

Course: Masters in Computer Applications (Batch 2023)
Program Structure
Semester I (First year)

Sr. No	Course Code	Course Title	Course Type	Credit					Credit Units
				L	T	PS			
1	CAS-610	Programming with Python-I	Core Courses	3	0	4	0	0	5
2	CAS-603	Advanced Database Management System	Core Courses	4	0	2	0	0	5
3	CAS-611	Advanced Data Structures -I	Core Courses	3	0	4	0	0	5
4	CAS-601	Advanced Software Engineering	Core Courses	4	0	2	0	0	5
5	CAS-609	Mathematical Structures in Computer Science	Allied Science Course	4	0	0	0	0	4
6	PSY-601	Self-Development and Interpersonal Skills	Value Added Course (Behavioral Science)	1	0	0	0	0	1
7	FOL-101/ FOL-102	Introduction to French Culture & Language/ Introduction to German Culture & Language	Value Added Course (Foreign Business Language)	1	0	0	0	0	1
			TOTAL	20	0	12			26
		Total Credits					Min Required: 26 Semester Credits: 26		

Course: Masters in Computer Applications
Program Structure
Semester II (First year)

Sr. No	Course Code	Course Title	Course Type	Credit					Credit Units	
				L	T	PS				
1		Statistics and Data Analysis	Allied Science Course	4	0	0	0	0	4	
2		Advanced Web Technologies	Core Courses	3	0	4	0	0	5	
3		Research Methodology & IPR	Core Courses	4	0	0	0	0	4	
4		Programming with Java	Core Courses	3	0	4	0	0	5	
5		Linux Administration	Core Courses	4	0	2	0	0	5	
6		Conflict resolution & management	Value Added Courses (Behavioral Science)	1	0	0	0	0	1	
7		French Grammar/German Grammar	Value Added Courses (FBL)	1	0	0	0	0	1	
			TOTAL	20	0	10			25	
		Total Credits						Min Required: 25		
								Semester Credits: 25		

**6-8 Weeks Industrial/Institutional training after 2nd Semester*

Course: Masters in Computer Applications
Program Structure
Semester III (Second year)

Sr. No	Course Code	Course Title	Course Type	Credit					Credit Units	
				L	T	PS				
1		Fundamentals of Artificial Intelligence & Soft Computing	Core Courses	3	0	4	0	0	5	
2		Advanced Computer Networks	Core Courses	4	0	0	0	0	4	
3		Theory of Computation	Core Courses	4	0	0	0	0	4	
4		Domain Elective - I	Domain Elective	4	0	0	0	0	4	
5		Domain Elective - II	Domain Elective	3	0	2	0	0	4	
6		Professional Ethics and Responsibilities – I	Value Added Courses	1	0	0	0	0	1	
7		Minor Project	NTCC	0	0	4	0	0	2	
8		*Industrial Training	NTCC	0	0	0	0	0	2	
			TOTAL	19	0	10			26	
		Total Credits						Min Required: 26 Semester Credits: 26		

Course: Masters in Computer Applications
Program Structure
Semester IV (Second year)

Sr. No	Course Code	Course Title	Course Type	Credit					Credit Units	
				L	T	PS				
1		Information Security and Cyber Laws	Core Courses	4	0	0	0	0	4	
2		Machine Learning and Data Analytics using Python	Core Courses	3	0	4	0	0	5	
3		Domain Elective - III	Domain Elective	4	0	0	0	0	4	
4		Domain Elective - IV	Domain Elective	3	0	2	0	0	4	
5		Professional Ethics and Responsibilities – II	Value Added Courses	1	0	0	0	0	1	
6		Seminar	NTCC	0	0	0	0	0	2	
7		Major Project	NTCC	0	0	8	0	0	4	
			TOTAL	15	0	14			24	
		Total Credits						Min Required: 24 Semester Credits: 24		

Domain Elective: I (Without Lab)

Enterprise Resource Planning

Data Mining and Business Intelligence

Optimization techniques

Domain Elective: II (With Lab)

Mobile Application Development

Big Data Analytics

Software Testing and Quality Assurance

Domain Elective: III (Without Lab)

Data Science

NLP and Speech Recognition

E-Commerce and Digital Marketing

Domain Elective: IV (With Lab)

Cloud Computing

IOT and Blockchain Technologies

Digital Image Processing

Sr. No.	Category	Sem-I	Sem-II	Sem-III	Sem-IV	Total
1.	Allied Sc.	04	04	00	00	08
2.	Basic. Sc.	00	00	00	00	00
3.	Core	20	19	13	09	61
4.	VAC-FBL	01	01	00	00	02
5.	VAC-BS	01	01	00	00	02
6.	VAC-PE	00	00	01	01	02
7.	Domain Elective	00	00	08	08	16
8.	NTCC	00	00	04	06	10
9.	MOOC	00	00	00	00	00
	Total	26	25	26	24	

Course: Masters in Computer Applications
Program Structure
Semester I (First year)

Sr. No	Course Code	Course Title	Course Type	Credit					Credit Units
				L	T	PS			
1		Programing with Python -I	Core Courses	3	0	4	0	0	5
2	CAS-603	Advanced Database Management System	Core Courses	4	0	2	0	0	5
3		Advanced Data Structures-I	Core Courses	3	0	4	0	0	5
4	CAS-601	Advanced Software Engineering	Core Courses	4	0	2	0	0	5
5		Mathematical Structures in Computer Science	Allied Science Course	4	0	0	0	0	4
6	PSY-101	Self-Development and Interpersonal Skills	Value Added Course (Behavioral Science)	1	0	0	0	0	1
7	FOL-101/ FOL-102	Introduction to French Culture & Language/ Introduction to German Culture & Language	Value Added Course (Foreign Business Language)	1	0	0	0	0	1
			TOTAL	20	0	12			26
		Total Credits						Min Required: 26 Semester Credits: 26	

Course Title: Advanced Software Engineering

L	T	P/S	SW/F W	No. of PSD A	TOTAL CREDIT UNITS
4	0	2	0	0	5

Course Contents/syllabus:

	Total Teaching Hours
Unit I: Software Engineering Fundamentals	15 H
<p>Basics of software engineering, software engineering overview, software challenges, key quality attributes, software engineering principles, Need of Software Engineering, Characteristics of Good Software</p> <p>SOFTWARE DEVELOPMENT LIFE CYCLES (SDLCs) – Part I Process Models and Solution Life Cycle Phases Traditional Life Cycle Models: Waterfall, V, Phased, Evolutionary, Spiral, CBSE Alternative Techniques: UP, RAD, JAD, PSP/TSP, Prototyping</p> <p>SOFTWARE DEVELOPMENT LIFE CYCLES (SDLCs) – Part II Agile Software Engineering Process Models: Extreme Programming , Agile Software Development, DevOps, Site Reliability Engineering (SRE) Roles and Types of Standards, ISO 12207: Life Cycle Standard, IEEE Standards for Software Engineering Processes and Specifications</p>	
Unit II: Software Project Management and Requirements	15 H
<p>Project Management: Management Activities, Project Planning, Project Scheduling, Risk Management, Software Cost Estimation: Productivity, Estimation Techniques, Algorithmic Cost Modeling, Project Duration and Staffing. Quality Management: Quality Assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics; Process Improvement: Process and Product Quality, Process Analysis and Modeling, Process Measurement, the SEI Process Maturity Model, and Process Classification</p> <p>Software Requirements: Functional and Non-Functional Requirements, User Requirements, System Requirements, Requirements Document; Requirements Engineering Process: Feasibility Studies, Requirements Elicitation and Analysis, Requirements Validation, Requirements Management.</p>	
Unit III: Architectural and Software Design	15 H
<p>Introduction: System Structuring; Control Models; Modular Decomposition; Domain- Specific Architectures; Distributed Systems Architectures: Multiprocessor Architectures; Client-Server Architectures, Distributed Object Architectures; CORBA (Common Object Request Broker Architecture)</p> <p>Object Oriented Design: Objects and Object Classes, Object-Oriented Design Process, Design Evolution; Real Time Software Design: Systems Design, Real-Time Executives, Monitoring and Control Systems, Data</p>	

Acquisition Systems; Design with Reuse: Component-Based Development, Application Families, Design Patterns; User Interface Design: Principles, User Interaction, Information Presentation, User Support, Interface Evaluation.	
Unit IV: Verification, validation and Testing	15 H
Verification and Validation (V & V): Static and Dynamic V & V, V & V Goals, V & V vs. Debugging, Software Inspections / Reviews, Clean-Room Software Development; Software Testing: Defect Testing, Integration Testing, Interface Testing, Object-Oriented Testing, Testing Workbenches	

Lab/ Practical details, if applicable:

(Total: 30 Hours)

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses.

A project may be carried out for various exercises of lab.

1. Introduction of Unified Modeling Language and open source software for designing.
2. Prepare a feasibility report of selected project.
3. Prepare a SRS document for selected Project.
4. Make Class diagrams for various set of objects involved in the project.
5. Make object diagrams involved in the project.
6. Make Use case diagram of the project.
7. Make sequence diagrams of the project.
8. Make collaboration diagrams of the project.
9. Make state chart diagram of the project.
10. Make activity diagram of the project.
11. Make component diagram of the project.
12. Make deployment diagram of the project.
13. Prepare the testing plan of the project with test case suite.
14. Introduction to various automated tools for testing.

Course Learning Outcomes:

1. Understand the basics of software Engineering along with various SDLC models.
2. Analyze the software project requirements, risk and cost involved in the project.
3. Understand the architecture and design of software.

- Validate and test the software as per requirements.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN	Pages
J.F.Peters and W. Pedrycz	Software Engineering: An Engineering Approach	Wiley	2007	978-0471189640	720
Roger Pressman	Software Engineering: A Practitioner's Approach-7 th edition	McGraw-Hill	2009	978-0071267823	928
Ghezzi, Jayazeri, and Mandrioli	Fundamentals of Software Engineering	Prentice-Hall	2002	978-0130991836	624
Ali Behforooz, and Frederick J.Hudson	Software Engineering Fundamentals	Oxford University Press	2012	978-0198090502	688
James Rumbaugh and Michael Blaha	Object - Oriented Modeling and Design With UML 2 nd Edition	Pearson Education India	2007	978-8131711064	504
Rajib Mall	Fundamentals of Software Engineering-4 th edition	Prentice Hall	2014	978-8120348981	544

Course Title: Programming with Python -I

L	T	P/S	SW/FW	No. of PSDA	TOTAL CREDIT UNITS
3	0	4	0	0	5

Course Contents/syllabus:

	Total teaching Hours
Unit I: Introduction to programming and basics of python	12 H
History of Python, Need of Python Programming, Applications, Basics of Python Programming, Using the IDLE, Running Python Scripts,	

Installation of Jupyter Notebook, Variables, Assignment, Keywords, Input-Output, Indentation, comments	
Unit II: Types, Operators and Expressions	18 H
Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations, Control Flow- if, if-elif-else, for, while, break, continue	
Unit III: Data Structures in Python	15 H
Lists - Creating, Printing, Operations on lists, Slicing, Methods; Tuples: Creating, Printing, properties of tuples, Sets, Dictionaries, Sequences and their properties.	
Unit IV: Functions and python packages	15 H
Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. Introduction to PIP, Installing Packages via PIP, Using Python Packages	

Lab/ Practical details, if applicable:

(Total: 60 Hours)

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out hands on experience in programming

1. Perform installation of python
2. Perform installation of jupyter notebook
3. Execute a basic python program with a print message.
4. WAP to Check the Python version on command line
5. WAP to display the current date and time.
6. WAP to input Integer Number as input from User
7. WAP to input Float Number as a Input from User
8. WAP to get Multiple inputs From a User in One Line
9. WAP to format Output String by its positions
10. WAP to access Output String Arguments by name
11. WAP which accepts the user's first and last name and print them in reverse order with a space between them.
12. WAP which accepts the radius of a circle from the user and compute the area.
13. WAP to print the following string in a specific format
14. WAP to implement arithmetic operators
15. WAP to implement relational (comparison) operators

16. WAP to implement logical, membership, identity operators
17. WAP to implement bitwise operators
18. WAP to implement show Operators Precedence
19. WAP to print all even and odd numbers using loops
20. WAP to implement for and while loops
21. WAP to sum all the items in a list.
22. WAP to multiply all the items in a list.
23. WAP to get the largest number from a list.
24. WAP to declare a dictionary
25. WAP to access dictionary elements
26. WAP to print dictionary elements
27. WAP to check whether a given key already exists in a dictionary.
28. WAP to sum all the items in a dictionary
29. WAP to check a dictionary is empty or not.
30. WAP to implement functions
31. WAP to implement function: call by value
32. WAP to show returning function variables
33. WAP to show use of local and global variables
34. WAP to implement an application using functions and loops.

