Oriented Design, Iterative Development & Continuous Testing, Modeling Based on UML, Layered Approach,
Unified Modeling Language: Introduction to Modeling & UML

Unit II - Functional Modeling

Object Oriented Analysis Process, Use Case Modeling: Actor Identification, Actor Classification, Actor Generalization, Use Cases Identification, Communication, Uses/Include and Extend Associations, Writing a Formal Use Cases, Use case scenarios, Use Case realizations.

Unit III – Structural Modeling

Domain / Class Modeling: Approaches For Identifying Classes (Noun-Phase Approach, Common Class Pattern Approach, Class Responsibilities Collaboration Approach, Naming Classes, Class Associations and Identification of Associations, Generalization/Specialization Relationship, Aggregation and Composition Relationships, Attributes and Methods Identification.

Unit IV - Interaction And Behavior Modeling

Activity Diagram: Activity and Actions, Initial and Final Activity, Activity Edge, Decision and Merge Points, Fork and Join, Input and Output Pins, Activity Group, Activity Partitions, Constraints on Action, Swim Lanes.

Sequence Diagram: Context, Objects and Roles, Links, Object Life Line, Message or stimulus, Activation/Focus of Control, Modeling Interactions. State Diagram: State Machine, Triggers and Ports, Transitions, Initial and Final State, Composite States, Submachine States. Introduction to Communication, Component, Deployment diagram	
Text books :	1. Michael. Blaha, James. Rumbaugh "Object-Oriented Modeling and Designwith UML", 2nd Edition, Pearson Education, 2005.
Reference Books :	1. Ali. Bahrami, "Object Oriented Systems Development", McGraw-Hill, 2008. 2. Grady. Booch "Object-Oriented Analysis and Design with Applications", 3rd 3. Edition, Pearson, 2007. 4. Mark. Priestley, "Practical Object-Oriented Design with UML", 2nd Edition, 5. Tata McGraw-Hill, 2003.

Assignments : Object Oriented System Design Laboratory	
1	Write Problem Statement for System / Project. Identify Project of enough complexity, which has at least 4-5 major functionalities. Identify stakeholders, actors and write detail problem statement for your system.
2	Prepare Use Case Model Identify Major Use Cases, Identify actors. Write Use Case specification for all major Use Cases. Draw detail Use Case Diagram using UML2.0 notations
3	Prepare Activity Model Draw Activity diagram with Swim lanes using UML2.0 Notations for major Use Cases
4	Prepare Analysis Model-Class Model and implement it. Identify Analysis Classes and assign responsibilities. Draw Analysis class Model using UML2.0 Notations. Implement Analysis class Model-class diagram with a suitable object oriented language
5	Prepare a Design Model from Analysis Model and implement it. Study in detail working of system/Project. Identify Design classes/ Evolve Analysis Model. Use advanced relationships. Draw Design class Model using OCL and UML2.0 Notations. Implement the design model with a suitable object-oriented language.
6	Prepare Sequence Model. Identify at least 5 major scenarios (sequence flow) for your system. Draw Sequence Diagram for every scenario by using advanced notations using UML2.0
7	Prepare a State Model and implement it. Identify States and events for your system. Study state transitions and identify Guard conditions. Draw State chart diagram with advanced UML 2 notations. Implement the state model with a suitable object-oriented language

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Department of Information Technology

T.Y.B.Tech.

2018 Pattern

Semester - VI

Syllabus Curriculum

Professional Elective II (ITUA32181A)
Machine Learning

Teaching Scheme	Examination Scheme						
Credits: 4 Lecture (L): 3 hrs./week Practicals/week: 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisites: Linear Algebra and Calculus, Probability Basics

Course Objectives:

- Understanding Human learning aspects.
- Understanding primitives and methods in learning process by computer.
- Understanding nature of problems solved with Machine Learning.
- Understanding of building basic machine learning models using Clouds.

Course Outcomes:

After studying this course, students will be able to:

1. Comprehend basics of statistics used in machine learning.
2. Understand binary and multiclass classification strategies and linear models.
3. Understand regression and generalization theory.
4. Demonstrate and apply algebraic models and logic based models
5. Demonstrate models based on probability
6. Critically analyze and adopt the ML practices to further develop ML based projects.

Unit I– Basics Of Statistics And Introduction To Machine Learning

Statistics : Descriptive Statistics, Hypothesis Testing, Regression methods and applications, Cluster analysis, Introduction to factoring and methods of factoring, selection of right method of factoring.
Introduction: What is and What is not Machine Learning, Examples of Machine Learning applications, Training versus Testing, Positive and Negative Class, Cross-validation. Types of Learning: Supervised, Unsupervised and Semi-Supervised Learning.

Unit II - Classification

Binary and Multiclass Classification: Assessing Classification Performance, Handling more than two classes, Multiclass Classification-One vs One, One vs Rest Linear Models: Perceptron, Support Vector Machines (SVM)
Dimensionality Reduction: Introduction to Dimensionality Reduction, Subset Selection

Unit III – Regression And Generalization

Regression: Assessing performance of Regression – Error measures, Overfitting and Under fitting , Catalysts for Overfitting, VC Dimensions Linear Models: Least Square method, Univariate Regression, Multivariate Linear Regression, Regularized Regression –overview of Ridge Regression and Lasso
Theory of Generalization: Bias and Variance Dilemma, Training and Testing Curves, Case Study of Polynomial Curve Fitting.

Unit IV - Logic Based And Algebraic Models	
Distance Based Models: Neighbors and Examples, Nearest Neighbor Classification, Distance based clustering algorithms - K-means and K-medoids, Hierarchical clustering. Rule Based Models: Rule learning for subgroup discovery, Association rules mining – Apriori Algorithm, Confidence and Support parameters. Tree Based Models: Decision Trees, Minority Class, Impurity Measures – Gini Index and Entropy, Best Split. Case Study on Application of algorithms (Cloud based)in industry	
Unit V – Probabilistic Models	
Conditional Probability, Joint Probability, Probability Density Function, Normal Distribution and its Geometric Interpretation, Naïve Bayes Classifier, Discriminative Learning with Maximum Likelihood. Probabilistic Models with Hidden variables: Expectation-Maximization methods, Gaussian Mixtures	
Unit VI - Trends In Machine Learning	
Ensemble Learning: Bagging, Randomization, Boosting, Stacking Reinforcement Learning: Exploration, Exploitation, Rewards, Penalties Deep Learning: The Neuron, Expressing Linear Perceptron as Neurons, Feed Forward Neural Networks, Linear Neurons and their Limitations, Sigmoid, Tanh and ReLU Neurons Practical Advice for ML Projects : 7 steps for ML projects.	
Text books :	1. EthemAlpaydin: Introduction to Machine Learning, PHI 2nd Edition-2013. 2. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
Reference Books :	1. C. M. Bishop: Pattern Recognition and Machine Learning, Springer 1st Edition-2013. 2. Ian H Witten, Eibe Frank, Mark A Hall: Data Mining, Practical Machine Learning Tools and Techniques, Elsevier, 3rd Edition. 3. Parag Kulkarni: Reinforcement Learning and Systemic Machine Learning for Decision Making, IEEE Press, Reprint 2015. 4. Nikhil Buduma: Fundamentals of Deep Learning, O'Reilly Media, June 2017. 5. Hastie, Tibshirani, Friedman: Introduction to Statistical Machine Learning with Applications in R, Springer, 2nd Edition 2012. 6. Kevin P Murphy: Machine Learning – A Probabilistic Perspective, MIT Press, August 2012.

Assignments : Machine Learning Laboratory	
1	Download any open source platform for implementing the assignments and write down the Functionalities associated with it. You may choose Weka, Python, R.
2	Implement SVM for performing classification and find out the accuracy using given data using python.
3	Supervised Learning - Regression (Using R) Generate a proper 2-D data set of N points. Split the data set into Training Data setand Test Data set. i) Perform linear regression analysis with Least Squares Method. ii) Plot thegraphs for Training MSE and Test MSE and comment on Curve Fitting and Generalization Error.
4	Create Association Rules for the Market Basket Analysis for the given Threshold. (Using R)
5	Implement K-means algorithm to create cluster on the given data using python.
6	Implement simple Naïve Bayes algorithm to calculate accuracy, TPR, FPR, TNR, Recall, Precision, error rate etc. measuring parameters on the given data by using Weka API .
7	Implement Q-learning algorithm on the given data.
8	Real time mini project implementation of above mentioned machine learning algorithms using cloud for any industry oriented problem.

