



Shri. Shamrao Patil(Yadavkar)Educational & Charitable Trust's
Sharad Institute of Technology College of Engineering
(An Autonomous Institute)

NBA Accredited, Accredited by NAAC 'A' Grade ISO9001:2015

Department: AI&DS

Rev: Course Structure/00/2023-24

Class: T.Y. B.Tech.

Semester: VI

Sr. No.	Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
				L	T	P	Total Hrs.	CA1	CA2	MS E	ESE	Total	
1	23AD3601	PCC	Machine Learning	3	--	--	3	10	10	30	50	100	3
2	23AD3602	PCC	Web Technology	3	--	--	3	10	10	30	50	100	3
3	23AD3603	PEC	Elective-II	3	--	--	3	10	10	30	50	100	3
4	23AD3604	PEC	Elective-III	3	--	--	3	10	10	30	50	100	3
5	23AD3605	PCC	Machine Learning Laboratory	--	--	2	2	15	15	--	20	50	1
6	23AD3606	PCC	Web Technology Laboratory	--	--	2	2	15	15	--	20	50	1
7	23AD3607	VSEC	Advanced-Data Visualization	--	--	4	4	15	15	--	20	50	2
8	23AD3608	PROJ	Capstone Project Phase-I	--	--	4	4	25	25	--	50	50	2
9	23ADMXX	MDM	Multidisciplinary Minor	3	--	--	3	10	10	30	50	100	3
10	23HSSM07	VEC	Aptitude Skills-IV	1	--	--	1	25	25	--	--	50	Audit
11	23HSSM08	VEC	Language Skills-IV	--	--	2	1	25	25	--	--	50	Audit
Total				16		14	29	170	170	150	360	800	21
Elective-II:				Elective-III									
23AD3603A: Software Modelling and Architecture				23AD3604A: Blockchain Management for AI									
23AD3603B: Cognitive Computing and NLP				23AD3604B: Computer Vision									
23AD3603C: Big Data Analytics				23AD3604C: Distributed System									

Multidisciplinary Minor

Basket	Finance & Management	Health Sciences/Science & Technology/Environment	Management & Entrepreneur Development
Sem VI	Data Science for business (23ADMDA4)	Medical image processing (23ADMDB4)	Engineering Econometrics (23ADMDC4)



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Course Category	PCC	OE	PEC	MDM	CEP	VSEC	Project	VEC	Total
Cumulative Credits	20	3	9	6	1	2	2	-	43
NEP Guideline	18-22	2	12	6	-	2	2	-	40-44




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23AD3601	PCC	Machine Learning	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Linear Algebra, Probability and Statistics

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

CO1	Explain the fundamental concepts of Machine Learning.
CO2	Make use of supervised and unsupervised learning algorithms for solving the problems.
CO3	Infer suitable hypotheses using the foundations of Computational Learning Theory
CO4	Solve problems using concepts of neural networks.

Course Contents:

Unit I: Introduction to Machine Learning Well-posed learning problems, types of learning, hypothesis space and inductive bias, Machine Learning Lifecycle, Basic ML concepts- labels, training/testing sets, Evaluation & Performance Metrics, Cross-validation, Applications of Machine Learning.	[6]
Unit II: Supervised Learning I Basics of supervised learning, Simple & Multiple Linear Regression, Decision Tree, K-Nearest Neighbor, Overfitting, Underfitting.	[6]
Unit III: Supervised Learning II Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM, Probability and Bayes learning.	[6]
Unit IV: Unsupervised Learning Basics of unsupervised learning, Clustering- K-Means Clustering, Hierarchical Clustering, DBSCAN, Dimensionality Reduction- Principal Component Analysis (PCA), Recommendation System.	[6]
Unit V: Computational Learning Theory Definition and significance of Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning.	[6]
Unit VI: Introduction to Deep Neural Networks Structure of a Neural Network, Perceptron, Importance of weights, biases, and activation functions, Multilayer Networks and Back Propagation, Deep Neural Networks-Introduction to CNN and RNN.	[6]



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Text Books:

1. Machine Learning, Tom Mitchell, First Edition, McGraw Hill, 1997.
2. Introduction to Machine Learning, Second Edition Ethem Alpaydm, The MIT Press
Cambridge, Massachusetts London, England

Reference Books:

1. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, The MIT Press
Cambridge, Massachusetts London, England
2. Machine Learning for Absolute Beginners: A Plain English Introduction, Third
Edition, Oliver Theobald




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23AD3602	PCC	Web Technology	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Database Management Systems, Computer Networks and Security

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

CO1	Implement and analyze the behavior of web pages using HTML and CSS
CO2	Apply the client-side technologies for web development
CO3	Analyze the concepts of Servlet and JSP
CO4	Analyze the Web services and frameworks
CO5	Apply the server-side technologies for web development
CO6	Create the effective web applications for business functionalities using latest web Development platforms.