Course Learning Outcomes:

1. Understand the basics of programming and implement basic python programs, input output functions, types and operators.
2. Develop programs using conditional, branching, iteration.
3. Learn the functions declaration, implementation, arguments.
4. Develop an application using the concepts of list, dictionary, tuples solve engineering and/or scientific problems

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN	Pages

Paul Barry	Head First Python	O'Reilly Media, Inc.	2016	9781491919538	
Wesley J. Chun	Core Python Programming	Prentice Hall	2006	978-0-13-226993-3	1120
Kenneth A. Lambert	Fundamentals of Python	Cengage	2019	9789353502898	496
Vamsi Kurama	Python Programming: A Modern Approach	Pearson	2018	978-9332587526	

Course Title: Advanced Database Management System (CAS-603)

L	T	P/S	SW/FW	No. of PSD A	TOTAL CREDIT UNITS
4	0	2	0	0	5

Course Contents/syllabus:

	Total teaching Hours
Unit I: RDBMS Fundamentals	15 H
Formal review of relational database, Theoretical concepts, Relational model conformity and Integrity, SQL Queries, Various Normal forms, Decomposition and synthesis approaches, Basics of query processing, external sorting, Processing of joins, materialized vs. pipelined processing, query transformation rules, DB transactions, ACID properties, interleaved executions, schedules, serializability.	
Unit II: Transaction Management and Concurrency Control	15 H
Concurrency control and Transaction management, Recovery Storage organization, Database performance tuning, Distributed relational systems and Data Replication, Security considerations. Transaction Control: Save Point, Commit, Rollback, DCL Commands, Synonym, sequence, Index, Views, Types of locks : Row level locks, Table level locks, Shared lock, Exclusive lock, Deadlock	
Unit III: Emerging Database Management System Technologies	15 H
Object Oriented Database concepts: object identity, structure, and type constructors; encapsulation of operations, methods, and persistence; type and class hierarchies and inheritance; structures and unstructured complex objects and type extensibility; polymorphism, multiple inheritance and selective inheritance, versions and configurations. Temporal database concepts: Time representation, calendars, and time dimensions; incorporating time in relational databases using tuple versioning, incorporating time in object-oriented databases using attribute versioning, time series data.	

Multimedia Databases: The nature of multimedia data and applications; spatial database concepts and architecture, introduction to multimedia database concepts. Deductive databases and Query processing: Prolog/Data log notations, clausal form and horn clauses; interpretations of rules. Mobile Databases: Mobile computing architecture, characteristics of mobile environments, data management issues. Geographic Information Systems: GIS applications, data management requirements of GIS, specific GIS data operations.	
Unit IV: New Database Applications and Environments	15 H
Data Mining: Overview of data mining technology (associated rules, classification, clustering), applications of data mining; Data Warehousing: Overview of data warehousing, typical functionality of a data warehouse.	

Lab/ Practical details, if applicable: (Total: 30 Hours)

Objective: The laboratory exercises in this section have been so designed that the students learn to verify some of the concepts learnt in the theory courses.

1. Introduction to SQL environment.
2. Exercises on basic SQL queries with DDL and DML commands
3. Perform queries for DCL Commands.
4. Implement various types of locks.
5. Implement authorization, authentication, privileges on database.
6. Perform queries to Create synonyms, sequence and index
7. Perform queries to Create, alter and update views
8. Perform exercise related to various kinds of joins.
9. Perform exercise related to synonyms and sequences.
10. Perform exercise related to Transaction Control: Save Point, Commit, Rollback
11. Introduction to various tools related to emerging databases.
12. Introduction to various Data Mining tools

Course Learning Outcomes:

1. Understand the various concepts related to relational database management System.
2. Analyze the control on various real time transactions along with concurrency.
3. Understand the concepts of emerging databases.
4. Understand about Data Mining and warehousing concepts.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN	Pages
R. Ramakrishnan, J. Gehrke	Database Management Systems, 3 rd Edition	McGraw Hill	2014	978-8131769591	1100
A. Silberschatz, H. Korth, S. Sudarshan	Database system concepts 5 th Edition	McGraw-Hill	2008	978-0071244763	1024
Ramez Elmasri, Shamkant B. Navathe	Fundamentals of Database Systems, 4 th Edition	Pearson Education	2004	9780321122261	1029
C. J. Date	An Introduction to Database System, 8 th Edition	Pearson Education	2004	978-0321197849	1040

Advanced Data Structures - I

L	T/Pr actice	P/ S	SW/F W	No. of PSDA	TOTAL CREDIT UNITS
3	0	4	0	0	5

Course Contents/Syllabus:

	Total Teaching Hours
Unit 1 Linear data structures	15 H
Introduction to Data Structures, Algorithms and Pseudo-codes, Arrays, Stacks and Queues. Operations on Stacks and Queues. Infix to postfix, Applications of stack and queues, Linked lists, Doubly linked list, Circular linked list, operations on linked lists: create, insert, display, delete, traverse.	
Unit 2 Sorting and algorithmic analysis	15 H
Sorting techniques: bubble sort, selection sort, insertion sort, quick sort, merge sort. Space and time Complexities, Best case, worst case and average case complexities, Types of complexity functions: constant, logarithmic, exponential, linear. Asymptotic notations. Tradeoffs between space and time, Complexity analysis of all sorting techniques.	
Unit 3 Non-Linear data structures	15 H
Terminology of trees, types of trees, Binary tree, BST, traversals, Creation, insert, display, delete in trees. Heap tree. MinHeap, max heap, AVL trees, Rotations of AVL tree, B Trees, Introduction to Graphs, Terminologies,	

Representation, graph traversal, Breadth first search, Depth first search, Minimum Spanning tree (Prim and Kruskal)	
Unit 4 Hashing and Problem solving techniques	15 H
Hash functions, Hash tables, hashing techniques, Concept of collisions, Applications, Brute force algorithms, Greedy algorithms, Divide and Conquer with examples, other applications of data structures.	

Lab/ Practical details, if applicable:

(Total: 60 Hours)

Objective: The laboratory exercises in this section have been so designed that the students can perform hands-on on various data structures, their implementation and usage for problem solving.

1. WAP to implement create, insert, display and traverse in array.
2. WAP to reverse elements of an array.
3. WAP to implement creation and insertion in Stack.
4. WAP to implement traversal, display and deletion in Stack.
5. WAP to implement creation and insertion in queue
6. WAP to implement traversal, display and deletion in queue
7. WAP to implement creation, display, concatenate in singly linked list.
8. WAP to implement merge operation in singly linked list.
9. WAP to implement a menu driven approach for given operations: Create, Display, Concatenate, merge, union, intersection in single list.
10. Write a menu driven program that implements doubly linked list.
11. Write a menu driven program that implements Singly circular linked list for the given operations: Create, Display, Count, Insert, Delete, Search.
12. WAP to implement bubble sort using n elements.
13. WAP to implement insertion sort using n elements.
14. WAP to implement selection sort using n elements.
15. WAP to implement merge sort using n elements.
16. WAP to create a binary tree.
17. WAP to traverse a binary tree.
18. WAP to create a binary search tree.
19. WAP for in-order, preorder and post-order traversal in binary tree.
20. WAP to Search the tree for a given node and delete the node
21. Write a program that implements Min and Max Heap tree.

22. WAP to create a graph.
23. Write a program to insert and delete nodes in graph using adjacency matrix.
24. Write a program to implement Breadth First search.
25. Write a program to implement Depth first search.
26. WAP to implement any brute force approach for a given problem.
27. WAP to implement greedy approach.
28. WAP to implement knapsack problem.
29. WAP to implement divide and conquer approach.

Course Learning Outcomes: This course will enable the students to:

1. Understanding the concept of complexity, fundamentals of algorithms and problem solving.
2. Learn and implement various searching and sorting techniques.
3. Understand and apply linear data structures like stack, queue, arrays, lists.
4. Understand, analyze and apply nonlinear data structures, trees and graphs for solving real world applications

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN	Pages
Seymour Lipschutz	Data Structures With C - by Schaum series	Tata McGraw Hill	2017	978-0070701984	
Robert Kruse, C.L. Tondo, Bruce Leung Pearson.	Data structures and Program Design in C	Pearson India	2006	978-8177584233	624
Tremblay & Sorenson	An Introduction to Data Structures with Application	McGraw Hill Education	2017	978-0074624715	872

Course Title: Mathematical Structures in Computer Science

Course Contents/syllabus:	L	T	P/S	SW/FW	TOTAL CREDIT UNITS
		4	0	0	0
					Teaching Hours
Unit I: Logic and Proof Techniques					15 H

Sets and Subsets, Operations on Sets, Sequence. Logic: Proposition and Logical Operations, Methods of Proof, Mathematical Induction. Mathematics Logic: Statements and Notation, Connectives, Normal forms, The Theory of Interface for The Statement Calculus, Inference Theory of The Predicate Calculus	
Unit II: Relation and Diagraph function	15 H
Counting: Permutation, Combination. Relational and Digraphs: Product Sets and Partitions, Relations and Digraphs, Paths in Relations and Digraphs Properties of Relations, Equivalence Relations, Computer Representation of Relations and Digraph, Manipulation of Relations, Transitive Closure. Functions: Definition and Introduction, Function for Computer Science, Permutation Functions,	
Unit III: Graph Theory, Boolean and Tree	15 H
Graph Theory: Basic Concept of Graph Theory, Euler Paths and Circuits, Hamiltonian Paths and Circuits. Other Relations and Structure- Partially ordered Sets, Lattices Finite. Boolean: Algebra, Functions of Boolean Algebras, Boolean Function as Boolean Polynomials. Tree- Introduction Undirected Tree, Minimal Spanning Trees.	
Unit IV: Group theory	15 H
Group, subgroup, Binary Operations Revisited Semigroups, Products and Quotations of Groups. Introduction to Computability, Languages Finite State Machines, Semigroup, Machines and Language.	

(Total: 60 Hours)

Course Learning Outcomes: On the successful completion of this course the student will be able to

1. Construct mathematical arguments using logical connectives and quantifiers.
2. Verify the correctness of an argument using symbolic logic and truth tables.
3. Construct proofs using direct proof, proof by contradiction, and proof by cases, or mathematical induction.
4. Perform operations on discrete structures such as sets, functions, relations, sequences, and groups.
5. Understand the basics of graph theory, Lattices, and their applications

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Rosen K.	Discrete Mathematics and Its Applications	7 th Edition, Tata McGraw-Hill Education	2011	9780070681880, 0070681880

Tremblay J. P. and Manohar R.	Discrete Mathematical Structures with Applications to Computer Science	Tata McGraw-Hill Education	1997	9780074631133, 9780074631133
Kolman B., Busby R. and Ross S. C.	Discrete Mathematical Structures	6 th Edition, Pearson	2015	9789332549593, 8131755541

COURSE CODE: PSY-601 (Self-Development and Interpersonal Skills)

L	T	P	Total Credits
1	0	0	1

Course Contents/syllabus:

	Total Teaching Hours
Unit I: Understanding Self and Worth	7 H
Formation of self-concept Dimension of Self Components of self; Self Competency; Meaning and Nature of Self Esteem, Importance & need of Self Esteem; Steps to enhance Self Esteem; Self Esteem at work	
Unit II: Emotional Intelligence: Brain Power	3 H
Introduction to EI; Difference between IQ, EQ and SQ Relevance of EI at workplace; Self-assessment, analysis and action plan	
Unit III: Managing Emotions and Building Interpersonal Competence	4 H
Need for and importance of Emotions; Healthy and Unhealthy expression of emotions Anger: Conceptualization and Cycle, Developing emotional and interpersonal competence; Self-assessment, analysis and action plan	
Unit IV: Leading Through Positive Attitude	4 H
Understanding Attitudes; Formation of Attitudes; Types of Attitudes; Effects of Attitude on: Behavior, Perception, Motivation, Stress, Adjustment, Time Management, Effective Performance Building Positive Attitude	

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

1. To apply cutting edge scientific insights about human behavior, and learn how to change human behavior by altering the “context” in which people act rather than how they think
2. Understand state-of-the-art methodological and statistical approaches that are necessary to evaluate the effectiveness of behavioral change.
3. Apply behavioral science knowledge and skills to develop insights on individuals and society
4. Analyze the nature of human behavior and the impact of factors that influence how humans feel, think and act at an individual, group and societal level
5. Evaluate the influence of values and attitudes on human behavior

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Singh A.	Achieving Behavioural Excellence for Success	Wiley Publication	2012	978812658027
Towers, Marc	Self Esteem	American Media	1995	9781884926297
Pedler Mike, Burgoyne John, Boydell Tom	A Manager's Guide to Self-Development	McGraw-Hill	2006	978-0077114701
Covey, R. Stephen	Seven habits of Highly Effective People	Simon & Schuster Ltd	2013	978-1451639612
Khera Shiv	You Can Win	Macmillan	2005	978-0333937402
Gegax Tom	Winning in the Game of Life	Harmony Books	1999	978-0609603925
Singh, Dalip	Emotional Intelligence at Work	Publications	2006	9780761935322
Goleman, Daniel	Emotional Intelligence	Bantam Books	2007	9780553095036
Goleman, Daniel	Working with E.I.	Bantam Books	1998	9780553104622

COURSE CODE: FOL101 (Introduction to French Culture & Language)

L	T	P	Total Credits
1	0	0	1

Course Contents/syllabus:

	Total Teaching hours
Unit-I Introduction to French language	3 h
<ul style="list-style-type: none"> • Brief introduction of French and Francophone countries • Presenting oneself • Getting information about someone else • Greeting and taking leave • Asking/giving personal information 	

Unit-II- A rendez-vous ; Visiting a place	6 h
<ul style="list-style-type: none"> • Pronouncing and writing numbers in French • Spell and count numbers • Telling the time • Temporal expressions • Communicating in class • Fixing an hour, place for a meeting. • Describing a person. • Identifying a person, object and place • Describing relation in a family • A specific person, object and place 	
Unit-III- An interview	4.5 h
<ul style="list-style-type: none"> • Description of objects, people and places • Nationalities • Speaking about one's professions • Expressing Actions using regular –er ending verbs; avoir, être; reflexive verbs – usage, conjugation • Interview of celebrity 	
Unit-IV- At the discotheque	4.5 h
<ul style="list-style-type: none"> • Portrait by a journalist • Giving a positive or negative reply • Asking questions • Discussion with a person • Activities in a day 	