Professional Elective II (ITUA32181B)
Information and Network Security

Teaching Scheme	**Examination Scheme**						
Credits: 4 Lecture (L): 3 hrs./week Practicals/week: 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisites: Mathematical concepts like Random numbers, Number theory, Finite Fields

Course Objectives:

- Understand the essentials of information security
- Analyze the Digitals security lapses.
- Study and implement the cryptographic algorithm.
- To illustrate the concept of digital signature and digital certificate.
- Illustrate the need of key management

Learn the various massage authentication methods.

Course Outcomes:

After studying this course, students will be able to:

1. Understand what are the common threats in information and data usage
2. Demonstrate the principles of symmetric and asymmetric cryptography.
3. Understand and apply the various symmetric and asymmetric key algorithms.
4. Apply the concepts of hashing and MAC with algorithms.
5. Comprehend the concepts of digital signature and digital certificates.
6. Design the various authentication methods.

Unit I –Security Basics

Introduction, Terminology, Attacks, Security Goals : Authentication, Authorization, Cipher Techniques: Substitution and Transposition, One Time Pad, Modular Arithmetic, GCD, Euclid's Algorithms, Chinese Remainder Theorem, Discrete Logarithm, Fermat Theorem, Block Ciphers, Stream Ciphers. Secret Splitting and Sharing.

Unit II -Stream ciphers, block ciphers, Multiple encryption and triple DES

Stream ciphers and block ciphers, Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example and implementation.
Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode

Unit III – Public Key Cryptosystems
Public Key Cryptosystems with Applications, Requirements and Cryptanalysis, RSA algorithm, its computational aspects and security, Diffie-Hillman Key Exchange algorithm, Man-in-Middle attack **Cryptographic Hash Functions** Cryptographic Hash Functions, their applications, Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA)
Unit IV - Message Authentication Codes
Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers **Digital Signature, its properties** Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm
Unit V – Key management and distribution
Key management and distribution, symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure. Remote user authentication with symmetric and asymmetric encryption, Kerberos
Unit VI - Web Security threats and approaches
Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS and SSH

Text books :	1. BruiceSchneier, "Applied Cryptography- Protocols, Algorithms and Source code in C", 2nd Edition, Wiely India Pvt Ltd, ISBN 978-81-265-1368-0 2. Nina Godbole, SunitBelapure, "Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiely India Pvt.Ltd.,ISBN- 978-81-265-2179-1 3. Bernard Menezes, "Network Security and Cryptography", Cengage Learning, ISBN-978-81-315-1349-1
Reference Books :	1. Cryptography & Network Security by Forouzan, Mukhopadhyay, McGrawHil 2. Cryptography & Network Security by Forouzan, Mukhopadhyay, McGrawHil 3. Cryptography And Network Security by WilliamStallings, Pearson 4. Information Security Principles and Practice by Mark Stamp

Assignments : Information and Network Security Laboratory	
1	Write program in C++ or Java to implement RSA algorithm for key generation and cipher verification
2	Develop and program in C++ or Java based on number theory such as Chinese remainder or Extended Euclidean algorithm. (Or any other to illustrate number theory for security)
3	Write program in C++ or Java to implement Diffie Hellman key exchange algorithm.
4	Write a program in C++, C# or Java to implement RSA algorithm using Libraries (API).
5	Write a program in C++, C# or Java to implement SHA-1 algorithm using Libraries (API)
6	Configure and demonstrate the use of IDS tool such as snort.
7	Configure and demonstrate use of vulnerability assessment tool such as NESSUS
8	Implement web security with Open SSL tool kit

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Department of Information Technology

Professional Elective II (ITUA32181C)

Multimedia Technologies

Teaching Scheme	**Examination Scheme**						
Credits: 4 Lecture (L): 3 hrs./week Practicals/week: 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisites: Computer Graphics, Database Systems

Course Objectives:

- To learn 5 basic components of multimedia (text, image, audio, video and animation)
- To learn the advance graphics
- To learn compression techniques for various multimedia components
- To learn animation and communication

Course Outcomes:

After studying this course, students will be able to:

1. Identify the essential features of graphics/image data types, file formats, and colour models in images and video.
2. Critically analyze and apply the major methods and algorithms for multimedia data compression.
3. Demonstrate animation creation, digitized sound processing, video control, and scanned images.
4. Handle multimedia Tools- Hyper Studio, Flash and Photoshop.
5. Apply communication in multimedia.
6. Study android based Multimedia frameworks.

Unit I – Introduction To Multimedia

Multimedia building blocks, Multimedia architecture, hardware support, Transition from conventional media to digital media.
Multimedia Authoring Basics, Some Authoring Tools, Introduction to HyperStudio(Case Study)
Multimedia Application: education, entertainment, edutainment, virtual reality, digital libraries, information kiosks, video on demand, video phone, video conferencing and telemedicine.
Usage of text in Multimedia, Families and faces of fonts, outline fonts, bitmap fonts International character sets and hypertext, Digital fonts techniques. Text compression: Huffman coding, LZ & LZW
Text file formats: TXT, DOC; RTF, PDF, PS

Unit II-Digital Image

Colour Science, Colour, Colour Models, Colour palettes, Basic Image fundamentals, image File formats - (BMP, HEIF,TIFF, JPEG, GIF), Basic Image Processing (Case study- Photoshop), Use of

image editing software, White balance correction, Dynamic range correction, Gamma correction, Photo Retouching. Image Compression: Types of Compression: Lossy& Lossless, Symmetrical & Asymmetrical, Intra-frame &Inter-frame Hybrid JPEG, Lossless: RLE, Shannon - Fano algorithm, Arithmetic coding. Lossy: Vector quantization, Fractal Compression Technique, Transform Coding, Psycho-analysis, and inter-frame Correlation. Hybrid: JPEG-DCT.
Unit III – Audio
Nature of sound waves, characteristics of sound waves, psycho-acoustic, Digitization of sound, frequency and bandwidth, decibel system, data rate, audio file format, Sound synthesis, MIDI, Compression and transmission of audio on Internet, Audio software and hardware. Audio file formats: WAV, AIFF, VOC, AVI, MPEG Audio File formats, RMF, WMA Audio compression techniques : DM, ADPCM and MPEG Audio file conversions Multimedia Supported audio formats in Android, Media Playback.
Unit IV -Video
Video Basics , How Video Works, Broadcast Video Standards, Analog video, Digital video, video signal formats, Video transmission standards: EDTV, CCIR, CIF, SIF, HDTV, digitization of video, video file formats: MOV, Real Video, H-261, H-263, Cinepack, Nerodigtal, video editing, DVD formats, Video Compression and File Formats. Video compression based on motion compensation, MPEG-1, MPEG-2, MPEG-4, MPEG-7, MPEG-21, video streaming Multimedia Supported video formats in Android, Media Playback.
Unit V -Animation
Animation: Basics of animation, types of animation, principles of animation, techniques of animation, Creating animation Cell Animation, Key frames, and Twinning ,Morphing and Inverse Kinematics ,Animation Software , Application of Animation , Web-Based Animation , Animation for Learning ,Animation Design and Usage Guidelines
Unit VI- Multimedia Communication And Multimedia application Tools
Multimedia Communication, Multimedia Communication Basics, Multimedia Network, Communications Standards, Introduction to Flash Multimedia in Android: Android Multimedia Framework Architecture, GStreamer: Introduction, GStreamer Based Multimedia Framework, Open Core Multimedia Engine

Text books :	1. Tay Vaughan, "Multimedia making it works", Tata McGraw-Hill, 2008. 2. Rajneesh Aggarwal & B. B Tiwari, "Multimedia Systems", Excel Publication, New Delhi, 2007. 3. Li & Drew, "Fundamentals of Multimedia", Pearson Education, 2009.. 4. Parekh Ranjan, "Principles of Multimedia", Tata McGraw-Hill, 2007. 5. AnirbanMukhopadhyay and Arup Chattopadhyay, "Introduction to Computer Graphics and Multimedia", Second Edition, Vikas Publishing House.
Reference Books :	

Assignments : Multimedia Technologies Laboratory	
1	Implement text compression using Huffman coding.
2	Implement text compression using LZW technique.
3	Implement Shannon Fano algorithm for data compression.
4	Perform Discrete Cosine Transformation.
5	Convert a colour image to a negative image.
6	Perform different operations (start, stop, pause, resume etc) on audio clip using Java.
7	Write a java program to design a simple MIDI player.
8	Prepare animation sequence on topic of your choice with appropriate animation software.
9	Study assignment on Hyper Studio
10	Study assignment on Flash and Photoshop.