Course Contents:

<p>Unit I- Web Essentials and Markup language-HTML The Internet, basic internet protocols, the World Wide Web, HTTP Request message, HTTP response message, web clients, web servers. HTML: Introduction, history and versions. HTML elements: headings, paragraphs, line break, colors and fonts, links, frames, lists, tables, images, and forms. Difference between HTML and HTML5. CSS: Introduction to Style Sheet, CSS features, CSS core syntax, Style sheets and HTML, Style rule cascading and inheritance, text properties. Bootstrap.</p>	[6]
<p>Unit II- Client-Side Technologies: JavaScript and DOM JavaScript: Introduction to JavaScript, JavaScript in perspective, basic syntax, variables and data types, statements, operators, literals, functions, objects, arrays, built-in objects. JavaScript debuggers. DOM: Introduction to Document Object Model, DOM history and levels, intrinsic event Handling, modifying element style, the document tree, DOM event handling, jQuery, Overview of Angular JS.</p>	[6]
<p>Unit III- Servlet and XML Servlet: Servlet architecture overview, A "Hello World" servlet, Servlets generating dynamic content, Servlet life cycle, parameter data, sessions, cookies, URL rewriting, other Servlet capabilities, data storage, Servlets concurrency, databases(MySQL), and JavaServlets.</p>	[6]



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XML: XML documents and vocabularies, XML declaration, XML Namespaces, DOM-based XML processing, transforming XML documents, DTD: Schema, elements, attributes.	
Unit IV- JSP and Web Services JSP: Introduction to Java Server Pages, JSP and Servlets, running JSP applications, Basic JSP, JavaBeans classes and JSP, Support for the Model-view-controller paradigm, JSP related technologies. Web Services: Web Service concepts, Writing a Java Web Service, Writing a Java web service client, Describing Web Services: WSDL, Communicating Object data: SOAP. Struts: Overview, architecture, configuration, actions, interceptors, result types, validations, localization, exception handling, annotations.	[6]
Unit V- Server Side Scripting Languages PHP: Introduction to PHP, uses of PHP, general syntactic characteristics, Primitives, operations and expressions, output, control statements, arrays, functions, pattern matching, form handling, files, cookies, session tracking, using MySQL with PHP, WAP and WML. ASP.NET: Introduction, Overview of the .NET Framework, Overview of C#, Introduction To ASP.NET, ASP.NET Controls, Web Services. Overview of Node JS.	[6]
Unit VI-Ruby and Rails Introduction to Ruby: Origins & uses of Ruby, scalar types and their operations, simple input and output, control statements, fundamentals of arrays, hashes, methods, classes, code blocks and iterators, pattern matching. Introduction to Rails: Overview of Rails, Document Requests, Processing Forms, Rails Applications and Databases, Layouts, Rails with Ajax. Introduction to EJB.	[6]
Text Books: 1. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Second Edition, Pearson Education, 2007, ISBN 978-0131856035. 2. Robert W. Sebesta, "Programming the World Wide Web", 4th Edition, Pearson Education, 2008.	
Reference Books: - 1. Marty Hall, Larry Brown, "Core Web Programming", Second Edition, Pearson Education, 2001, ISBN 978-0130897930. 2. H. M. Deitel, P. J. Deitel and A. B. Goldberg, "Internet & World Wide Web How to Program", Third Edition, Pearson Education, 2006, ISBN 978-0131752429. 3. Chris Bates, "Web Programming Building Internet Applications", 3 rd Edition, Wiley India, 2006. Xue Baietal, "The Web Warrior Guide to Web Programming", Thomson, 2003.	




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Elective-II

23AD3603A	PEC	Software Modeling and Architecture	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Java Programming

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

CO1	Explain Software Modeling Concepts
CO2	Understand Static Modeling Techniques
CO3	Interpret Dynamic Modeling Techniques
CO4	Describe Software Architecture and Quality Attributes
CO5	Understand Architectural Design and Documentation
CO6	Identify and Explain Design Patterns

Course Contents:

<p>Unit I-Concepts of Software Modeling Software Modeling: Introduction to Software Modeling, Advantages of modeling, Principles of modeling. Evolution of Software Modeling and Design Methods: Object oriented analysis and design methods, Concurrent, Distributed Design Methods and Real-Time Design Methods, Model Driven Architecture (MDA), 4+1 Architecture, Introduction to UML, UML building Blocks, COMET Use Case-Based Software Life Cycle. Requirement Study: Requirement Analysis, SRS design, Requirements Modeling. Use Case: Actor and Use case identification, use case relationship (Include, Extend, Use case Generalization, Actor Generalization), Use case template.</p>	[6]
<p>Unit II-Static Modeling Study of classes (analysis level and design level classes). Methods for identification of classes: RUP (Rational Unified Process), CRC (Class, Responsibilities and Collaboration), Use of Noun Verb analysis (for identifying entity classes, controller classes and boundary classes). Class Diagram: Relationship between classes, Generalization/Specialization Hierarchy, Composition and Aggregation Hierarchies, Associations Classes, Constraints. Object diagram, Package diagram, Component diagram, Composite Structure diagram, Deployment Diagram.</p>	[6]