Course Learning Outcomes: At the end of this course, the students will be able to express themselves in writing and orally in basic French. This course content focuses on the speech of the students in a lucid and a concurrent manner using appropriate vocabulary and pronunciation techniques. Extra stress will be given on their understanding of grammatical structures and the foreign accent of the language. At the end of the course, the student shall be able to :

1. Understand information; Express in his own words; Paraphrase; Interpret and translate.
2. Apply information in a new way in a practical context
3. Analyse and break-down information to create new ideas
4. Evaluate and express opinion in a given context

Text / Reference Books:

Author	Title	Publisher	Year	ISBN No
Christine Andant, Chaterine Metton, Annabelle Nachon, Fabienne Nugue	A Propos - A1 Livre De L'Eleve, Cahier D' Exercices	Langers International Private Limited	2010	978-9380809069
<u>Manjiri Khandekar</u> and <u>Roopa Luktuke</u>	Jumelage - 1 Methode De Fraincais - French	Langers International Private Limited	2020	978-9380809854
<u>Michael</u> <u>Magne, Marie-</u> <u>Laure Lions-</u> <u>Olivieri</u>	Version Originale 1: Cahier d'exercices	Maison Des Langues	2010	978-8484435617

COURSE CODE: FOL102 (Introduction to German Culture & Language)

L	T	P	Total Credits
1	0	0	1

Course Contents/syllabus:

	Total Teaching hours
Unit-I Introduction to German Language (Einführung)	3 h
<ul style="list-style-type: none"> • Introduction to German as a global language, Self-introduction and Greetings, Die Alphabeten, Phonetics: the sound of consonants and vowels, Wie buchstabieren Sie Ihren Name? 	
Unit-II- Numbers and everyday conversation (die Zahl und Gespräche)	6 h
<ul style="list-style-type: none"> • Counting in German from 1-100, Simple Calculation and verb 'kosten' - Wie viel kostet das? Plural Forms, Vocabulary: Wochentage, Monate, Jahreszeiten, Ordinal numbers and the question - Wann haben Sie Geburtstag? 	
Unit-III- Regular verbs and nominative case: articles and pronouns (Regelmässige Verben und Nominativ Kasus: Artikel und Pronomen)	4.5 h
<ul style="list-style-type: none"> • Introduction to all personal pronouns and conjugation of Regular verbs Detailed exercise on regular verbs. Reading a text on regular verbs. Introduction to definite. Vocabulary: Schulsachen und Getränke, Nominative case/ Articles (der, die, das) Nominative Pronouns: - Applicability of pronouns for both persons and things. 	

Usage of nominative Personal Pronouns Introduction of nominative possessive pronouns usage of nominative possessive pronouns	
Unit-IV- The Family, Work-life and Professions (Familienmitglieder und Berufe) & Interrogative sentences (W-Fragen)	4.5 h
The Family, Work-life and Professions (Familienmitglieder und Berufe) <ul style="list-style-type: none"> Vocabulary: Professions and conjugation of the verb 'sein' Introduction to simple possessive pronouns with the help of the verb 'haben' Usage of possessive pronouns. Interrogative sentences (W-Fragen) W-Fragen: who, what, where, when, which, how, how many, how much, etc. Exercises on the question pronouns 	

Course Learning Outcomes: At the end of this course, the students will be able to express themselves in writing and orally in basic German. This course content focuses on the speech of the students in a lucid and a concurrent manner using appropriate vocabulary and pronunciation techniques. Extra stress will be given on their understanding of grammatical structures and the foreign accent of the language. At the end of the course, the student shall be able to:

1. Understand information; Express in his own words; Paraphrase; Interpret and translate.
2. Apply information in a new way in a practical context
3. Analyse and break-down information to create new ideas
4. Evaluate and express opinion in a given context

Text / Reference Books:

Author	Title	Publisher	Year	ISBN
<u>Rolf Bruseke</u>	Starten Wir A 1	Langers International Pvt Ltd (Max Hueber Verlag)	2017	978-3190160006
<u>Giorgio Motta</u>	Wir Plus Grundkurs Deutsch fur Junge Lerner Book	Ernst Klelt Verlog	2011	978-8183072120
Heimy Taylor, <u>Werner Haas</u>	Station en Deutsch Self Study Course German Guide	Wiley	2007	978-0470165515

Course: Masters in Computer Applications
Program Structure
Semester II (First year)

Sr. No	Course Code	Course Title	Course Type	Credit					Credit Units	
				L	T	PS				
1		Statistics and Data Analysis	Basic Science Course	4	0	0	0	0	4	
2		Advanced Web Technologies	Core Courses	3	0	4	0	0	5	
3		Research Methodology & IPR	Core Courses	4	0	0	0	0	4	
4		Programming with Java	Core Courses	3	0	4	0	0	5	
5		Linux Administration	Core Courses	4	0	2	0	0	5	
6		Conflict resolution & management	Value Added Courses (Behavioral Science)	1	0	0	0	0	1	
7		French Grammar/German Grammar	Value Added Courses (FBL)	1	0	0	0	0	1	
			TOTAL	20	0	10			25	
		Total Credits						Min Required: 25 Semester Credits: 25		

**6-8 Weeks Industrial/Institutional training after 2nd Semester*

Course Title: Statistics and Data Analysis**Course Contents/syllabus:**

L	T	P	TOTAL CREDIT UNITS
4	0	0	4

	Teaching Hours
Unit I	15 H
Data collection and graphical presentation, Measures of central tendency, Measures of dispersion, Skewness and Kurtosis, Correlation and Regression. Definitions of Probability – classical, statistical, and axiomatic. Conditional Probability and Independence, Bayes’ theorem, and its applications. Random variable, Expectation and Moment generating function.	
Unit II	15 H
Discrete distributions: Uniform, Bernoulli, Binomial, Poisson, Geometric, Negative Binomial, Hypergeometric, and their properties. Continuous distributions: Uniform, Exponential, Gamma, Beta, Weibull, Normal and Lognormal, and their properties. Transformation of random variable, Multiple random variable, Joint and Marginal distributions, Bivariate transformation, Covariance and correlation.	
Unit III	15 H
Random sample and sampling distribution, Chi square, t and F-distributions, Order Statistics, Concepts of sufficiency principle and unbiasedness. Point and Interval estimation, Random sample generation.	
Unit IV	15 H
Hypothesis testing, one and two-tail test, Z-test, Chi test, t-test, F-test, analysis of variance and regression	

Course Learning Outcomes: On the successful completion of this course the student will be able to understand the

1. Basics of descriptive statistics and probability theory
2. Use of statistical distributions and their applications in the real-world problems
3. concepts of random sampling and sampling distribution
4. various statistical tests to analyze the data statistically

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Rohatgi V. K. and Saleh, A.K. Md. E.	An Introduction to Probability and Statistics	2 nd Edition, John Wiley and Sons	2009	9788126519262, 9788126519262
Casella G. and Berger R. L.	Statistical Inference	2 nd Edition, Cengage Learning India	2002	9788131503942, 9788131503942

Hogg R. V., Mckean J. and Craig A. T	Introduction to Mathematical Statistics	7 th Edition, Pearson Education India	2013	9789332519114, 9789332519114
Mukhopadhyay P	Mathematical Statistics	Books and Allied	2016	9788187134930

Course Title: Advanced Web Technologies

Course Contents/syllabus:	L	T	P/S	SW/FW	TOTAL CREDIT UNITS
	3	0	4	0	5

	Teaching Hours
Unit I: HTML and XHTML	11 H
Introduction to WWW, HTML, XHTML, Basic Structure of HTML Page, Basic Tags, Types of Tags, Lists, Tables, Images, Forms, Frames.	
Unit II: CSS	11 H
Introduction, Types of Style Sheets –Inline Style Sheets, External Style Sheets – Style Classes, Properties: Font, Background, Border, text, margin, padding. Tables, positioning– line/marker, Outlines.	
Unit III: JavaScript and HTML Documents	12 H
JAVA SCRIPT – Introduction, variables, operations, control structures, loops, keywords, Arrays, functions, mathematical functions & string functions. Objects, Expressions, Pattern matching, Exception Handling, Built-in objects, Events and Event Handling, Validations, Mouse events -cursor, clicks.	
Unit IV: XML	11 H
Introduction, Syntax, Document structure, Document type definitions, Name spaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, XML processors.	

Lab/ Practical details:

List of Experiments -with basic instructions

(Total: 60 Hours)

Objective: The aim of this section of Lab is to teach experiments of web development pertaining to the units being taught in the theory paper specifically related to HTML, CSS and JavaScript and XML.

1. Write HTML code to use the tags like caption, title, body etc.
2. Write HTML code to divide the screen into multiple frames.
3. Write HTML code to link the pages and display the images.
4. Write HTML code to create a table
5. Write HTML code for form and place some text boxes, command box, selection box etc. on the form.

6. Write a Java Script for displaying message, time and date etc using document write method.
7. Write a Java Script for displaying different buttons (Ex: ok, cancel) icons (ex: question) and boxes (input, message box).
8. Write a Java Script to extract month, year, day from current date.
9. Write programs on string. (Ex: Accepting a string, calculating the position of the character in the string, Length)
10. Write a program to display all the records in the table.
11. Write a program to display a registration form.
12. Write a small program using XML.

Course Learning Outcomes:

1. The student is expected to get familiar about the concept of various web technologies.
2. To understand the concepts of HTML, CSS and JavaScript.
3. To learn to use various tags, links and formatting used in HTML.
4. To know how to integrate JavaScript with HTML pages and implement various events on web forms.
5. To learn markup language XML and its use in web development.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Thomas Powell	Web Design The complete Reference	Tata McGraw Hill	2002	978-0072224429
Thomas Powell	HTML and XHTML The complete Reference	Tata McGraw Hill	2003	9780072229424
Jeffrey C. Jackson	Web Technologies–A Computer Science Perspective	Pearson Education	2006	8131717151
Chris Bates	Web Programming Building Internet Applications	Wiley	2007	0470017759

Course Title: Research Methodology and IPR

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
4	0	0	0	4
				Teaching Hours
Unit I: Introduction				15 H

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.		
Unit II: Literature and Report Writing		15 H
Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper		
Unit III: Developing and reviewing research proposal		15 H
Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee		
Unit IV: IPR		15 H
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.		

Course Learning Outcomes: After studying this course students will be able to:

1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Stuart Melville and Wayne Goddar	Research methodology: An Introduction	Juta Academic	2014	978-0702156601
Wayne Goddard and Stuart Melvill	Research Methodology: An Introduction	Juta Academic	2014	978-0702156601
Ranjit Kumar	Research Methodology: A Step by Step Guide for beginners	Pearson	2005	978-8131704967

Halbert	Resisting Intellectual Property	Routledge	2006	978-3131658111
Robert P. Merges, Peter S. Menell, Mark A. Lemley	Intellectual Property in New Technological Age	Clause 8	2016	978-1945555008

Course Title: Programming with Java

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
3	0	4	0	5

Course Contents/syllabus:

	Teaching Hours
Unit I: Introduction	9 H
Java Programming Fundamentals: Introduction to Java, Stage for Java, Origin, Challenges of Java, Java Features, Java Program Development, Object Oriented Programming. Java Essentials: Elements of Java Program, Java API, Variables and Literals, Primitive Data Types, The String class, Variables, Constants, Operators, Scope of Variables & Blocks, Types of Comment in Java.	
Unit II: Control Statements & Object Oriented Features	12 H
Control Statements: Decision making statements (if, if-else, nested if, else if ladder, switch, conditional operator), Looping statements (while, do-while, for, nested loops), Jumping statements (Break and Continue). Classes and Objects: Basic concepts of OOPS, Classes and Objects, Modifiers, Passing arguments, Constructors, Overloaded Constructors, Overloaded Operators, Static Class Members, Garbage Collection. Inheritance: Basics of inheritance, Inheriting and Overriding Superclass methods, Calling Superclass Constructor, Polymorphism, Abstract Classes, Final Class.	
Unit III: Arrays and Strings	12 H
Arrays and Strings: Introduction to array, Processing Array Contents, Passing array as argument, Returning array from methods, Array of objects, 2D arrays, Array with three or more dimensions. String class, string concatenation, Comparing strings, Substring, Difference between String and String Buffer class, String Tokenizer class.	
Unit IV: Interfaces and Exceptions	12 H
Interface and Packages: Basics of interface, Multiple Interfaces, Multiple Inheritance Using Interface, Multilevel Interface, Packages, Create and Access Packages, Static Import and Package Class, Access Specifiers. Exception Handling: Introduction, Try and Catch Blocks, Multiple Catch, Nested Try, Finally, Throw Statement, Built-In Exceptions.	