Professional Elective III (ITUA32182A)
Human Computer Interaction

Teaching Scheme	**Examination Scheme**						
Credits: 4 Lecture (L): 3 hrs./week Practicals/week: 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisites: Software Engineering.

Course Objectives:

- Provide an overview of the concepts relating to the design of human-computer interfacesin ways making computer-based systems comprehensive, friendly and usable.
- Understand the theoretical dimensions of human factors involved in the acceptance ofcomputer interfaces.
- Understand the important aspects of implementation of human-computer interfaces.
- Identify the various tools and techniques for interface analysis, design, and evaluation.
- Identify the impact of usable interfaces in the acceptance and performance utilization ofinformation systems.
- Identify the importance of working in teams and the role of each member within an interface development phase.

Course Outcomes:

After studying this course, students will be able to:

1. Understand the Human-Computer Interaction and what interaction design is.
2. Understand Human Capabilities and Core Cognitive aspects of interaction design.
3. Design Interactive Systems with clear understanding of HCI principles that influence a system's interface design, before writing any code.
4. Create interfaces for different environments, people, places, and activities.
5. Apply Quantitative Analysis, Evaluation, and Redesign.
6. Evaluate sample interfaces using different models.

Unit I – Introduction to Human-Computer Interaction

Includes the difference between good and poor interaction design, what interaction design is and how it relates to human-computer interaction and other fields, what is involved in the process of interaction design, the different forms of guidance used in interaction design, etc.
Need for Design - Examples from Design of everyday things, case studies, Evolution of the web and digital interfaces, Design thinking and wicked problems.
Exercise - Identify problems around us requiring design solution Or problems solved using design.

Unit II – Understanding the Design Process
Interaction design basics, HCI in the software process, Design rules, Implementation support, Evaluation techniques, Universal design, User support, Individual differences, designing interfaces for all, User research and techniques, Understanding Personae, Good and poor design, Ergonomics. Exercise - Creating personae for different application in everyday use.
Unit III – Understanding the Interaction
Understanding device specific interactions and human aspects involved, Interaction styles, Interacting with voice, visual and audio visual interfaces, Understanding Scenarios and context of use for user. Exercise - Listing down scenarios for an application/system, critical task list for each scenario Understanding user journey and user journey maps. Exercise - Creating a user journey map for a particular task **Interaction Styles**- Direct Manipulation and Virtual Environments, Menu Selection, Form Filling and Dialog Boxes, Command and Natural Languages, Interaction Devices, Collaboration and Social Media Participation
Unit IV – Design Issues
Introduction to UX design process and case study, Understanding Information Architecture, Overview of tools. Exercise - Open and closed card sorting technique - Creating information architecture for a system Understanding navigation models based on information architecture, High level concept sketches/wireframes. Exercise - Creating low fidelity concept sketches for critical tasks of system/problems. Quality of Service, Balancing Function and Fashion, User Documentation and Online Help, Information Search, Information Visualization.
Unit V – UI Evaluation Techniques
What, why and when to evaluate, Design guidelines, Golden rules and heuristics, Goals of Evaluation, Evaluation criteria, Evaluation through: Expert analysis, User participation, Testing techniques - Formative and Summative testing, surveys, peer reviews and so on. Case study - ROI on UX/HCI methodology
Unit VI – Outside the Box
Cognitive models, Goal and Task hierarchy models, Linguistic models, Physical and Device models, Design principles. Exercise - Conduct evaluation of different sample interfaces using different models. Introduction to Prototyping tools, Understanding how UI Interaction & Prototype Design works, UX - Industry overview.Prototyping / wire framing tool exercise: Design a small mobile app design, along with user journeys and multiple interaction touch points using Figma or Balsamiq.

Text books :	1. "Human Computer Interaction" by Alan Dix, Janet Finlay, ISBN :9788131717035, Pearson Education (2004) 2. "Designing the User Interface - Strategies for Effective Human Computer Interaction", by Ben Shneiderman ISBN : 9788131732557, Pearson Education (2010).

Reference Books :	1. Usability Engineering: Scenario-Based Development of Human-Computer Interaction, by Rosson, M. and Carroll, J. (2002) 2. The Essentials of Interaction Design, by Cooper, et al., Wiley Publishing (2007) 3. Usability Engineering, by Nielsen, J. Morgan Kaufmann, San Francisco, 1993. ISBN 0-12-518406-9 4. The Resonant Interface: HCI Foundations for Interaction Design, by Heim, S., Addison-Wesley. (2007) Usability engineering: scenario-based development of human-computer interaction, By Rosson, M.B & Carroll, J.M. , Morgan Kaufman.(2002)

Assignments : Human Computer Interaction Laboratory	
1	Design of Everyday Things: Find 3 unique usability problems in the day-to-day objects that you have observed or encountered. Describe them in 3 slides in a presentation.
2	User Research: Contextual Inquiry: In groups of two, conduct an interview with a newcomer to IIT Bombay in trying to understand their perspective on way-finding in the campus. Record the audio with the user's permission. (If the user disagrees, take notes and prepare transcripts). Try to follow as many sutras of contextual inquiry as possible.
3	One-minute audio clips / transcripts from this interview on a Google classroom. Each clip / transcript should demonstrate your understanding of one of the sutras during the interview. Name the audio file according to the sutra. In an accompanying Word/PDF document, write a short (100 word) description of each audio file / transcript and a justification of the sutra. You may embed photographs to establish the context of the interview. Don't forget to list your names.
4	User Persona: Creating personae for different application in everyday use. Develop a precise description of the user of the product in focus of the design and what the user wishes to accomplish.
5	User journey and User journey maps*:* Listing down scenarios for an application/system, critical task list for each scenario. Creating a user journey map for a particular task.
6	Design Process: Understanding navigation models based on information architecture, High level concept sketches/wireframes. Creating low fidelity concept sketches for critical tasks of a system/problems. Use the attached sketch sheet (take prints as required) to create wireframe for your project. (Ref:- https://www.invisionapp.com/inside-design/wireframe-examples/)
7	Prototype Design: Design a small mobile app design, along with user journeys and multiple interaction touch points using Figma or Balsamiq.
8	Evaluation: Choose an appropriate evaluation method for each of the following situations. In each case identify: (i) the participants (ii) the technique used (iii) representative tasks to be examined (iv) measurements that would be appropriate (v) an outline plan for carrying out the evaluation. (a) You are at an early stage in the design of a spreadsheet package and you wish to test what type of icons will be easiest to learn. (b) You have a prototype for a theatre booking system to be used by potential theatre-goers to reduce queues at the box office. (c) You have designed and implemented a new game system and want to evaluate it before release. (d) You have developed a group decision support system for a solicitor's office. (e) You have been asked to develop a system to store and manage student exam results and would like to test two different designs prior to implementation or prototyping.

BansilalRamnathAgarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Department of Information Technology

Professional Elective III (ITUA32182B)

Advance Operating Systems

Teaching Scheme	Examination Scheme						
Credits: 4 Lecture (L): 3 hrs./week Practicals/week: 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisites: Computer Organization and Architecture, Fundamentals of Data Structures.

Course Objectives:

- To study the fundamentals of OS and DOS
- To understand the concept of Inter-process communication in distributed OS
- To understand the synchronization in distributed OS
- To understand the resource management distributed OS.
- To study and understand the recent type of advanced OS (Mobile OS)

Course Outcomes:

After studying this course, students will be able to:

1. Understand the general concept of OS and DOS.
2. Understand and apply inter-process communication in the distributed OS.
3. Demonstrate the synchronization in distributed OS.
4. Analyze and Comprehend the Memory management distributed OS.
5. Demonstrate the File management distributed OS.
6. Study and understand the recent type of advanced OS (Mobile OS).