List of Experiments:**(Total 60 Hours)**

1. Write a program to perform following operations on two numbers input by the user:
 - 1) Addition 2) subtraction 3) multiplication 4) division
2. Write a Java program to print result of the following operations.
 1. $-15 + 58 * 45$
 2. $(35+8) \% 6$
 3. $24 + -5*3 / 7$
 4. $15 + 18 / 3 * 2 - 9 \% 3$
3. Write a Java program to compute area of:
 - 1) Circle 2) rectangle 3) triangle 4) square
4. Write a program to convert temperature from Fahrenheit to Celsius degree using Java.
5. Write a program through Java that reads a number in inches, converts it to meters.
6. Write a program to convert minutes into a number of years and days.
7. Write a Java program that prints current time in GMT.
8. Design a program in Java to solve quadratic equations using if, if else
9. Write a Java program to determine greatest number of three numbers.
10. Write program that gets a number from the user and generates an integer between 1 and 7 subsequently should display the name of the weekday as per that number.
11. Construct a Java program to find the number of days in a month.
12. Write a program to sum values of an Single Dimensional array.
13. Design & execute a program in Java to sort a numeric array and a string array.
14. Calculate the average value of array elements through Java Program.
15. Write a Java program to test if an array contains a specific value.
16. Find the index of an array element by writing a program in Java.
17. Write a Java program to remove a specific element from an array.
18. Design a program to copy an array by iterating the array.
19. Write a Java program to insert an element (on a specific position) into Multidimensional array.
20. Write a program to perform following operations on strings:
 - 1) Compare two strings.

- 2) Count string length.
 - 3) Convert upper case to lower case & vice versa.
 - 4) Concatenate two strings.
 - 5) Print a substring.
21. Developed Program & design a method to find the smallest number among three numbers.
 22. Compute the average of three numbers through a Java Program.
 23. Write a Program & design a method to count all vowels in a string.
 24. Write a Java method to count all words in a string.
 25. Write a method in Java program to count all words in a string.
 26. Write a Java program to handle following exceptions:
 - 1) Divide by Zero Exception.
 - 2) Array Index Out Of B bound Exception.
 27. To represent the concept of Multithreading write a Java program.
 28. To represent the concept of all types of inheritance supported by Java, design a program.
 29. Write a program to implement Multiple Inheritance using interface.
 30. Construct a program to design a package in Java.
 31. To write and read a plain text file, write a Java program.
 32. Write a Java program to append text to an existing file.
 33. Design a program in Java to get a list of all file/directory names from the given.
 34. Develop a Java program to check if a file or directory specified by pathname exists or not.
 35. Write a Java program to check if a file or directory has read and write permission.

Course Learning Outcomes: After studying this course students will be able to:

1. Execute Core Java concepts.
2. Illustrate the role of different data type, operators and control statement in java with the help of programs.
3. Write programs to handle exceptions
4. Implement string operations in Java
5. Execute interfaces and packages.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Balagurusamy	Programming with Java: A Primer, 6 th Ed.	TMH	2019	978-9353162344
Sagayaraja, Denis, Karthik, Gajalakshmi	Java Programming for Core and Advanced Learners,	The Orient Blackswan	2018	978-9386235329
Herbert Schildt and Dale Skrien	Java Fundamentals, A Comprehensive Introduction	McGraw Hill	2017	978-1259006593
H. Schildt	Java, The complete Reference, 11	TMH	2020	978-9390491629

Course Title: Linux Administration

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
4	0	2	0	5

	Teaching Hours
Unit I: Introduction	15 H
Introduction: Linux: The Operating System: Linux Distributions, Difference Between Linux and Windows, Separation of the GUI and the Kernel, Understanding Linux Kernel, Installing Linux in a Server Configuration, Booting and Shutting Down Process, Concept of Root, Basic commands, working with vi Editor.	
Unit II: File System & Packages	15 H
Understanding files and File System: Understanding Files and Directories in Linux, File Structure and hierarchy, File Permissions, File Management and Manipulation, Managing File System. Managing Packages & Users: Installing and removing Software in Linux, Getting and Unpacking the Package, Configuring the Package, Compiling the Package, Installing the Package, Managing Users and Groups.	
Unit III: DNS & Web Server	15 H
DNS: Installing a DNS Server, Configuring a DNS Server, DNS Records Types, Setting Up BIND Database Files, The DNS Toolbox, Configuring DNS Clients. Web Server: Understanding the HTTP Protocol, Installing the Apache HTTP Server, Starting Up and Shutting Down Apache, Configuring Apache.	
Unit IV: E-mail & Samba Servers	15 H

<p>E-Mail Server: Understanding SMTP, Installing the Postfix Server, Configuring the Postfix Server, Running the Server, POP and IMAP Basics, Installing the UW-IMAP and POP3 Server</p> <p>Samba Server: The Mechanics of SMB, Samba Administration, Using SWAT, creating a Share, Mounting Remote Samba Shares, Creating Samba Users, Using Samba to Authenticate Against a Windows Server.</p>	
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List of Experiments: (Total 30 Hours)

1. Installation of Linux operating system.
 - a. Partitioning drives
 - b. Configuring boot loader (GRUB/LILO)
 - c. Network configuration
 - d. Setting time zones
 - e. Creating password and user accounts
 - f. Installing and removing packages
 - g. Shutting down
2. Working with basic commands
3. Linux system administration
 - a. Becoming super user
 - b. Temporarily changing user identity with su command
 - c. Using graphical administrative tools
 - d. Administrative commands
 - e. Administrative configuration files
4. Configuring NICs with Network Device Configuration Utilities (ip and ifconfig)
5. Install and configuring a DNS Server with a domain name of your choice.
6. Install and configuring DHCP server and client
7. Install and configuring Mail Server
8. Install and configuring Apache Web Server for hosting websites
9. Securing a simple network with Linux firewall (Netfilter/iptables)
10. Securing a simple network with Linux firewall (Netfilter/iptables)

Course Learning Outcomes: After studying this course students will be able to:

1. Discuss the evolution of Open-Source operating systems

2. Prepare environment for working on open-source operating system like Linux.
3. Perform resource management in Linux.
4. Write scripts in Linux
5. Execute user level privileges

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Wale Soyinka	Linux Administration: A Beginner's guide	McGraw Hill	2017	978-1259061189
Evi Nemeth & Garth Synder.	UNIX and Linux system administration Handbook	Pearson	2019	978-9353062859
Richard Petersen	Linux: The Complete Reference,6 th Ed.	McGraw Hill	2017	978-0070222946
Emmett Dulaney	Linux All-In-One for Dummies	Wiley	2018	978-8126577637

Course Title: CONFLICT RESOLUTION & MANAGEMENT

L	T	P/S	SW/FW /PSDA	TOTAL CREDIT UNITS
1	0	0	0	1

Contents/syllabus:

	No. of Session
Unit-1- Conflict Management, Resolution and Management	4 H
<ul style="list-style-type: none"> • Meaning and nature of conflict Types of Conflict • Styles and Techniques of conflict management • Conflict management and interpersonal communication • Conflict Resolution Strategies • Ways of Managing Conflict (Healthy & Unhealthy) • Impact of Conflict Resolution & Management 	
Unit-2- Behavioral & Interpersonal Communication	4 H
<ul style="list-style-type: none"> • Importance of Interpersonal Communication 	

<ul style="list-style-type: none"> • Rapport Building – NLP, Communication mode • Steps to improve interpersonal communication • Meaning and Nature of Behavioral Communication • Relevance of Behavioral Communication 	
Unit-3- Relationship Management for Personal and professional Development	3 H
<ul style="list-style-type: none"> • Importance of relationships • Maintaining healthy relationships • Communication Styles • Types of Interpersonal Relationships 	
Unit-4- Stress Management	4 H
<ul style="list-style-type: none"> • Understanding of Stress & GAS Model Symptoms of Stress • Individual and Organizational consequences with special focus on health Healthy and Unhealthy strategies for stress management • Social support for stress management and well being • Stress free, Successful and Happy Life 	

List of Professional Skill Development Activities (PSDA):

- Project on Conflict Management
- Term Paper on Need and Techniques of Stress Management among Youth

Course Learning Outcomes: On completion of the course:

- To recognize Conflict and How to Manage them
- To learn Communication and interpersonal behavior
- To understand the significance & Importance of Relationship
- To learn to live stress free and happy life.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN	Pages
Dr. Abha Singh	Achieving Behavioral Excellence for Success	Wiley Publication	2013	9788126538027	248

Vangelist L. Anita, Mark N. Knapp	Interpersonal Communication and Human Relationships	Pearson	2014	978020 500608 3	46 4
Christine Simons and Belinda Naylor-Stables	Effective Communication for Managers: Getting your message across	Cengage Learning EMEA	1997	978- 030433 1208	32 0
Richard Blonna	Coping with Stress in a Changing World-5 th Edition	McGraw- Hill Education	2011	978- 007352 9714	38 4

Course Title: French Grammar

L	T	P/S	SW/FW	Total Credit Units
1	0	0	0	1

Course Contents/syllabus:

	Teaching Hours
Unit-I: My family and my house	4 H
Descriptors/Topics <ul style="list-style-type: none"> • Talk about your family members • Usage of possessive adjectives • Describe your house/apartment • Prepositions of location • Negation 	
Unit-II- Lifestyle	3 H
Descriptors/Topics <ul style="list-style-type: none"> • Talk about your hobbies and pastimes • Usage of appropriate articles: definite and contracted • Talk about your daily routine • Usage of pronominal verbs 	
Unit-III- In the city	3 H
Descriptors/Topics <ul style="list-style-type: none"> • Filling up a simple form 	

<ul style="list-style-type: none"> • Ask for personal information • Usage of interrogative adjectives • Give directions about a place • Ordinal numbers • Usage of demonstrative adjectives 	
Unit-IV- Weekend	3 H
Descriptors/Topics <ul style="list-style-type: none"> • Talk about your week-end plans • Usage of disjunctive pronouns • Usage of Near Future tense • Talk about weather • Write a simple post card 	

Course Learning Outcomes: At the end of the course, the student shall be able to:

1. Understand information; Express in his own words; Paraphrase; Interpret and translate.
2. Apply information in a new way in a practical context
3. Analyze and break-down information to create new ideas
4. Evaluate and express opinion in a given context

Text / Reference Books:

Author	Title	Publisher	Year of Publication	ISBN No
Christine Andant, Catherine Metton, Annabelle Nachon, Fabienne Nugue,	A Propos - A1, Livre de l'élève et Cahier d'exercices.	Langers International Pvt. Ltd.	2010	978- 9380809069
Collins Dictionaries	Easy Learning French Complete Grammar, Verbs and Vocabulary	Collins	2016	978- 0008141721
Nikita Desai, Samapita Dey Sarkar	Apprenons La Grammaire Ensemble - French	Langers International Pvt. Ltd.	2017	978- 8193002681

Course Title: German Grammar

Course Contents/syllabus:

L	T	P/S	SW/FW	Total Credit Units
1	0	0	0	1

	Teaching Hours
Module I: Time (Uhrzeit); People and the World: Land, Nationalität und Sprache	4 H
<ul style="list-style-type: none"> • Introduction of time • Read text related to time and teach the students the time expressions • Exercises related to Time • Adverbs of time and time related prepositions • Vocabulary: Countries, Nationalities, and their languages • Negation: “nicht/ kein” • Ja/Nein Fragen. • All the colors and color related vocabulary, adjectives, and opposites • Exercises and comprehension for the same. 	
Module II: Irregular verbs (unregelmässige Verben)	3 H
<ul style="list-style-type: none"> • Introduction to irregular verbs and their conjugation e.g. fahren, essen, lesen etc • Read a text related to the eating habits of Germans • Vocabulary: Obst, Gemüse, Kleiderstück with usage of irregular verbs • Free time and hobbies • Food and drinks 	
Module III: Accusative case: articles and pronouns (Akkusativ Kasus: Artikel und Pronomen)	3 H
<ul style="list-style-type: none"> • Introduction to the concept of object (Akkusativ) • Formation of sentences along with the translation and difference between nominative and accusative articles • Usage of accusative Definite articles 	

<ul style="list-style-type: none"> • Usage of accusative Indefinite articles 	
Module IV: Accusative case: possessive pronouns (Akkusativ Kasus: Possessivpronomen) Family and Relationship	3 H
<ul style="list-style-type: none"> • Accusative Personal Pronouns: - Revision of the nominative personal pronouns and introduction of accusative. Applicability of pronouns for both persons and things. • Usage of accusative Personal Pronouns • Introduction of accusative possessive pronouns • Difference between nominative and accusative possessive pronouns • usage of accusative possessive pronouns 	

At the end of the course, the student shall be able to:

1. Understand information; Express in his own words; Paraphrase; Interpret and translate.
2. Apply information in a new way in a practical context
3. Analyze and break-down information to create new ideas
4. Evaluate and express opinion in a given context

Text / Reference Books:

Author	Title	Publisher	Year	ISBN No	Pages
Dora Schulz, Heinz Griesbach	Deutsche Sprachlehre Fur Auslander	Max Hueber Verlag	1984	978-3190010066	-
Hartmut Aufderstrasse, Jutta Muller, Helmut Muller	Themen Aktuell: Glossar Deutsch	Max Hueber Verlag	2003	978-3190816903	-
Giorgio Motta	Wir Plus Grundkurs Deutsch fur Junge Lerner Book German Guide	Goyal Publishers	2011	9788183072120	248

Course: Masters in Computer Applications
Program Structure
Semester III (Second year)

Sr. No	Course Code	Course Title	Course Type	Credit					Credit Units	
				L	T	PS				
1		Fundamentals of Artificial Intelligence & Soft Computing	Core Courses	3	0	4	0	0	5	
2		Advanced Computer Networks	Core Courses	4	0	0	0	0	4	
3		Theory of Computation	Core Courses	4	0	0	0	0	4	
4		Domain Elective -I	Domain Elective	4	0	0	0	0	4	
		Domain Elective -II	Domain Elective	3	0	2	0	0	4	
5		Professional Ethics and Responsibilities – I	Value Added Courses	1	0	0	0	0	1	
6		Minor Project	NTCC	0	0	4	0	0	2	
7		*Industrial Training	NTCC	0	0	0	0	0	2	
			TOTAL	19	0	10			26	
		Total Credits						Min Required: 26 Semester Credits: 26		

Domain Elective: I

Enterprise Resource Planning
Data Mining and Business Intelligence
Optimization techniques

Domain Elective: II

Mobile Application Development
Big Data Analytics
Software Testing and Quality Assurance

Course Title: Fundamentals of Artificial Intelligence & Soft Computing

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
3	0	4	0	5

	Teaching Hours
Unit I: Introduction	9 H
What is intelligence? Foundations of artificial intelligence (AI). History of AI. AI problems: Toy Problems, Real World problems- TicTac-Toe, Water Jug, Question-Answering, 8-puzzle, 8-Queens problem. Formulating problems, Searching for Solutions.	
Unit II: Knowledge Representation and Heuristic Search	12 H
Propositional Logic, Propositional Theorem Proving-Inference and Proofs, Proof by Resolution, Horn Clauses and definite Clauses, Forward and Backward chaining; First order Logic, Inference in First order Logic. Informed (Heuristic) Search Strategies-Hill Climbing, Simulated Annealing, Greedy best-first search, A* and optimal search, Memory bounded heuristic search.	
Unit III: Soft Computing and Neural Networks	12 H
What is Soft Computing? Difference between Hard and Soft Computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing. Neural Networks: Introduction, what is Neural Network, Learning rules and various activation functions, Supervised Learning Networks, Un- Supervised Learning Networks.	
Unit IV: Fuzzy Systems and Genetic Algorithms	12 H
Fuzzy Systems: Fuzzy Set theory, Fuzzy vs. Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification. Genetic Algorithm: History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization. Introduction to Hybrid Systems.	

List of Experiments: (Total 60 Hours)

Instructions: Develop the assignments in MATLAB/Python.

1. Use logic programming in Python to check for prime numbers.
2. Use logic programming in Python parse a family tree and infer the relationships between the family members.
3. Python script for building a puzzle solver.
4. Implementation of uninformed search techniques in Python.
5. Implementation of heuristic search techniques in Python.

6. Python script for tokenizing text data.
7. Extracting the frequency of terms using a Bag of Words model.
8. Predict the category to which a given piece of text belongs.
9. Python code for visualizing audio speech signal
10. Python code for Generating audio signals
11. Create a perceptron with appropriate no. of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required. Output the final weights.
12. Implement AND function using ADALINE with bipolar inputs and outputs.
13. Implement AND function using MADALINE with bipolar inputs and outputs.
14. Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform maxmin composition on any two fuzzy relations.
15. Maximize the function $f(x)=x^2$ using GA, where x ranges from 0-25. Perform 6 iterations has read and write permission.

Course Learning Outcomes: After studying this course students will be able to:

1. Highlight the significance of Artificial Intelligence in knowledge representation
2. Examine the useful search techniques; learn their advantages, disadvantages and comparison.
3. Explain neural network theory and fuzzy logic theory.
4. Apply artificial neural networks and fuzzy logic theory for various problems.
5. Determine the use of Genetic algorithm to obtain optimized solutions to problems.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Russel and Norvig	Artificial Intelligence-A Modern Approach, 3 rd ed.	Prentice Hall	2015	978-9332543515
Elaine Rich, Kevin Knight and SB Nair	Artificial Intelligence	TMH	2017	978-0070087705
S.N. Sivanandam, S.N. Deepa	Principles of Soft Computing	Wiley	2018	978-8126577132

S. Rajasekaran, G. A. Vijayalakshami	Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications	PHI	2017	978- 8120353343
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Course Title: Advanced Computer Networks

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
4	0	0	0	4

	Teaching Hours
Unit I: Introduction	15 H
Computer Networks: Uses of computer Networks, Goals and applications of networks, Computer Network Structure and Architecture, Reference models: OSI model. Physical Layer: Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise, Multiplexing: Frequency Division, Time Division, Wavelength Division, Introduction to Transmission Media: Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared)	
Unit II: Data Link Layer	15 H
Data Link Layer: Design issues, Framing, Error detection and correction codes: parity, checksum, CRC, hamming code, Data link protocols for noisy and noiseless channels, Sliding Window Protocols: Stop & Wait ARQ, Goback-N ARQ, Selective repeat ARQ, Data link protocols: HDLC and PPP. Medium Access Sub-Layer: Static and dynamic channel allocation, Random Access: ALOHA, CSMA-CA/CD protocols, Controlled Access: Polling, Token Passing.	
Unit III: Network and Transport Layer	15 H
Network Layer: Design issues, IPv4 classful and classless addressing, subnetting, Routing algorithms: distance vector, Congestion control: Principles of Congestion Control, Congestion prevention policies, Leaky bucket and token bucket algorithms. Transport Layer: Elements of transport protocols: addressing, connection establishment and release, flow control and buffering, multiplexing and demultiplexing, crash recovery, introduction to TCP/UDP protocols and their comparison.	
Unit IV: Wireless Networks	15 H
An Overview of Select Wireless and Mobile Networking Technologies: Principles, WLANs: IEEE 802.11, Cellular Networks, Issues in Seamless Mobility Adhoc networks: Features, advantages and applications, Adhoc versus Cellular networks, Network architecture, Protocols: MAC protocols, Routing protocols, Technologies. Wireless Communication Systems: Evolution, examples of wireless communication systems, 2G Cellular networks, Evolution for 2.5G TDMA Standards, IS-95B for 2.5G CDMA.	

Course Learning Outcomes: After studying this course students will be able to:

1. Define computer networks
2. Identify the role played by different layers of network model
3. Outline the concept of Internet protocols and network security.
4. Highlight the benefits of Adhoc networks
5. Explain the protocols used in wireless communication systems.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
A.S. Tanenbaum	Computer Networks	Dorling Kindersley	2003	978-8129701343
Forouzan	Data Communications & Networking	Tata McGraw Hill	2017	978-1259064753
Larry L. Peterson & Bruce S. Davie	Computer Networks: A Systems Approach	Morgan Kaufmann	2011	978-0123850591
James F. Kurose & Keith W. Ross	Computer Networking: A Top-Down Approach	Pearson Education	2016	978-9332585492

Course Title: Theory of Computation

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
4	0	0	0	4

Course Contents/syllabus:

	Teaching Hours
Unit I: Introduction	15 H
Formal Language, Non-Computational Problems, Diagonal Argument, Russel's Paradox. Theory of Automata: Deterministic Finite Automaton (DFA), Nondeterministic Finite Automaton (NFA), Equivalence of DFA and NFA, Mealy and Moore Models, Minimization of Finite Automata	
Unit II: Regular Expressions and Languages	15 H

Regular Sets and Regular Grammars: Regular Languages, Regular Grammars, Regular Expressions, Properties of Regular Language, Pumping Lemma, Non-Regular Languages, Lexical Analysis. Context Free Language: Properties of Context Free Language, Chomsky Classification of Languages, Context Free Grammar, Simplification of Context Free Grammar, Chomsky Normal Form, Greibach Normal Form		
Unit III: Context Free and Context Sensitive Grammar		15 H
Push Down Automata: Ambiguity, Parse Tree Representation of Derivation Trees, Equivalence of PDA's and Pushdown Automaton (PDA), Non-Deterministic Pushdown Automaton (NPDA). Turing Machines (TM): Standard Turing Machine and its Variations; Universal Turing Machines, Models of Computation and Church-Turing Thesis.		
Unit IV: Turing Machines		15 H
Recursive and Recursively Enumerable Languages; Context Sensitive Languages, Unrestricted Grammars, Chomsky Hierarchy of Languages, Construction of TM for Simple Problems. Unsolvable Problems and Computational Complexity: Unsolvable Problem, Halting Problem, Post Correspondence Problem, Unsolvable Problems for Context-Free Languages, Measuring and Classifying Complexity, Tractable and Intractable Problems.		

Course Learning Outcomes: After studying this course students will be able to:

1. Write a formal notation for strings, languages and machines.
2. Design finite automata to accept a set of strings of a language.
3. Design context free grammars to generate strings of context free language
4. Define complexity and computability concepts.
5. Determine equivalence of languages accepted by Push Down Automata and languages generated by context free grammars

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman	Introduction to Automata Theory, Languages, and Computation	Pearson	2008	978-8131720479
Harry R. Lewis and Christos H. Papadimitriou	Elements of the Theory of Computation	Pearson	2015	978-9332549890

Dexter C. Kozen	Automata and Computability, Undergraduate Texts in Computer Science	Springer	2007	978-0387949079
Michael Sipser	Introduction to the Theory of Computation	Cengage	2014	978-8131525296
John Martin	Introduction to Languages and The Theory of Computation	TMH	2007	978-0070660489

Course Title: Enterprise Resource Planning

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
4	0	0	0	4

	Teaching Hours
Unit I: Introduction	15 H
Basic ERP Concepts: Enterprise-An overview, Benefits & Risk, Evolution and Structure, Conceptual Model of ERP. ERP & Related Technologies: Business Process Reengineering (BPR), Data Warehousing and Data Mining, OLAP, Product Life Cycle Management, Supply Chain management, CRM.	
Unit II: ERP Functional Module	15 H
Introduction, Finance, Manufacturing, Human Resource, Plant maintenance, Material Management, Integration of ERP, Supply Chain and Customer Relationship Application	
Unit III: ERP Implementation and Strategic Grid	15 H
Implementation Challenges / Strategies / Methodologies, ERP Project Teams, Vendors and Consultants, Dealing with employee resistance, Training and Education, data migration, Project Management and monitoring	
Unit IV: ERP Maintenance and Emerging Trends	15 H
Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of ERP Implementation. Calculation of ROI of ERP implementation, Hidden costs, ERP success inhibitors and accelerators. Emerging Trends on ERP: Technologies in ERP Systems and Extended ERP, ERP Market Place and Dynamics, Future Directives in ERP; ERP E Commerce & E – Governance: Concept, frame work, area of application like public sector, service industry Case Studies: Development and Analysis of ERP Implementations.	

Course Learning Outcomes: After studying this course students will be able to:

1. Define ERP & Related Technologies
2. Compare different types of ERP functional modules.
3. Explain Implementation Strategies of ERP
4. Discuss the latest trends and domains of ERP.
5. Analyze various case studies related to ERP implementation

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Alexis Leon	Enterprise Resource Planning	Mc Graw Hill	2019	978-9353167820
Vinod Kumar Garg and Venkita Krishnan N K	Enterprise Resource Planning Concepts and Practice	Prentice Hall	2003	978-8120322547
V.K. Garg & N.K. Venkita Krishnan	ERP Ware: ERP Implementation Framework	Prentice Hall	2004	978-8120315525
S Sadagopan	ERP A Managerial Prospective	Mc Graw Hill	1999	978-0074631089
Rahul V. Altekar	Enterprise-wide Resource Planning	PHI	2006	978-8120326330

Course Title: Data Mining and Business Intelligence

Course Contents/syllabus:

	L	T	P/S	SW/FW	TOTAL CREDIT UNITS
	4	0	0	0	4
					Teaching Hours
Unit I: Introduction					15 H
Reporting and Analyzing data, Raw data to valuable information-Lifecycle of Data, The building Blocks: Defining Features – Data Warehouses (DW) and Data Marts - Overview of the components – Metadata, Need, Basic elements, trends. Business Intelligence (BI) Definitions and Concepts, BI Process and Technology, BI Roles and Responsibilities.					
Unit II: Architecture and Data Mining					15 H

The Architecture of BI and DW: BI and DW architectures and its types, Relation between BI and DW - OLAP and OLTP definition and its differences, Dimensional analysis: Drill-down and roll-up – slice and dice or rotation, schemas: Stars, snowflakes and fact constellations. Motivation for Data Mining, Data Mining Definition, and Functionalities, Classification of DM Systems - DM task and its applications, Integration of a Data, KDD Process, Steps of pre-processing data - Data cleaning: Missing Values, Noisy Data - Data, Integration, and transformation - Data Reduction: Data cube aggregation, Dimensionality reduction - Data Compression.		
Unit III: Association, Classification and Prediction		15 H
Introduction, Data Generalization and summarization-based characterization, Association Rule Mining; Market basket analysis - basic concepts - Finding frequent item sets: Apriori algorithm - generating rules – Improved Apriori algorithm Introduction, Issues regarding Classification and prediction: Classification methods: Decision tree, Bayesian Classification, Rule based, CART, Neural Network Prediction methods: Linear and nonlinear regression, Logistic Regression		
Unit IV: Data Mining for BI and Advanced Topics		15 H
Data mining for business Applications like Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance and CRM etc., Clustering, Spatial mining, web mining, text mining, Data Analytics Life Cycle: Big data Business Analytics, State of the practice in analytics role of data scientists, Hadoop architecture.		