UNIT I- Introduction To Os And Distributed Os

A simple OS – structure, processes, address spaces and threads, managing processes, loading programs into processes, Basic concepts: context switching – procedures, threads, system calls, interrupts. Distributed computing systems fundamentals: Introduction to Distributed computing systems, Models, Popularity. Distributed computing system, Design issues of Distributed operating system, distributed computing environment.

UNIT II- Message Passing And Remote Procedure Calls

Features of a good Message Passing System. Issues in IPC by Message Passing Synchronization, Buffering, Multi-datagram Messages, Process Addressing, Failure handling. RPC Model, Implementing RPC Mechanism. Stub Generation. RPC Messages, Marshaling Arguments and Results. Parameter Passing semantics, call semantics, Communication protocols for RPC's, Client- Server Building, Exception handling.

UNIT III- Distributed Shared Memory

General Architecture of DSM systems. Design and implementation Issues of DSM, Granularity, Structure of Shared Memory Space, Consistency models, Replacement strategy, Thrashing.

UNIT IV- Synchronization And Resource Management In Ds	
Clock Synchronization. Event Ordering, Mutual Exclusion, Deadlock in the distributed systems, Election Algorithms. Resource Management: Features of global scheduling algorithm, Task assignment approach, Load-balancing and Load approach.	
UNIT V-Distributed File Systems	
Features of good DFS, File models, File Accessing models. File- Sharing Semantics, File-Caching schemes, File Replication, Fault Tolerance, Automatic Transactions, Design Principles	
UNIT VI -Mobile Operating System	
Mobile O.S.: Introduction, Kernel design in Mobile OS, Scheduling in Mobile OS, File systems on mobile phones, I/O in Mobile OS, Case study: Symbian or Android	
Text books :	1. Thomas W. Doeppner, Operating Systems in Depth, Wiley India, First Edition, ISBN No. 978-81- 2653709-9. 2. Dr. P. K. Sinha, Distributed Operating Systems: Concepts and Design, PHI, Second Edition, ISBN No. 978-0780311190. 3. Michael J. Jipping, Smartphone Operating System Concepts with Symbian OS: A Tutorial Guide, John Wiley & Sons, ISBN No. 978-0-470-06523-5.
Reference Books :	1. Mukesh Singhal and Niranjan Shivaratri, Advanced Concepts In Operating System, Tata McGraw-Hill Education, ISBN No. 978-0070575721. 2. G.Coulouris, J. Dollimore, T. Kindberg & G. Blair, Distributed Systems concepts and design, Addison Wesley, Fifth Edition, ISBN No. 978-0-13-214301-1.

Assignments : Advance Operating System Laboratory	
1	Case study on Common Object Request Broker Architecture.
2	Implementation of Deadlock through Simulation.
3	Study of 3 tier client server architecture.
4	Case study on Client and RMI Server.
5	WAP to Implement an Election algorithm.
6	S/W Simulation for Clock Synchronization in Distributed System using Lamport's Algorithm.
7	Implementation of Banker's Algorithm for avoiding Deadlock

Professional Elective III (ITUA32182C)

Advance Database Management System

Teaching Scheme	Examination Scheme						
Credits: 4 Lecture (L): 3 hrs./week Practicals/week: 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	25	125

Prerequisites: Database Management System.

Course Objectives:

- To learn and understand Database Modeling, Database Architectures.
- To learn and understand Object Oriented Databases.
- To learn and understand web database language, XML, JDOQL.
- To learn NoSQL Databases (Open source) and big data analytics.
- To learn Web data and mining.
- To learn current trends in databases.

Course Outcomes:

After studying this course, students will be able to:

1. Understand the Advances in Database Architectures for Big data.
2. Apply the basics of web and object oriented database using XML and JDOQL.
3. Apply the basic concepts of NoSQL Databases.
4. Comprehend big data trends and it's features.
5. Understand the impact of analytics and big data on the information industry and the external ecosystem for analytical and data services.
6. Understand of current trends in databases.

Unit – I Parallel And Distributed Databases

Parallel Database: Introduction, Architectures, Interquery and Intraquery Parallelism, Parallelism on Multicore processor, Parallel Query Optimization,
Distributed Database: Introduction, Data Storage, Distributed Transactions, Commit Protocol, Concurrency control, Distributed Recovery.

Unit – II Object-Based Database

Overview, Complex databases, Structured data types, operations on structured and unstructured data. Encapsulation and ADTs. Inheritance, Objects, OIDs and Reference types, Database Design, ORDBMS Implementation challenges-Storage and Access methods, Query Optimization, ODMS-Object model. NOSQL object database-ObjectDB (JDO), JDO Data Model.

Unit – III Big Databases

Introduction to Big Data, NoSQL database system – Column based and key value based

Column based Database (Cassandra) : Architecture, Managing data, Data Caching, Tuning, Data backup, Cassandra Query Language, CQL Data Model, Indexing Key Value based Database (DynamoDB): Data Model, Operations, Data Access, Indexing.
Unit – IV Big Databases
Graph Databases (Neo4j): vGraphs are the Future, Why Data Relationships Matter, Data Modeling Basics, Data Modeling Pitfalls to Avoid, Why a Database Query Language Matters, Imperative vs. Declarative Query Languages, Graph Theory & Predictive Modeling.
Unit – IV Big Data Analytics
Introduction to data mining and analytics: Data Streams mining, Stream data management systems: Issues and solutions, Stream frequent pattern analysis, Stream classification, Stream cluster analysis, Graph based database, graph mining, Methods for Mining Frequent Sub graphs Mining Variant and Constrained Substructure Patterns, Social Network Analysis, Models of social network generation, mining on social network, Apache Flume NG – Microsoft StreamInsight as tools for Complex Event Processing (CEP) applications.
Unit – VI Current Trends In Advanced Databases
Deductive Databases: Introduction, Semantics, Fix point operator, Safe data log programmers, Least Model, Least fixed point, Query Processing, Query Evaluation, Prototypes, and Deductive Vs RDBMS. Multimedia Database, Cloud Databases, Spatial Databases, Temporal Databases.

Text books :	1. Raghu Ramkrishanan, Johannes Gehrke 4 th Edition "Database Management Systems". Avi Silberschatz , Henry F. Korth , S. Sudarshan, "Database System Concepts, Sixth 2. Edition", ISBN-13: 978-93-3290-138-4, MCGraw Hill. 3. Bryce Merkl Sasaki, Joy Chao & Rachel Howard "Graph Databases for Beginners".
Reference Books :	1. Shio Kumar Singh, Database Systems Concepts Design and Applications, ISBN-978- 81-317-6092-5, Pearson 2. Mario Piattini, Oscar Diaz "Advanced Database Technology and Design"- online book. 3. J. Han, M. Kamber Data mining: concepts and techniques. Morgan Kaufmann. 4. Bing Liu, Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data, Springer. 5. Big Data Black Book, DT Editorial Services, Wiley-Dreamtech Press, ISBN- 6. 9789351197577, May 2015. 7. http://nosql-database.org/

Assignments : Advance Database Management System Laboratory	
1	Study and Configure Hadoop for Big Data.
2	Study of NoSQL Databases such as Hive/Hbase/Cassendra/DynamoDB.
3	Design Data Model using NoSQL Databases such as Hive/Hbase/Cassendra/DynamoDB.
4	Implement any one Partitioning technique in Parallel Databases.
5	Implement Two Phase commit protocol in Distributed Databases.
6	Design Persistent Objects using JDO and implement min 10 queries on objects using JDOQL in ObjectDB NOSQL DATABASE
7	Create XML, XML schemas , DTD for any database application and implement min 10 queries using XQuery FLOWR expression and XPath.
8	Design database schemas and implement min 10 queries using Hive/ Hbase/ Cassendra column based databases
9	Design database schemas and implement min 10 queries using DynamoDBkeyValue based databases
10	Implement any one machine learning algorithm for classification / clustering task in BIG data Analytics.
11	Design and Implement social web mining application using NoSQL databases, machine learning algorithm, Hadoop and Java/.Net.
	• Instructor should maintain progress report of mini project throughout the semester from project group and assign marks as a part of the term work. • Instructor should frame Practical Assignments based on above mentioned list of assignments. • Submission of each Practical Assignment should be in the form of handwritten write-ups/ printout of source code and output. Instructor should assign an assignment no. 11 to a group of 3 - 4 students. Practical Examination will be based on the all topics covered and questions will be asked to judge understanding of practical performed at the time of practical examination • Group of students should submit the Report for assignment no. 12 which will be consist of Title of the Project, Abstract, Introduction, scope, Requirements, Data Modeling , Database design, Algorithms, Graphical User Interface, Source Code, Testing document, Conclusion. • All the assignments should be conducted on Latest version of Open Source Operating Systems, toolsand Multi-core CPU supporting Virtualization and Multi-Threading.