Course Learning Outcomes: After studying this course students will be able to:

1. Highlight the need of Data Warehousing & Mining
2. Differentiate between the Transactional and Analytical data models.
3. Identify the real-life applications where data mining can be applied.
4. Apply different data mining algorithms on wide range of data sets.
5. Comment on latest tools for data mining and big data analysis

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
J. Han, M. Kamber	Data Mining Concepts and Techniques	Elsevier	2007	978-9380931913
Arun K. Pujari	Data Mining Techniques	The Orient Blackswan	2016	978-9386235053
M. Kantardzic	Data mining: Concepts, models, methods and algorithms	Wiley	2019	978-1119516040

Paulraj Ponnian	Data Warehousing Fundamentals	Wiley	2012	978-8126537297
G. Shmueli, N.R. Patel, P.C. Bruce	Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner	Wiley	2010	978-0470526828

Course Title: Optimization Techniques

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
4	0	0	0	4

	Teaching Hours
Unit I: Introduction	15 H
Introduction to linear and non-linear programming formulation of different models.	
Unit II: Linear and Integer Programming	15 H
Geometry of linear programming, Graphical method, Linear programming (LP) in standard form, Solution of LP by simplex method, Exceptional cases in LP, Duality theory, Dual simplex method, Sensitivity analysis. Integer Programming: Branch and bound technique.	
Unit III: Transportation Problem and Project Management	15 H
Initial basic feasible solutions of balanced and unbalanced transportation/assignment problems, Optimal solutions. [CO3] Project Management: Construction of networks, Network computations, Floats (free floats and total floats), Critical path method (CPM), Crashing.	
Unit IV: Game Theory	15 H
Two-person zero-sum game, Game with mixed strategies, Graphical method and solution by linear programming.	

Course Learning Outcomes: After studying this course students will be able to:

1. Define the scope of operation research
2. Solve linear programming problems
3. Prepare feasible solutions for transportation and assignment problems
4. Outline the Project Management problems using CPM
5. Find solution to various optimization problems

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Chandra, S., Jayadeva, Mehra, A	Numerical Optimization with Applications	Narosa	2009	978- 8173198540
Taha H.A.	Operations Research-An Introduction	Pearson	2019	978- 9352865277
Pant J. C.	Introduction to optimization: Operations Research	Jain Brothers	2008	978- 8183600767
Bazaarra Mokhtar S., Jarvis John J. and Shirali Hanif D.	Linear Programming and Network flows	Wiley	2010	978- 0470462720
Swarup, K., Gupta, P. K., Mammohan	Operations Research	Sulthan chand	2010	978- 8180547713

Course Title: Mobile Application Development

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
3	0	2	0	4

	Teaching Hours
Unit I: Introduction	11 H
Mobile Applications –Characteristics and Benefits – Frameworks and Tools, Types, Application Model. Profiles of Mobile devices. Building Blocks of Mobile Applications: User Interface Designing, Layout, User Interface elements, Functionality based user interface, Naïve Data Handling, Sprucing up Mobile applications. Testing Mobile Applications: Debugging Applications, Testing Strategies, Test Automation of Applications.	
Unit II: Mobile Operating System	11 H
Introduction to Mobile Operating Systems and why they are needed, Open Platforms, Mobile OS Features, Symbian, BlackBerry, Android, iOS, Windows, Tizen, Ubuntu, etc. Android programming: Android toolkit, Components of an Android application, Android Software Development using Eclipse – Concepts, Terminology, Views and Perspectives, memory management, communication protocols, application development methods, deployment.	
Unit III: Android Programming	11 H

Android programming: Android toolkit, Components of an Android application, Android Software Development using Eclipse – Concepts, Terminology, Views and Perspectives, memory management, communication protocols, application development methods, deployment.		
Unit IV: IOS		12 H
Development environment, iOS Layers, Architecture, User Interface tool kit interfaces, Event handling, Graphics services, Layer Animation, Basic iPhone Styling, Advanced iPhone Styling.		

List of Experiments (Total 30 Hours)

1. Using emulator to deploy and run mobile apps
2. Create an Android application that shows Hello + name of the user and run it on an emulator.
3. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
4. Develop an ANDRIOD application that uses GUI components, Font and Colors.
5. Write an application that draws basic graphical primitives on the screen.
6. Develop an application that uses Layout Managers and event listeners.
7. Create and Login application as above. On successful login, open browser with any URL.
8. Testing mobile app - unit testing, black box testing and test automation.
9. Create an iOS application that can play audio and video files.
10. Write an iOS application that creates alarm clock.
11. Devise an iOS application that draws basic graphical primitives (rectangle, circle) on the screen.
12. Build an iOS mobile application that create, save, update and delete data in a database.

Course Learning Outcomes: After studying this course students will be able to:

1. Define framework of mobile application development
2. Comment upon the building blocks of mobile computing
3. Test the mobile applications
4. Compare development environment of different operating systems for mobile application development.
5. Write programs for basic mobile applications

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Zigurd Mednieks, L. Dornin, G. Blake Meike, M. Nakamura	Programming Android	O'Reilly	2011	978-1449389697
A. Allan	Learning iPhone Programming	O'Reilly	2010	978-0596806439
Neal Goldstein, Tony Bove	iPhone Application Development All-In-One For Dummies	John Wiley & Sons	2010	978-0470542934
<u>Carmen Delessio</u> , <u>Lauren Darcey</u> , <u>Shane Conder</u>	Android Application Development In 24 Hours, Sams Teach Yourself	Sams	2015	978-0672337390

Course Title: Big Data Analytics

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
3	0	2	0	4

	Teaching Hours
Unit I: Introduction	11 H
Evolution of Big data – Best Practices for Big data Analytics, Big data characteristics, Validating – The Promotion of the Value of Big Data, Big Data Use Cases, Characteristics of Big Data Applications, Perception and Quantification of Value, Understanding Big Data Storage, A General Overview of High-performance Architecture – HDFS, Map Reduce and YARN – Map Reduce Programming Model.	
Unit II: Cloud Virtualization	12 H
Advanced Analytical Theory and Methods: Overview of Clustering – K-means, Use Cases, Overview of the Method, Determining the Number of Clusters, Diagnostics, Reasons to Choose and Cautions, Classification: Decision Trees, Overview of a Decision Tree, The General Algorithm – Decision Tree Algorithms, Evaluating a Decision Tree, Decision Trees in R, Naïve Bayes, Bayes ‘Theorem, Naïve Bayes Classifier. Association Rules – Overview, Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules, Finding Association & finding similarity, Recommendation System: Collaborative Recommendation- Content Based Recommendation, Knowledge Based Recommendation, Hybrid Recommendation Approaches.	

Unit III: Cloud Service and Deployment Models		11 H
Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating moments, Counting oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) applications, Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics.		
Unit IV: Cloud Security		11 H
Hadoop Implementation and Deployment: Introducing Hadoop, Hadoop cluster components, Hadoop Architecture, Hadoop Ecosystem, Evaluation criteria for distributed Map Reduce runtimes, Enterprise-grade Hadoop Deployment, Hadoop Implementation.		

List of Experiments (Total 30 Hours)

1. Design and Create Cube by identifying measures and dimensions for Star Schema, Snowflake
2. Design and Create Cube by identifying measures and dimensions for Design storage for cube using storage
3. Process Cube and Browse Cube Data by replacing a dimension in the grid, filtering and drilldown using cube browser
4. Process cube to browse dimension data and view dimension members, member properties, member property values
5. Create and use Excel Pivot Table Report based on data cube
6. Design and Create data mining models using Analysis Service of SQL server 2005
7. Design and Build targeted mailing data mining model using analysis service of SQL server and compare their predictive capabilities using the Mining Accuracy Chart View and Create predictions using Prediction Query Builder.
8. Perform various steps of Preprocessing on the given relational database / warehouse
9. To implement Data Mining Extensions (DMX) language and MDX query language
10. Perform various steps of Preprocessing using WEKA software
11. Creating Data Mining Structure & Predictive Models (Neural Networks and Decision Tree) using the Excel Add-In for SQL Server.
12. To setup Hadoop
13. To run sample program using Hadoop

Course Learning Outcomes: After studying this course students will be able to:

1. Understand the fundamental processes, concepts and techniques of data mining and develop an appreciation for the inherent complexity of the data- mining task.
2. To develop skills for analyzing Knowledge based Systems
3. Implement various high-performance Architectures.
4. Analyze Data in various scenarios.
5. Manage Job Execution in Hadoop Environment

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
J. Han, M. Kamber	Data Mining Concepts and Techniques	Elsevier	2007	978-9380931913
M. Kantardzic	Data mining: Concepts, models, methods and algorithms	John Wiley & Sons	2019	978-1119516040
Robert D. Schneider	Hadoop for Dummies	John Wiley & Sons	2013	978-1118250518
M. Dunham	Data Mining: Introductory and Advanced Topics	Pearson	2006	978-8177587852
Paulraj Ponnian	Data Warehousing Fundamentals	John Wiley & Sons	2012	978-8126537297
Pieter Adriaans, Dolf Zantinge	Data Mining	Addison-Wesley	1996	978-0201403800

Course Title: Software Testing and Quality Assurance

Course Contents/syllabus:	L	T	P/S	SW/FW	TOTAL CREDIT UNITS
		3	0	2	0

	Teaching Hours
Unit I: Introduction	11 H
Testing, Verification and Validation, Test Strategies for Conventional and Object-Oriented Software, Unit Testing, Integration Testing, Validation Testing, Alpha and Beta Testing, System Testing, Recovery Testing, Security Testing, Stress Testing, Performance Testing, Metrics for Source Code, Metrics for Testing, Debugging Process, Debugging Strategies.	
Unit II: Testing Techniques	11 H

Software Testing Fundamentals, Black Box and White Box Testing, Basis Path Testing, Flow Graph Notation, Independent Program Paths, Graph Matrices, Control Structure Testing, Condition Testing, Data Flow Testing, Loop Testing, Graph Based Testing Methods, Equivalence Partitioning		
Unit III: Object oriented and Specialized System testing		11 H
Applicability of Conventional Test Case Design Methods, Issues in Object Oriented Testing, Fault-Based Testing, Scenario-Based Testing, Random Testing and Partition Testing for Classes, Inter Class Test Case Design. Testing Process and Specialized Systems Testing: Test Plan Development, Requirement Phase, Design Phase and Program Phase Testing, Testing Client/Server Systems, Testing Web based Systems, Testing Off the-Shelf Software, Testing in Multiplatform Environment, Testing for Real Time Systems, Testing Security		
Unit IV: Quality Assurance and risk Management		12 H
Quality Concepts, Quality Control, Software Quality Attributes, Quality Assurance, SQA Activities, Software Reviews, Formal Technical Reviews, Review Guidelines, Software Reliability, Software Safety, Quality Assurance Standards, ISO 9000, ISO 9001:2000, ISO 9126 Quality Factors, CMM, CMMI, PCMM, TQM, Six Sigma, SPICE, Software Quality Assurance Metrics. Risk Management and Change Management: Software Risks, Risk Identification, Risk Projection, Risk Refinement, The RMMM Plan, Software Configuration Management, Baselines, Software Configuration Items, SCM Process: Version Control, Change Control, Configuration Audit, Configuration Management for Web Engineering.		

List of Experiments

(Total 30 Hours)

1. Introduction to Test Cases, how to create a simple test case and record it in the excel file.
2. Developing Login functionality and testing them manually and storing the data in the sheet.
3. Testing the registration functionality
4. Testing flight reservation system and recording test cases
5. Testing the date field scenario programmatically and recording test cases.
6. Taking scenario of product description functionality in ecommerce website.
7. Taking a scenario of payment functionality and order history in ecommerce website.
8. Practicing the data flow testing taking some another logic and implying path testing
9. Taking up path testing
10. Developing a logical code to test boundary value exemptions

11. Create an image upload functionality and make their test cases
12. Teams will make HTML CSS design templates in hours and perform load and performance testing
13. Developing applications to automate basis path testing.
14. Exposure to automated testing tools such as Rational test manager, Selenium, Loadrunner or any other similar tools.

Course Learning Outcomes: After studying this course students will be able to:

1. Explain various approaches of software testing and quality assurance for software development.
2. Create test strategies, design test cases, prioritize and execute them.
3. Identify various risks involved with software projects and build risk management
4. Plan software management and configuration activities.
5. Discuss the risk management involved in software development.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Daniel Galin	Software Quality Assurance – From Theory to Implementation	Pearson	2008	978-8131723951
Boris Beizer	Software Testing Techniques	Wiley	2002	978-8177222609
Roger S. Pressman	Software Engineering	Tata McGraw Hill	2017	978-0070701137
William E. Perry	Effective Methods for Software Testing	Wiley	2006	978-8126508938
Naresh Chauhan	Software Testing – Principles and Practices	Oxford University Press	2016	978-0199465873

Course Title: Professional Ethics and Responsibilities - I

Course Contents/syllabus:	L	T	P/S	SW/FW	TOTAL CREDIT UNITS
		1	0	0	0
					Teaching Hours
Unit I: Introduction to Ethics					04 H
Origin of Ethics, Ethics: definition, moral philosophy, nature of moral judgments and reactions.					

Unit II: Ethical Issues at workplace		04 H
Ethical Dilemma's, Challenges in ethical decision making, Redressal of grievances		
Unit III: Code of Ethics		05 H
Principle of Ethics, Compliance based and values-based code of ethics, Professional obligation, Role of regulatory authority, Respect for Privacy, Confidentiality, Inform Consent and debriefing		
Unit IV: Different theories of ethics		05 H
Theories of Ethics (Utilitarian Theory, Right Theory & Casuist Theory), Benefit of Ethics. Freedom in ethical discourse		

Professional Skills Development Activities:

- Students will carry out an industrial survey /interview /focus group discussion to identify and understand the translation of professional values and ethics in daily work practices. Students will compile a minor project report based on it.
- The students will develop a case study based on any major violation of professional ethics by studying newspaper articles, policy documents, discussions paper in parliament media interviews and documentaries etc (Give presentation in team of 3).
- The students will carry out a home assignment by writing a review of literature on ethical issues and practices in his/ her area of study.