Design of Algorithms (ITUA32183)

Teaching Scheme	Examination Scheme						
Credits: 3 Lecture (L): 3 hrs./week Practicals/week: 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	25	-	125

Prerequisites: Basic mathematics, Discrete structure, Fundamentals of Data structure, Data structures and files.

Course Objectives:

- To understand the problem solving and problem classification.
- To know the basics of computational complexity analysis and various algorithm design strategies.
- To provide students with solid foundations to deal with a wide variety of computational problems.
- To provide a thorough knowledge of the most common algorithms and data structures.
- To analyze a problem and identify the computing requirements appropriate for its solutions.
- To understand basic concepts of P, NP class problems and parallel algorithms.

Course Outcomes:

After completion of the course, student will be able to

1. Calculate computational complexity using asymptotic notations for various algorithms.
2. Apply Divide & Conquer as well as Greedy approach to design algorithms.
3. Practice principle of optimality.
4. Illustrate different problems using Backtracking.
5. Compare different methods of Branch and Bound strategy.
6. Explore the concept of P, NP, NP-complete, NP-Hard and parallel algorithms

Unit I –Introduction

Analysis of Algorithm, Efficiency- Analysis framework, asymptotic notations – big O, theta and omega. Analysis of Non-recursive and recursive algorithms, Amortized Analysis. Solving Recurrence Equations (Homogeneous and non-homogeneous) Proof Techniques: Minimum 2 examples of each: Contradiction, Mathematical Induction – Tiling Problem, Direct proofs, Proof by counterexample, Proof by contraposition

Unit II - Divide and Conquer and Greedy

Divide & Conquer: General method, Control abstraction, Merge sort, Quick Sort – Worst, Best and average case. Binary search, Large integer Multiplication, Strassen's Matrix multiplication. (for all above
algorithms analysis to be done with recurrence)
Greedy Method: General method and characteristics, Prim's method for MST , Kruskal method for MST
(using nlogn complexity), Dijkstra's Algorithm, Huffman Trees (nlogn complexity), Fraction Knapsack
problem, Job Sequencing.

Unit III – Dynamic Programming
General strategy, Principle of optimality, Warshal's and Floyd's Algorithm , Optimal Binary Search Trees, 0/1 knapsack Problem, Travelling Salesman Problem, multistage GraphProblem, longest common subsequence.
Unit IV - Backtracking
General method, Recursive backtracking algorithm, iterative backtracking method. 8- queens problem, Sum of subsets, Graph coloring, Hamiltonian Cycle , 0/1 Knapsack Problem
Unit V – Branch and Bound
The method, Control abstractions for Least Cost Search, Bounding, FIFO branch and bound, LC branch and bound, 0/1 Knapsack problem – LC branch and bound and FIFO branch and bound solution, Traveling sales person problem.
Unit VI - Computational Complexities and Parallel Algorithms
Non Deterministic algorithms, The classes P, NP, NP Complete, NP hard Proofs for NP Complete Problems: Clique, Vertex Cover Parallel Algorithms: Introduction, models for parallel computing, computing with complete binary tree, Pointer doubling algorithm

Text books :	1. Horowitz and Sahani, "Fundamentals of computer Algorithms", Galgotia. ISBN 81-7371-612-9 .
Reference Books :	1. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm" PHI, ISBN:81-203-2141-3. 2. AnanyLevitin, "Introduction to the Design & Analysis of Algorithm ",Pearson ISBN 81- 7758-835-4 3. Gilles Brassard, Paul Bratle "Fundamentals of Algorithms ", Pearson ISBN 978-81-317-1244-3 4. George T. Heineman, Gary Pollice, Stanley Selkow "Algorithms in a Nutshell, A Desktop Quick Reference", O'Reilly, ISBN 13:978-81-8404-608-3

Assignments : Design of Algorithms Laboratory	
1	Write a program to implement matrix multiplication using Strassen's method. (Divide and Conquer).
2	Implement program to find minimum and maximum element from given list using Divide and Conquer.
3	Write a program to implement optimal storage tape using greedy approach.
4	Write a program to implement longest common subsequence (Dynamic Programming) and verify the complexity.
5	Write a program to print shortest path and cost for the directed graph using Bellman Ford algorithm (Dynamic Programming) and verify the complexity.
6	Write a recursive program to find the solution of placing n queens on chess board so that no queen takes each other (backtracking).
7	Write a non-recursive program to check whether Hamiltonian path exists in undirected graph or not. If exists print it. (backtracking).
8	Write a program to solve the travelling salesman problem. Print the path and the cost. (Branch and Bound).

System Programming (ITUA32184)

Teaching Scheme	**Examination Scheme**						
Credits: 3 Lecture (L): 3 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	-	100

Prerequisites: Computer Organization and architecture, Processor Architecture and Interfacing, Data Structures, Theory of Computation: DFA, NFA, Regular expressions, Grammars.

Course Objectives:

- To study language processing fundamentals and assemblers.
- To design macro processors.
- To study and understand compiler design.
- To understand working of syntax analyzer.
- To understand importance of semantic analysis and storage allocation in compilation process.
- To study different code optimization methods.

Course Outcomes:

After studying this course, students will be able to:

1. Interpret language processing fundamentals with detail designing of assembler.
2. Describe design of macroprocessor and working of linker and loader.
3. Explain seven phases of compiler.
4. Illustrate the working of Parser
5. Understand functions of Semantic Analysis.
6. Apply code optimization techniques in the compilation process.

Unit I – Introduction To Systems Programming And Assemblers

Introduction: Need of System Software, Components of System Software, Language Processing Activities, Fundamentals of Language Processing.
Assemblers: Elements of Assembly Language Programming, A simple Assembly Scheme, Pass structure of Assemblers, Design of Two Pass Assembler.

UNIT II - Macroprocessors, Loaders And Linkers

Macro Processor: Macro Definition and call, Macro Expansion, Nested Macro Calls and definition, Advanced Macro Facilities, Design of two-pass Macro Processor.
Loaders: Loader Schemes, Compile and Go, General Loader Scheme, Absolute Loader Scheme, Subroutine Linkages, Relocation and linking concepts, Self-relocating programs, Relocating Loaders, Direct Linking Loaders, Overlay Structure, Linkers.

Unit III – Introduction To Compilers

Phase structure of Compiler and entire compilation process.
Lexical Analyzer: The Role of the Lexical Analyzer, Input Buffering. Specification of Tokens, Recognition Tokens, Design of Lexical Analyzer using Uniform Symbol Table, Lexical Errors.

LEX: LEX Specification, Generation of Lexical Analyzer by LEX.
Unit IV - Parsers
Role of parsers, Classification of Parsers: Top down parsers- recursive descent parser and predictive parser (LL parser), Bottom up Parsers – Shift Reduce parser, LR parser. YACC specification and Automatic construction of Parser (YACC).
Unit V – Semantic Analysis And Storage Allocation
Need, Syntax Directed Translation, Syntax Directed Definitions, Translation of assignment Statements, iterative statements, Boolean expressions, conditional statements, Type Checking and Type conversion. Intermediate Code Formats: Postfix notation, Parse and syntax tress, Three address code, quadruples and triples. Storage Allocation: Storage organization and allocation strategies.
Unit VI - Code Generation And Optimization
Code Generation: Code generation Issues. Basic blocks and flow graphs, A Simple Code Generator. Code Optimization: Machine Independent: Peephole optimizations: Common Sub-expression elimination, Removing of loop invariants, Induction variables and Reduction in strengths, use of machine idioms, Dynamic Programming Code Generation. Machine dependent Issues: Assignment and use of registers

Text books :	1. D. M. Dhamdhere, Systems Programming and Operating Systems, Tata McGraw-Hill, ISBN 13:978-0-07-463579-7, Second Revised Edition 2. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Compilers Principles, Techniques and Tools, Addison Wesley, ISBN:981–235–885 - 4, Low Price Edition . 3. John R. Levine, Tony Mason & Doug Brown, "Lex&Yacc", O'Reilly
Reference Books :	1. J. J. Donovan, Systems Programming, McGraw-Hill, ISBN 13:978-0-07-460482-3, Indian Edition.

Open Elective-I (IOEUA32185A)
Information & Cyber Security

Teaching Scheme	Examination Scheme						
Credits: 3 Lecture (L): 3 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	-	100

Prerequisites : Fundamentals of Computer networks

Course Objectives:

- To know the need and basic of security.
- To learn various types of Cryptographic algorithm.
- To learn various authentication techniques.
- To acquire knowledge of protocols employed to provide Confidentiality and integrity.
- To understand various threats
- To acquaint with current security scenario.

Course Outcomes:

After studying this course, students will be able to:

1. Identify the basics and need of security (Understand)
2. Make use of various Cryptographic algorithm (Apply)
3. Examine various authentication techniques (Analyze)
4. Differentiate protocols for confidentiality and integrity (Understand)
5. Select techniques for securing a network (Remember)
6. Summarize Top OWASP top 10 vulnerabilities (Understand)

Unit I – Security Basics and Introduction to cryptography

Introduction, Elements of Information Security, Understanding concepts: threat, exploit, privacy, vulnerability and policy, Types of Attacks, Operational Model of Network Security, Cryptography, Substitution Ciphers, Transposition Ciphers, Stenography applications and limitations

UNIT II - Symmetric Key Cryptography

Introduction, Encryption Methods: Symmetric, Asymmetric, Block Ciphers and methods of Operations, Data Encryption Standard (DES), Advance Encryption Standard (AES).

Unit III – Asymmetric Key Cryptography

Public Key Cryptography, RSA Algorithm: Working, Key length, Security, Key Distribution, Deffie-Hellman Key Exchange, Authentication methods, Message Digest, Kerberos, X.509 Authentication service.
Digital Signatures: Implementation, Algorithms, Standards (DSS), Authentication Protocol.

Unit IV - Network Layer Security	
IP Security: IPSec protocols, and Operations, AH Protocol, ESP Protocol, ISAKMP Protocol, Oakkey determination Protocol, VPN. WEB Security: Introduction, Secure Socket Layer (SSL), SSL Session and Connection, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol. Electronic Mail Security: Introduction, Pretty Good Privacy, MIME, S/MIME, Comparison. Secure Electronic Transaction(SET)	
Unit V – Firewall And Intrusion	
Introduction, Computer Intrusions. Firewall Introduction, Characteristics and types, Benefits and limitations. Firewall architecture, Trusted Systems, Access Control. Intrusion detection, IDS: Need, Methods, Types of IDS, Password Management, Limitations and Challenges.	
Unit VI - Introduction to OWASP	
Introduction, Top 10 Vulnerabilities, understanding Top 10 Vulnerabilities.	
Text books :	1. AtulKahate, "Cryptography and Network Security", McGraw Hill Publication, 2nd Edition, 2008, ISBN: 978-0-07-064823-4. 2. Dr. V. K. Pachgare, "Cryptography and Network Security", PHI, 2nd Edition, 2015.
Reference Books :	1. William Stallings, "Cryptography and network security principles and practices", Pearson, 6th Edition, ISBN: 978-93-325-1877-3. 2. Forouzan, "Cryptography and Network Security (SIE)", McGraw Hill, ISBN: 007070208X, 9780070702080

Open Elective-I (IOEUA32185B)
Automotive Electronics

Teaching Scheme	Examination Scheme						
Credits: 3 Lecture (L): 3 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	-	100

Prerequisites : Basics of sensors and actuators, general automotive system, basics of OS

Course Objectives:

- To make familiar about automotive system operations.
- To illustrate need for automation in automotive operations and appropriate electronics for the same.
- To discuss suitability of electronics hardware and software platform for control, compute and communication systems in automotive.
- To discuss control algorithms used in automotive.
- To introduce various communication standards used for intra and inter-cluster communication in automotive electronic system.
- To make awareness of fault diagnosis system in automotive.

Course Outcomes:

After studying this course, students will be able to:

1. Understand powertrain and transmission mechanism of SI and DI engine.
2. Identify need of automation in automotive operations and appropriate electronics for the same.
3. Select suitable electronics hardware and software platform for design and development of various control, compute and communicate oriented automotive systems.
4. Understand control theory for automotive systems
5. Understand communication and fault diagnostic protocols used in automotive
6. Use the techniques, skills, and modern engineering tools necessary for automotive engineering practice

Unit I – Power Train Engineering and Fundamentals of Automotive

Fundamentals of Petrol, diesel and gas engines and electric motors. Basic Automotive System. Alternators and charging, battery technology, Ignition systems. Basic of Hybrid designs (solar power, electric/gasoline, LPG, fuel cells). Basic Transmission systems.

UNIT II - Sensors and Actuators in Automotive

In-vehicle sensors: Working principles, Characteristics, limitations and use within the automotive context of the following: Temperature sensing e.g. coolant. Position sensing e.g. crankshaft, throttle plate. Pressure sensing e.g. exhaust differential, tyre pressure measurement system. Distance sensing e.g. anti-collision,Velocity sensing e.g. speedometer, anti-skid, Torque sensing e.g. automatic transmission, Vibration sensing e.g. Airbags, Flow sensing and measurement e.g. Fuel injection.
Use of Actuators: Types, working principle, Characteristics, limitations and use within the automotive context of each type.

Unit III – Electronics Processing System in Automotive
Interfacing electronics: Operational amplifier circuits, Instrumentation amplifiers, Comparators. Level shifting, Wave-shaping, Filters. Noise mechanisms and reduction. Electronics control unit: Automotive processors and OS, typical design consideration of ECU
Unit IV - Automotive Control Systems
Control system approach in Automotive: Analog and Digital control methods. Cruise control, traction control, actuator limiting, wind-up, gain scheduling, adaptive control. **Special Control Schemes:** Vehicle braking fundamentals, Antilock systems, Variable assist steering and steering control, Controls for Lighting, Wipers, Air-conditions/Heating, Remote keyless Entry and Anti-theft System. Spark Ignition and Compression Ignition Engines and their electronic controls. **Engine management testing:** Engine management system strategies and implementation, Simulation and implementation methods.
Unit V – Automotive Communication Systems
Communication interface with ECUs: Interfacing techniques and interfacing with infotainment gadgets. Automotive Buses: Use of various buses such as CAN, LIN, Flexural, Recent trends in automotive buses (Such as OBDII, MOST, IE, IELLI, D2B, and DSI: Only Comparative study). **Application of Telematics in Automotive:** Global Positioning Systems (GPS) and General Packet Radio Service (GPRS), for use in an automotive environment.
Unit VI - Diagnostics and Safety in Automotive
Fundamentals of Diagnostics: Basic wiring system and Multiplex wiring system. Preliminary checks and adjustments. Self-Diagnostic system. Fault finding and corrective measures. Electronic transmission checks and Diagnosis. Diagnostic procedures and sequence. On board and off board diagnostics in Automotive. **Safety in Automotive:** Safety norms and standards. Passenger comfort and security systems. Electromagnetic environment and Automotive EMC Standards. SAE and IEEE Standards.

Text books :	1. Williams. B. Ribbens, "Understanding Automotive Electronics", 6th Edition, 2003, Elsevier 2. Science, Newness Publication. 3. Robert Bosch, "Automotive Electronics Handbook", John Wiley and Sons, 2004. 4. K.P. Ramchandran, G.K. Vijayraghavan, M.S. Balsundaram, "Mechatronics: Integrated Mechanical and Electronic System", Wiley India, 2010.
Reference Books :	1. Ronald K Jurgen, "Automotive Electronics Handbook", 2nd Edition, McGraw-Hill, 1999. 2. James D Halderman, "Automotive Electricity and Electronics", PHI Publication 2005.