Course Learning Outcomes: After studying this course students will be able to:

1. Relate code of ethics with appropriate profession
2. Comprehend the concept of professional ethics
3. Analyze various ethical issues at workplace
4. Interpret theories of ethics and their implications

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
R Boatright John, D Smith Jeffrey, Prasan Patra Bibhu	Ethics and the Conduct of Business	Pearson	2017	978-9352862306
Edmund G Seebauer and Robert L Barry	Fundamentals of Ethics for Scientists and Engineers	Oxford University	2008	978-0195698480
Richard Rowson	Working Ethics: How to Be Fair in a Culturally Complex World	Jessica Kingsley	2006	978-1853027505
Laura P. Hartman and Joe Desjardins	Business Ethics: Decision Making for Personal Integrity and Social Responsibility	Mc Graw Hill	2013	978-1259098277

Michael Davis, Andrew Stark	Conflict of Interest in the Professions	OUP, USA	2001	978- 0195128635
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**Course: Masters in Computer Applications
Program Structure
Semester IV (Second year)**

Sr. No	Course Code	Course Title	Course Type	Credit					Credit Units
				L	T	PS			
1		Information Security and Cyber Laws	Core Courses	4	0	0	0	0	4
2		Machine Learning and Data Analytics using Python	Core Courses	3	0	4	0	0	5
3		Domain Elective -III	Domain Elective	4	0	0	0	0	4
4		Domain Elective -IV	Domain Elective	3	0	2	0	0	4
5		Professional Ethics and Responsibilities – II	Value Added Courses	1	0	0	0	0	1
6		Seminar	NTCC	0	0	0	0	0	2
7		Major Project	NTCC	0	0	8	0	0	4
			TOTAL	15	0	14			24
			Total Credits				Min Required: 24		
							Semester Credits: 24		

Domain Elective: III

Data Science

NLP and Speech Recognition

E-Commerce and Digital Marketing

Domain Elective: IV

Cloud Computing

IOT and Blockchain Technologies

Digital Image Processing

Course Title: Information Security and Cyber Laws

Course Contents/syllabus:	L	T	P/S	SW/FW	TOTAL CREDIT UNITS
		4	0	0	0
					Teaching Hours
Unit I: Introduction					15 H
Introduction to Information System, classification and components of information system, Computer Security Concepts, CIA (Confidentiality, integrity and availability), Security Functional Requirements. User Authentication: Means of Authentication, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication.					
Unit II: Access Control & Security					15 H
Access Control: Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, File Access Control, Role-Based Access Control. Database Security: The Need for Database Security, Database Access Control, Database Encryption. Malicious Software: Types of Malicious Software (Malware)-Viruses, Worms, SPAM E-mail, Trojans, Zombie, Bots, Keyloggers, Phishing, Spyware, Backdoors, Rootkits, Preventive Measures. Denial-of-Service Attacks: Types of DoS attacks, Defenses Against Denial-of-Service Attacks.					
Unit III: Intrusion Detection & Prevention					15 H
Intrusion Detection: Intruders, Intrusion Detection, Host-Based Intrusion Detection, Distributed Host-Based Intrusion Detection, Network-Based Intrusion Detection, Honeypots. Firewalls & Intrusion Prevention Systems: The Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Intrusion Prevention Systems. Cryptographic Algorithms: Symmetric Encryption Principles, Data Encryption Standards (DES)					
Unit IV: Security Protocols					15 H
Introduction to Internet Security Protocols & Standards: SSL, TLS, HTTPS, IPv4 and IPv6 Security protocols. Security Policies and Cyber Laws: Concept of Information Security Policy, ISO Standards, various Indian Cyber Laws, Information Technology Act 2000, Electronic Record and E-Governance, Classification and Provisions of Cyber Crimes, Regulation of Certifying Authorities, Patent, Copyright, Digital signature, Introduction to Cyberspace					

Course Learning Outcomes: After studying this course students will be able to:

1. Identify issues involved in the field of information security.
2. Explain the key security requirements of Confidentiality, Integrity & Availability.

3. Demonstrate the concept of Intrusion Detection & Intrusion Prevention.
4. Apply Symmetric Encryption techniques.
5. Describe the concept of Security policies and Cyber Laws.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
William Stallings, Lawrie Brown	Computer Security: Principles & Practice	Pearson	2019	978-9353438869
Surya Prakash Tripathi, Ritendra Goel, Praveen Kumar Shukla	Introduction to Information Security and Cyber Law	Dreamtech Press	2014	978-9351194736
Christof Paar, Jan Pelzl,	Understanding Cryptography: A Textbook for Students and Practitioners	Springer	2014	978-3642446498
William Stallings	Cryptography and Network Security Principles and Practices	Pearson	2017	978-9332585225
Darren Death	Information Security Handbook	Packt Publishing	2017	978-1788478830

Course Title: Machine Learning and Data Analytics Using Python

Course Contents/syllabus:	L	T	P/S	SW/FW	TOTAL CREDIT UNITS
		3	0	0	4
					Teaching Hours
Unit I: Introduction					10 H
Machine Learning: Introduction, supervised, unsupervised, reinforcement learning. Regression: Linear Regression, linear classification, logistic regression.					
Unit II: Clustering & Classification					11 H
Clustering: K nearest neighbor, decision trees, Random forest. Classification: Naïve Bayes, principal component analysis, Introduction to neural networks.					
Unit III: Python Programming					12 H

Introduction to Python Programming: Data types, operators, control structures, functions, modules. Numpy: Introduction to numpy, arrays, array indexing, operations		
Unit IV: Pandas & Matplotlib		12 H
Pandas: Introduction to pandas, series, group by, Data Frames, missing data, merging, joining, concatenating, operations, data input and output. Matplotlib: Plotting, markers, line, labels, grid, subplot, scatter, bars, histograms, pie charts.		

List of Experiments (Total:60 Hours)

1. Design and evaluate a data model using Linear Regression.
2. Design and evaluate a data model using Logistic Regression.
3. Design and evaluate a data model using KNN.
4. Design and evaluate a data model using K Means Clustering.
5. Design and evaluate a data model using SVM.
6. Design and evaluate a data model using PCA.
7. Design and evaluate a data model using Decision Trees.
8. Design and evaluate a data model using Random Forest.
9. Compare the performance of all the above ML techniques on a similar data set using matplotlib.

Course Learning Outcomes: After studying this course students will be able to:

1. Explain Machine Learning concepts
2. Differentiate between supervised and unsupervised learning
3. Discuss clustering and classification algorithms
4. Analyse data using Python Numpy, Panda Libraries
5. Implement data visualization using matplotlib library of Python.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
M Pradhan, U Dinesh Kumar	Machine Learning using Python	Wiley	2019	978-8126579907
Andreas Muller	Introduction to Machine Learning with Python: A Guide for Data Scientists	Shroff/O'Reilly	2016	978-9352134571
Willian Mckinney	Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython	Shroff/O'Reilly	2017	978-9352136414

Puneet Mathur	Machine Learning Applications Using Python: Cases Studies from Healthcare, Retail and Finance	APRESS	2019	978-1484247143
John Paul, Luca Massron	Python for Data Science For Dummies	Wiley	2019	978-8126524938

Course Title: Data Science

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
4	0	0	0	4

	Teaching Hours
Unit I: Introduction	15 H
Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications. Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources.	
Unit II: Data Analysis	15 H
Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.	
Unit III: Data Visualization and Applications	15 H
Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings. Applications of Data Science, Technologies for visualization, Bokeh (Python)	
Unit IV: Recent trends in Data Science	15 H
Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.	

Course Learning Outcomes: After studying this course students will be able to:

1. Explain how data is collected, managed and stored for data science.
2. Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists.
3. Implement data collection and management scripts using MongoDB.
4. Apply various techniques for data visualization.

5. Understand recent trends in the field of data collection techniques.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Cathy O’Neil and Rachel Schutt	Doing Data Science, Straight Talk from the Frontline	O’Reilly Media	2013	978-1449358655
Jure Leskovek, Annand Rajaraman and Jeffrey Ullman	Mining of Massive Datasets	Cambridge University Press	2020	978-1108476348
Foster Provost, Tom Fawcett	Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking	O’Reilly Media	2013	978-1449361327
<u>Qurban A. Memon, Shakeel Ahmed Khoja</u>	Data Science: Theory, Analysis and Applications	CRC Press	2019	978-0367208615

Course Title: NLP and Speech Recognition

Course Contents/syllabus:

	L	T	P/S	SW/FW	TOTAL CREDIT UNITS
	4	0	0	0	4
					Teaching Hours
Unit I: Introduction					15 H
Introduction to Natural Language Processing Regular Expressions, Text Normalization, Edit Distance: Regular Expressions, Words, Corpora, Text Normalization, Minimum Edit Distance.					
Unit II: N-gram Language Models and Naïve Bayes					15 H

N-gram Language Models: N-Grams, Evaluating Language Models, Generalization and Zeros, Smoothing, Kneser-Ney Smoothing, Huge Language Models and Stupid Backoff, Advanced: Perplexity's Relation to Entropy Naive Bayes and Sentiment Classification: Naive Bayes Classifiers, Training the Naive Bayes Classifier, Optimizing for Sentiment Analysis, Naive Bayes for other text classification tasks, Naive Bayes as a Language Model, Evaluation: Precision, Recall, F-measure, Test sets and Cross validation, Statistical Significance Testing, Avoiding Harms in Classification.		
Unit III: Logistic Regression and Chatbots		15 H
Classification: the sigmoid, Learning in Logistic Regression, the cross-entropy loss function, Gradient Descent, Regularization, Multinomial logistic regression, Interpreting models, Advanced: Deriving the Gradient Equation Properties of Human Conversation, Chatbots, GUS: Simple Frame-based Dialogue Systems, The Dialogue-State Architecture, Evaluating Dialogue Systems, Dialogue System Design.		
Unit IV: Phonetics and Automatic Speech Recognition		15 H
Speech Sounds and Phonetic Transcription, Contents, Articulatory Phonetics, Prosody, Acoustic Phonetics and Signals, Phonetic Resources Automatic Speech Recognition and Text-to-Speech: The Automatic Speech Recognition Task, Feature Extraction for ASR: Log Mel Spectrum, Speech Recognition Architecture, CTC, ASR Evaluation: Word Error Rate, TTS, Other Speech Tasks.		

Course Learning Outcomes: After studying this course students will be able to:

1. Discuss the fundamental concepts of natural language processing
2. Explain text normalization, use of edit distance, and regular expressions
3. Implement Naive bayes and sentiment classification algorithms
4. Familiarize with chatbots and phonetics
5. Describe the concept of speech recognition and text to speech conversion.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Daniel Jurafsky, James H. Martin	Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition	Pearson	2013	978-9332518414
Ruslan Mitkov	The Oxford Handbook of Computational Linguistic	OUP Oxford	2022	978-0199573691

Grant Ingersoll, Thomas Morton and Drew Farris	Taming Text: How to Find, Organize, and Manipulate It	Manning Publications	2013	978-1933988382
Steven Bird, Ewan Klein and Edward Loper	Natural Language Processing with Python	Shroff	2011	978-8184047486

Course Title: E-Commerce and Digital Marketing

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
4	0	0	0	4

	Teaching Hours
Unit I: Introduction	15 H
Introduction to Electronic Commerce: Technical Components of Ecommerce, E-Commerce Framework, E-Commerce Applications and Electronic Business. Internet Service provider and World wide web. Architectural Framework for Electronic Commerce, WWW as the Architecture and Hypertext publishing.	
Unit II: E-Payment and Data Interchange	15 H
Electronic payment System: Types and Traditional payment, Value exchange system, Electronic funds transfer, Digital Token Based Electronic Payment System, Smart Cards – Credit Cards, Risk in Electronic Payment Systems, Designing Electronic Payment Systems. Electronic Data Interchange: Concepts and applications of EDI and Limitation. EDI and Electronic Commerce standardization and EDI – EDI Software Implementation. EDI Applications in Business – EDI: Legal, Security and Privacy issues. E- Governance for India: Indian customer EDI system and Service centers.	
Unit III: Digital Marketing	15 H
Introduction to Digital Marketing: Components of Online Marketing (Email, Forum, Social network, Banner, Blog), Impact of Online Marketing, Basics of Affiliate Marketing, Viral Marketing, Influencer Marketing, Referral Marketing, Online Advertising, Mobile Marketing, Web analytics and Email Marketing.	
Unit IV: SEO & SEM	15 H
Search Engine Optimization (SEO) and Social Engine Marketing (SEM) Importance of Internet and Search Engine and Role of Keywords in SEO, On-Page Optimization (Onsite) and Off Page Optimization. Introduction to Social Media Marketing Website Planning & Creation: Content Marketing Strategy, Keywords Research and Analysis, Web Presence and Creating content. Successful content marketing strategies and case studies.	