Open Elective-I (IOEUA32185C)
Industrial Engineering

Teaching Scheme	Examination Scheme						
Credits: 3 Lecture (L): 3 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	-	100

Prerequisites : NA

Course Objectives:

- To introduce the concepts, principles and framework of contents of Industrial Engineering.
- To acquaint the students with various productivity enhancement techniques.
- To acquaint the students with different aspects of Production Planning and Control and Facility Design.
- To introduce the concepts of various cost accounting and financial management practices as applied in industries
- To acquaint the students with different aspects of Human Resource activities and Industrial Safety rules.
- To acquaint students with different aspect of simulation modeling for various industrial engineering\applications.

Course Outcomes:

After studying this course, students will be able to:

1. Compute the partial productivity and total productivity indexes considering different influencing factors
2. Analyse each operation with a view to eliminate unnecessary operations, avoidable delays and other forms of waste.
3. Compute the standard time for a qualified worker to carry out a specified job at a defined level of performance.
4. Design a physical arrangement of facilities most economically at optimum plant location.
5. Design the production system considering an estimate of future event through past data.
6. Calculate optimum inventory level by establishing the relationship among the factors affecting profit.

Unit I – Introduction to Industrial Engineering and Productivity

Definition and Role of Industrial Engineering, Types of production systems and organization structure, Functions of management. Measurement of productivity: Factors affecting the productivity, Productivity Models and Index (Numerical), Productivity improvement techniques.

UNIT II - Methods Study

Work Study: Definition, objective and scope of work-study, Human factors in work-study.
Method Study: Definition, objective and scope of method study, work content, activity recording and exam aids.

Charts to record movements: Operation process charts, flow process charts, travel chart, two-handed chart and multiple activity charts. **Principles of Motion Economy:** Classification of movements, SIMO chart, and micro motion study. Definition and installation of the improved method, brief concept about synthetic motion studies. Introduction to Value Engineering and Value Analysis.
Unit III – Work System Design
Work Measurements: Definition, objectives and uses, Work measurement techniques. **Work Sampling:** Need, confidence levels, sample size determinations, random observation, conducting study with the simple problems. **Time Study**: Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information, Rating and standard rating, standard performance, scales of rating, factors affecting rate of working, allowances and standard time determination. **Introduction to PMTS, MTMand MOST.**
Unit IV - Production Planning and Control
Introduction: Types of production systems, Need and functions of PPC, Aggregate production planning. Capacity Planning, ERP: Modules, Master Production Schedule, MRP and MRP-II. **Forecasting Techniques**: Causal and time series models, moving average, exponential smoothing, trend and seasonality (Numerical), Demand Control strategies (MTO, MTA, MTS). **Introduction to Supply Chain Management:** Basic terminologies.
Unit V – Facility Design
Plant Location: Need and factors influencing plant location, Plant Layout: Objectives, principles, types of plant layouts. Introduction to Assembly Line Balancing and Layout parameters to evaluate. **Material Handling systems:** Objectives, relation with plant layout, principles. Types and purpose of different material handling equipment, Selection of material handling equipment. **Inventory control and Management**: Types of inventories, Need of inventories, terminology, costs, Inventory Models: Basic production models, (with and without shortage and discount), ABC, VED Analysis.
Unit VI - Engineering Economy, Human Resource and Industrial Safety
Introduction to Costing: Elements of Cost, Break-Even Analysis (Numerical). Introduction to Debit and Credit Note, Financial Statements (Profit and loss account and Balance Sheet), Techniques for Evaluation of capital investments. **Human Resource Development**: Functions: Manpower Planning, Recruitment, Selection, Training. Concept of KRA (Key Result Areas), Performance Appraisal (Self, Superior, Peer, 360º). Industrial Safety: Safety Organization, Safety Program.

Text books :	1. M Mahajan, Industrial Engineering and Production Management, Dhanpat Rai and Co. 2. O. P. Khanna, Industrial engineering and management, Dhanpat Rai publication 3. Martend Telsang, Industrial Engineering, S. Chand Publication. 4. Banga and Sharma, Industrial Organization& Engineering Economics, Khanna publication
Reference Books :	1. Introduction to Work Study by ILO, ISBN 978-81-204-1718-2, Oxford & IBHPublishing Company, New Delhi, Second Indian Adaptation, 2008.

	2. H. B. Maynard, K Jell, Maynard 's Industrial Engineering Hand Book, McGraw Hill Education. 3. Askin, Design and Analysis of Lean Production System, Wiley, India 4. Zandin K.B., Most Work Measurement Systems, ISBN 0824709535, CRCPress,2002 5. Martin Murry, SAP ERP: Functionality and Technical Configuration, SAP Press; 3rdNew edition (2010). 6. Barnes, Motion and time Study design and Measurement of Work, Wiley India. 7. Raid Al-Aomar, Adwerd J Williams, Onur M. Uigen 'Process Simulation using WITNESS', Wiley.

Open Elective-I (IOEUA32185D)
Artificial Neural Network in Engineering

Teaching Scheme	Examination Scheme						
Credits: 3 Lecture (L): 3 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	-	100

Prerequisites : NA

Course Objectives:

- To make students aware of various soft computing techniques in general and Artificial Neural Networks in particular, giving details about its working and analogy with Biological Neural networks.
- To give students ideas about designing and training an Artificial Neural network using different algorithms to solve uinvariate and multivariate time series problems.

Course Outcomes:

After studying this course, students will be able to:

1. Understand ANN as AI, soft computing and data driven model and describe its types.
2. Compute the Net information given components of neuron.
3. Describe various network training algorithms.
4. Determine various design related aspects of ANN namely architecture, stopping criteria, performance function, overfitting.
5. Describe working of Recurrent networks, Radial basis function networks, Generalized regression neural networks, Self-organizing maps using case studies.
6. Design, train, and test 2 or 3 layered Feed forward back propagation neural network for time series and cause effect models.

Unit I – Introduction to Artificial Neural Networks

Biological Neural Network, Introduction to Artificial Intelligence, soft computing techniques, Data driven modeling, ANN as AI, Soft computing and data driven technique, Artificial Neuron, ANN-history and general properties, ANN types according to architecture and Neuro-Dynamics, ANN Vs empirical, statistical, physical, physics based models

UNIT II - Artificial Neuron

Components of artificial neuron, methods of computing net information, Activation functions (linear, sigmoidal, hyperbolic tangent, hard limiter, soft-lin), perceptron, Multi-layered perceptron (MLP)

Unit III – Network training

Pre-training procedures- data normalization, network initialization, Types of training-Supervised and un-supervised, Network training using supervised training algorithms – Standard back propagation algorithm or gradient descent algorithm (mathematical treatment), introduction to Network training

using conjugate gradient, resilient back propagation, Broydan-Fletcher-Goldfarb-Shanno algorithm, One step secant algorithm, Levernberg-Marquardt algorithm.
Unit IV - Important Aspects of ANN design
Network architecture- inputs, outputs, number of hidden layers, number of hidden neurons, stopping criteria, overfitting, validation, testing, De-normalization, Evaluating model performance, data division, performance function
Unit V – Types of ANN
Recurrent networks, Radial basis function networks, Generalized regression neural networks, Self-organizing maps (discuss using case studies of each referring to published papers and literature).
Unit VI - Applications of Feed Forward Back Propagation Neural Networks
Time series (univariate and multivariate) models, cause-effect models, Applications in Civil engineering, Electronics and Telecommunications, Mechanical Engineering, Computer Engineering, design, train and test simple 2 or 3 layered feed forward back propagation ANN for time series and cause effect models. Image Classifications using ANN.
Continuous Evaluation
1. Calculation of network output for any given ANN with sigmoidal, hyperbolic tangent and linear activation functions 2. Implementing standard backpropagation algorithm manually, Using WEKA or any other software 3. Designing, training, and testing 2-3 layered FFBP ANN using standard backpropagation algorithm for any time series problem (univariate) 4. Evaluating the performance of ANN developed in Experiment 3 by varying number of hidden neurons, activation functions, normalization ranges 5. Designing, training, and testing 2-3 layered FFBP ANN using standard backpropagation algorithm for any time series problem (multi-variate) 6. Evaluating the performance of ANN developed in Experiment 5 by varying number of hidden neurons, activation functions, normalization ranges 7. Designing, training, and testing 2-3 layered FFBP ANN using standard backpropagation algorithm for any cause effect problem 8. Evaluating the performance of ANN developed in Experiment 7 by varying number of hidden neurons, activation functions, normalization ranges 9. Demonstration of MNIST digit classification using ANN.

Text books :	1. Wasserman, P.D., (1993), " Advanced methods in neural computing", Van Nostrand Reinhold, New York 2. Kosko, B., (1992), "Neural Networks and Fuzzy systems", Prentice Hall, Englewood Cliffs, NJ 3. Bose, N. K., Liang, P. (1998), "Neural Network Fundamentals with Graphs, Algorithms and Applications", Tata McGraw-Hill Publication.
Reference Books :	

Open Elective-I (IOEUA32185E)
Social Media Analytics

Teaching Scheme	Examination Scheme						
Credits: 3 Lecture (L): 3 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	20	30	20	30	-	-	100

Prerequisites : NA

Course Objectives:

- To understand foundations of Social Media Analytics.
- To Visualize and understand the data mining aspects in social networks.
- To solve mining problems by different algorithms.
- To understand network measures for social data.
- To understand behavioral part of web applications for Analysis.
- To analyze the data available on any social media applications.

Course Outcomes:

After studying this course, students will be able to:

1. Understand the basics of Social Media Analytics.
2. Understand the visualization of social networks and the significance of Data mining in Social media.
3. Demonstrate the algorithms used for text mining.
4. Evaluate the performance of centrality measures on social graph.
5. Explain Behavior Analytics techniques used for social media data.
6. Apply social media analytics for Facebook, LinkedIn and Twitter kind of applications.

Unit I – Introduction To Social Media Analytics (Sma) And Types Of Analytics Tools

Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas,
The foundation for analytics, Social media data sources, Defining social media data, data sources in social media channels, Estimated Data sources and Factual Data Sources, Public and Private data, data gathering in social media analytics

UNIT II - The Social Networks Perspective And Its Visualization

The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks.
A Taxonomy of Visualization, The convergence of Visualization, Interaction and Analytics. Data mining in Social Media: Introduction, Motivations for Data mining in Social Media, Data mining methods for Social Media

Unit III – Text Mining In Social Networks
Introduction, Keyword search, Classification Algorithms, Clustering Algorithms-Greedy Clustering, Hierarchical clustering, k-means clustering, Transfer Learning in heterogeneous Networks, Sampling of online social networks, Comparison of different algorithms used for mining, tools for text mining.
Unit IV - Network Measures
Centrality: Degree Centrality , Eigenvector Centrality, Katz Centrality , PageRank, Betweenness Centrality, Closeness Centrality ,Group Centrality ,Transitivity and Reciprocity, Balance and Status, Similarity: Structural Equivalence, Regular Equivalence
Unit V – Behavior Analytics
Individual Behavior: Individual Behavior Analysis, Individual Behavior Modeling, Individual Behavior Prediction Collective Behavior: Collective Behavior Analysis, Collective Behavior Modeling, Collective Behavior Prediction
Unit VI - Case Study
Mining Twitter: Overview, Exploring Twitter's API, Analyzing 140 Characters Mining Facebook: Overview, Exploring Facebook's Social Graph API's, Analyzing Social Graph Connections. Mining Linked In: Overview, Exploring Linked In API

Text books :	1. Reza Zafarani Mohammad Ali Abbasi Huan Liu, Social Media Mining, Cambridge University Press, ISBN: 10: 1107018854. 2. Charu C. Aggarwal, Social Network Data Analytics, Springer, ISBN: 978-1-4419-8461-6. 3. Matthew Ganis, Avinash Kohirkar Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media,Pearson publications,2016
Reference Books :	1. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, McGraw Hill Education, 978-0-07-176829-0. 2. 2. Matthew A. Russell, Mining the Social Web, O'Reilly, 2nd Edition, ISBN:10: 1449367615. 3. Jiawei Han University of Illinois at Urbana-Champaign Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2nd Edition, ISBN: 13: 978-1-55860-901-3 ISBN: 10: 1-55860-901-6. 4. Bing Liu, Web Data Mining : Exploring Hyperlinks, Contents and Usage Data, Springer, 2nd Edition, ISBN: 978-3-642-19459-7

Employability Skill (ITUA32186)
(Mobile Application Development)

Teaching Scheme	**Examination Scheme**						
Credits: 3 Lecture (L): 3 hrs./week Practicals/week: 2 hrs./week	CIE	ISE	SCE	ESE	PR/OR	TW	Total
	-	-	50	-	-	25	75

Prerequisites : Fundamentals of Data Structures, Object Oriented Programming, Data Structures and Files

Course Objectives :

- To learn how to employ Integrated Development Environment(IDE) for implementing and testing of software solution in android development
- To acquire contemporary skills to make the students employable in information technology domain

Course Outcomes :

After studying this course, students will be able to:

1. Understand Android activities life cycle.
2. Demonstrate operations on GUI objects.
3. Perform & evaluate Event driven programming.
4. Apply various techniques on working with menu.

Unit I: Introduction to Android:

Overview of Android: What does Android run On – Android Internals? Android for mobile apps development Environment setup for Android apps Development Framework - Android- SDK, Eclipse Emulators – What is an emulator Android AVD? Android Emulation – Creation and set up First Android Application

Unit II: Android Activities and GUI Design Concepts

Design criteria for Android Application : Hardware Design Consideration, Design Demands For Android application, Intent, Activity, Activity Lifecycle and Manifest Creating Application and new Activities Simple UI -Layouts and Layout properties :Introduction to Android UI Design, Introducing Layouts XML Introduction to GUI objects viz.: Push Button , Text / Labels , EditText, ToggleButton , Padding

Unit III: Advanced UI Programming

Event driven Programming in Android (Text Edit, Button clicked etc.) Activity Lifecycle of Android

Unit IV: Toast, Menu, Dialog, List and Adapters

Menu: Basics, Custom v/s System Menus, Create and Use Handset menu Button (Hardware) Dialog : Creating and Altering Dialogs , Toast : List & Adapters Demo Application Development and Launching Basic operation of SQLite Database 5.6 Android Application Priorities

Text books :	1. Building Android Apps IN EASY STEPS McGraw-Hill Education 2. Professional Android 2 Application Development Reto Meier Wiley India Pvt Ltd 3. Beginning Android Mark L Murphy Wiley India Pvt Ltd 4. Pro Android Sayed Y Hashimi and Satya Komatineni Wiley India Pvt Ltd
Reference Books :	1. Android Studio Development Essentials by Neil Smyth 2. The Definitive Guide to SQL Lite by Michael Owens
Web References:	1. http://www.tutorialspoint.com/android/ http://www.tutorialspoint.com/android/android_overview.htm 2. http://www.codelearn.org/android-tutorial/android-introduction 3. http://pl.cs.jhu.edu/oose/resources/android/Android-Tutorial.pdf 4. http://mobisys.in/blog/2012/01/introduction-to-android-sqlite-database/ 5. www.appmakr.com/Android 6. www.telerik.com/android-development 7. developer.android.com/training/basics/firstapp

Assignments : Employability Skill(Mobile Application Development) Laboratory	
1	Installation and setup of java development kit(JDK),setup android SDK, setup eclipse IDE, setup android development tools (ADT) plugins, create android virtual device.
2	Create "Hello World" application. That will display "Hello World" in the middle of the screen using TextView Widget in the red color
3	Create application for demonstration of android activity life cycle 2 Create Registration page to demonstration of Basic widgets available in android.
4	Create sample application with login module.(Check username and password) On successful login, Chnage TextView "Login Sucessful". And on failing login, alert user using Toast "Login fail"
5	Create login application where you will have to validate usename and passwords Till the username and password is not validated , login button should remain disabled.
6	Create and Login application as above. Validate login data and display Error to user using setError() method. Create an application for demonstration of Relative and Table Layout in android.
7	Create an application for demonstration of Scroll view in android 2 Create an application for demonstration of Explicitly Starting New Activity using Intent.
8	Create an application that will pass two number using TextView to the next screen , and on the next screen display sum of that number.
9	Create spinner with strings taken from resource folder (res >> value folder). On changing spinner value, change background of screen.
10	Create an application that will get the Text Entered in Edit Text and display that Text using toast (Message).
11	Create an application that will Demonstrate Button onClick() Event and change the TextView Color based on button Clicked.
12	Create an UI such that, one screen have list of all the types of cars. On selecting of any car name, next screen should show Car details like: name, launched date, company name.
13	Create an application that will Demonstrate Dialog Box Control In Android 4