Course Learning Outcomes: After studying this course students will be able to:

1. Discuss the scope of ecommerce.
2. Explain payment modes used in ecommerce today.
3. Execute a comprehensive digital marketing strategy and plan
4. Describe the use digital marketing for multiple goals within a larger marketing and/or media strategy.
5. List the major digital marketing channels.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Whitley, David	E-Commerce Strategy, Technologies and Applications	Mc Graw Hill	2017	978-0070445321
Laudon and Traver	E-Commerce: Business, Technology & Society	Pearson	2001	978-0201748154
Damian Ryan,	Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation	Kogan Page	2016	978-0749478438
Seema Gupta	Digital Marketing	Mc Graw Hill	2009	978-9353169787
Puneet Singh Bhatia	Fundamentals of Digital Marketing	Pearson	2017	978-9332587373

Course Title: Cloud Computing

Course Contents/syllabus:	L	T	P/S	SW/FW	TOTAL CREDIT UNITS
		3	0	2	0
					Teaching Hours
Unit I: Introduction					11 H

<p>Overview of Computing Paradigm: Recent trends in Computing - Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing.</p> <p>Introduction to Cloud Computing: Vision of Cloud Computing, Defining a Cloud, Cloud Reference Model, Deployment Model, Characteristics, Benefits of Cloud Computing, Challenges ahead. Cloud computing vs. Cluster computing vs. Grid computing.</p>		
Unit II: Migration and Virtualization		11 H
<p>Migrating into a Cloud: Introduction, Broad approaches to Migrating into the Cloud, The Seven-Step Model of Migration Into a Cloud. Virtualization: Introduction, Characteristics of Virtualized environment, Taxonomy of Virtualization techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples- Xen, VMware, Microsoft Hyper-V</p>		
Unit III: SLA Management and Security		11 H
<p>SLA Management in Cloud Computing: Inspiration, Traditional Approaches to SLO Management, Types of SLA, Life Cycle of SLA, SLA management in Cloud. Automated Policy-based management.</p> <p>Securing Cloud services: Cloud Security, Securing Data- Brokered Cloud Storage Access, Storage location and tenancy, Encryption, Auditing and compliance.</p> <p>Cloud Storage: Provisioning Cloud Storage, Virtual storage containers, Cloud Storage Interoperability (CDMI, OCCI), Database Storage, Resource Management</p>		
Unit IV: Advanced Topics		12 H
<p>Energy Efficiency in cloud, Market Oriented Cloud Computing, Federated Cloud Computing, Mobile Cloud Computing, Fog computing, Big Data Analytics, Basics of IoT.</p> <p>Cloud Platforms in Industry: Amazon Web Services-Compute Services, Storage Services, Communication Services, Additional Services. Google App Engine-Architecture and Core Concepts, Application Life Cycle. Cost Model. Microsoft Azure-Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.</p>		

List of Experiments (Total 30 Hours)

1. Install VirtualBox/VMware Workstation on different OS.
2. Install different operating systems in VMware.
3. Simulate a cloud scenario using simulator.
4. Implement scheduling algorithms.
5. To study cloud security management.
6. To study and implementation of identity management
7. Case Study - Amazon Web Services/Microsoft Azure/Google cloud services.

8. Enlist various companies in cloud business and the corresponding services provided by them and tag them under SaaS , PaaS & IaaS.
9. Create a warehouse application using tools supplied by any SaaS provider.
10. Implementation of Para-Virtualization using VM Ware’s Workstation/ Oracle’s Virtual Box and Guest O.S. Learn creation, migration, cloning and managing of virtual machines.
11. Using public cloud service providers tools for exploring the usage of IaaS, PaaS and SaaS cloud services.
12. Interact with Cloud Storage and conduct typical management tasks such as bucket creation, file transfers, Access Control Lists (ACL) permissions and Identity and Access Management (IAM) configuration.
13. Setting up a private cloud using open-source tools (Eucalyptus/Open Stack etc.).
14. Hands-on exercises on open-source tool like cloudsim.

Course Learning Outcomes: After studying this course students will be able to:

1. Discuss the basic concept and importance of cloud computing.
2. Explain the process of migrating to a cloud solution for different applications.
3. Compare and evaluate the virtualization technologies.
4. Monitor and manage the cloud resources, applications and data while addressing the security concerns.
5. Use cloud solutions offered by industry leaders for various applications.

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Raj Kumar Buyya, James Broberg, Andrezei M. Goscinski	Cloud Computing: Principles and Paradigms	Wiley	2013	978-8126541256
Anthony T. Velte, Toby J. Velte and Robert Elsenpeter	Cloud Computing: A practical Approach	Mc Graw Hill	2017	978-0070683518
Barrie Sosinsky	Cloud Computing Bible	Wiley	2011	978-0470903568

Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper	Cloud Computing for dummies	Wiley	2009	978- 8126524877
Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi	Mastering Cloud Computing	Mc Graw Hill	2017	978- 1259029950

Course Title: IOT and Blockchain Technologies

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
3	0	2	0	4

	Teaching Hours
Unit I: Introduction	11 H
Definitions & Characteristics of IoT, Physical Design of IoT-Things in IoT, Protocols, Logical Design of Functional Blocks, Communication Models, Communication APIs. Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels & Deployment Templates.	
Unit II: Elements of IOT	11 H
Elements of IoT: Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- familiarity with APIs for Communication, Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP. Solution Framework for IoT applications. Domain Specific IoTs: IoT applications for Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.	
Unit III: Concept of Blockchain	11 H
Overview of Blockchain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Blockchain, Transactions, Distributed Consensus, Public vs Private Blockchain, Understanding Crypto currency to Blockchain, Permissioned Model of Blockchain, Overview of Security aspects of Blockchain.	
Unit IV: Bitcoin and Blockchain	12 H

<p>Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.</p> <p>Enterprise Application of Blockchain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Blockchain, Blockchain enabled Trade, We Trade — Trade Finance Network, Supply Chain Financing, Identity on Blockchain.</p>		
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List of Experiments

(Total 30 Hours)

1. Design a simple smart contract to understand state variables.
2. Design a simple smart contract to understand getter and setter functions.
3. Design a simple smart contract to understand transaction vs calls.
4. Design a simple smart contract to understand fixed size arrays and dynamic arrays.
5. Design a simple smart contract to understand array resizing.
6. Design a simple smart contract to understand concepts like structures.
7. Design a simple smart contract to understand enums.
8. Design a simple smart contract to understand mappings.
9. Design a simple smart contract to understand constructors.
10. Design a smart contract to understand built-in global variables.
11. Design a simple smart contract to understand variables visibility specifiers.
12. Design a simple smart contract to understand function modifiers.
13. Design a simple smart contract to understand fallback payable function.
14. Design a simple smart contract to understand accessing the contract balance.
15. Design a simple smart contract of storage.
16. Design a smart contract to implement cryptocurrency.
17. Create and deploy a blockchain network using Hyperledger Fabric SDK/Ethereum for Java Set up and initialize the channel, install and instantiate chain code, and perform invoke and query on your blockchain network.
18. Interact with a blockchain network. Execute transactions and requests against a blockchain network by creating an app to test the network and its rules.
19. Develop an IOT asset tracking app using Blockchain. Use an IOT asset tracking device to improve a supply chain by using Blockchain, IOT devices and Node-RED.

Course Learning Outcomes: After studying this course students will be able to:

1. Discuss the terminology and enabling technologies of IoT and Blockchain
2. Identify various element of IoT.
3. Enumerate the steps involved in IoT system design methodology
4. Describe the working of bit coin crypto currency
5. List domain specific applications of IoT and Blockchain

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Arshdeep Bahga, Vijay Madiseti	Internet of Things-A Hands-on Approach	Orient Blackswan	2015	978-8173719547
Melanie Swan	Blockchain: Blueprint for a New Economy	Shroff/O'Reilly	2015	978-9351109921
Andreas Antonopoulos	Mastering Bitcoin: Unlocking Digital Cryptocurrencies	Shroff/O'Reilly	2017	978-9352135745
Pethuru Raj and Anupama C. Raman	The Internet of Things: Enabling Technologies, Platforms, and Use Cases	Auerbach Publications	2017	978-1498761284
Imran Bashir	Mastering Blockchain	Packt Publishing	2018	978-1788839044

Course Title: Digital Image Processing

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
3	0	2	0	4

	Teaching Hours
Unit I: Introduction	11 H
Fundamental steps in Digital Image Processing, Components of an image processing system, Image sampling and quantization, Color models. Pixel relationships and distance metrics -Image coordinate system, Image topology, Connectivity, Relations, Distance measures. Classification of image processing Operations - Arithmetic, Logical, Geometrical (Translation, Scaling, Zooming, Linear Interpolation, Mirror or Reflection, Shearing, Rotation, Affine and Inverse transformation) Operations, Image interpolation Techniques (Down sampling and up sampling), Set operations, Statistical operations, Convolution and Correlation operations.	
Unit II: Image Enhancement	11 H

Image enhancement point operations- Linear and non-linear functions, Piecewise linear functions, Histogram processing. Spatial filtering - basics of filtering in the spatial domain, Vector representation, smoothing linear and non-linear filters, sharpening filters. Basics of filtering in the frequency domain, Image smoothing and sharpening using frequency domain filters. A model of the image degradation/restoration process, Noise models, Noise filters, Degradation function.		
Unit III: Wavelet Domain		11 H
Wavelet analysis, Continuous wavelet transform, Discrete wavelet transform, Wavelet decomposition and reconstruction in two dimensions, Wavelet packet analysis, Wavelet based image denoising.		
Unit IV: Compression and Segmentation		12 H
Image compression model, Compression measures, Compression algorithm and its types (Entropy, Predictive, Transform and layered coding), Types of redundancy (Coding, Inter-pixel, Psycho-visual and Chromatic), Lossless compression algorithms – Run-length, Huffman, Bit-plane, Arithmetic, Predictive coding. Lossy compression algorithms – Lossy predictive, Block transform coding. Image Segmentation: Classification of image segmentation algorithms, Point, Line and Edge detection, Hough transforms, Corner detection, Global thresholding, Otsu’s method, Multivariable thresholding, Region-based segmentation, Watershed segmentation		

List of Experiments (Total 30 Hours)

1. Installation of image processing software and use of basic image processing commands.
2. Generation of lines, array, matrix and image
3. Reading and displaying images in different formats using different color models
4. Converting color images into monochrome images
5. Displaying of image Histogram
6. Image color enhancements using pseudo coloring techniques
7. Image restoration techniques.
8. Application of image processing operations
9. Point, Line, and Edge Detections in images
10. Boundary Detections in images
11. Color image processing
12. Wavelet transforms.
13. Image compression techniques

14. A minor project based on above taught image processing techniques.

Course Learning Outcomes: After studying this course students will be able to:

1. Discuss the need of various image transforms along with properties
2. Learn different techniques employed for the enhancement of images
3. Describe the rapid advances in Machine vision
4. Analyze images in multi resolution environment
5. Evaluate image compression techniques

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
Rafael C. Gonzales, Richard E. Woods	Digital Image Processing	Pearson	2018	978-9353062989
Anil Jain K	Fundamentals of Digital Image Processing	Pearson	2015	978-9332551916
Willliam K Pratt	Digital Image Processing	Wiley	2010	978-8126526840
Nick Efford	Digital Image Processing a practical introduction using Java	Addison Wesley	2000	978-0201596236

Course Title: Professional Ethics and Responsibilities -II

Course Contents/syllabus:

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
1	0	1	0	1

	Teaching Hours
Unit I: Philosophy	04 H
Introduction to philosophy; definition, nature and scope, concept, branches	
Unit II: Practices at workplace	04 H
Employee Rights, Conflicts of Interest, Employee Relationship at workplace.	
Unit III: Ethics in different domains	04 H
Role of ethics in different domain, Ethics in Research, Medicine, Engineering, Sciences, Entrepreneurship, Psychology, Journalism, Management, law, Humanities etc.	
Unit IV: Sustainable practices	06 H

Green Practices, Ethics to handle VUCA environment, Importance of sustainability, Sustainable Business practices, Corporate Social Responsibility, Inclusive development.		
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Professional Skills Development Activities:

- Students will carry out an industrial survey /interview /focus group discussion to identify and understand the translation of professional values and ethics in daily work practices. Students will compile a minor project report based on it.
- The students will develop a case study based on any major violation of professional ethics by studying newspaper articles, policy documents, discussions paper in parliament media interviews and documentaries etc. (Give presentation in team of 3).
- The students will carry out a home assignment by writing a review of literature on ethical issues and practices in his/ her area of study.

Course Learning Outcomes: After studying this course students will be able to:

1. Relate code of ethics with appropriate profession
2. Comprehend the concept of professional ethics
3. Analyze various ethical issues at workplace
4. Interpret theories of ethics and their implications

Text / Reference Books:

AUTHOR	TITLE	Publisher	Year of publication	ISBN
R Boatright John, D Smith Jeffrey, Prasan Patra Bibhu	Ethics and the Conduct of Business	Pearson	2017	978-9352862306
Edmund G Seebauer and Robert L Barry	Fundamentals of Ethics for Scientists and Engineers	Oxford University	2008	978-0195698480
Richard Rowson	Working Ethics: How to Be Fair in a Culturally Complex World	Jessica Kingsley	2006	978-1853027505
Laura P. Hartman and Joe Desjardins	Business Ethics: Decision Making for Personal Integrity and Social Responsibility	Mc Graw Hill	2013	978-1259098277
Michael Davis, Andrew Stark	Conflict of Interest in the Professions	OUP, USA	2001	978-0195128635