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Unit III-Dynamic Modeling Activity diagram: Different Types of nodes, Control flow, Activity Partition, Exception handler, Interruptible activity region, Input and output parameters, Pins. Interaction diagram: Sequence diagram, Interaction Overview diagram, State machine diagram, Advanced State Machine diagram, Communication diagram, Timing diagram.	[6]
Unit IV-Software Architecture and Quality Attributes Introduction to Software Architecture, Importance of Software Architecture, Architectural Structure and Views. Architectural Pattern: common module, Common component-and-connector, Common allocation. Quality Attributes: Architecture and Requirements, Quality Attributes and Considerations.	[6]
Unit V-Architectural Design and Documentation Architecture in the Life Cycle: Architecture in Agile Projects, Architecture and Requirements, Designing and Architecture. Documenting Software Architecture: Notations, Choosing and Combining views, Building the documentation Package, Documenting Behavior, Documenting Architecture in an Agile Development Project.	[6]
Unit VI-Design Patterns Design Patterns: Introduction, Different approaches to select Design Patterns. Creational patterns: Singleton, Factory, Structural patterns: Adapter, Proxy. Behavioral Patterns: Iterator, Observer Pattern with applications.	[6]
Text Books: 1. Jim Arlow, Ila Neustadt, "UML 2 and the unified process –practical object-oriented analysis and design", Addison Wesley, Second edition, ISBN 978-0201770605. 2. Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", Second Edition, Pearson, ISBN 978-81-775-8996-2 3. Erich Gamma, "Design Patterns", Pearson, ISBN 0-201-63361-2.	
Reference Books: 1. Hassan Gomaa, "Software Modeling and Design- UML, Use cases, Patterns and Software Architectures", Cambridge University Press, 2011, ISBN 978-0-521-76414-8 2. Gardy Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education, Second edition, 2008, ISBN 0-321-24562 3. Ian Sommerville, "Software Engineering", Addison-Wesley, ISBN 0-13-703515-2	




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Elective-II

23AD3603B	PEC	Cognitive Computing and NLP	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture: 3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Python programming, ML Libraries

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

CO1	Understand the fundamental concepts of cognitive computing and natural language processing.
CO2	Understand the architecture and workflow of cognitive systems using NLP techniques.
CO3	Make use of Advanced Analytics with cognitive computing
CO4	Understand the business implications of cognitive computing
CO5	Develop a prototype solution using cognitive and big data technologies.

Course Contents:

Unit 1: Foundation of Cognitive Computing Cognitive computing as a new generation, the uses of cognitive systems, gaining insights from data, Artificial Intelligence as the foundation of cognitive computing, and understanding cognition. Design Principles for Cognitive Systems: Components of a cognitive system, building the corpus, bringing data into the cognitive system, machine learning, hypotheses generation and scoring, presentation and visualization services.	[6]
Unit 2: Fundamentals of Natural Language Processing Introduction to NLP: Basic concepts of Natural Language Processing. NLP Techniques: Text processing, tokenization, stemming, lemmatization. Language models: N-grams, Bag of Words, TF-IDF, Part-of-Speech (POS) tagging, Named Entity Recognition (NER)	[6]
Unit 3: Natural Language Processing in support of a Cognitive System Role of NLP in a cognitive system, semantic web, Applying Natural Language Technologies to Business problems. Representing knowledge in Taxonomies and Ontologies: Representing knowledge, Defining Taxonomies and Ontologies, knowledge representation, models for knowledge representation, implementation considerations.	[6]




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<p>Unit 4: Relationship between Big Data and Cognitive Computing Dealing with human-generated data, defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion, and streaming data, integration of big data with traditional data. Applying Advanced Analytics to cognitive computing: Advanced analytics is on a path to cognitive computing, Key capabilities in advanced analytics, Using advanced analytics to create value, Impact of open-source tools on advanced analytics.</p>	[6]
<p>Unit 5: The Business Implications of Cognitive Computing Preparing for change, advantages of new disruptive models, knowledge meaning to business, difference with a cognitive systems approach, meshing data together differently, using business knowledge to plan for the future, answering business questions in new ways, building business-specific solutions, making cognitive computing a reality, cognitive application changing the market.</p>	[5]
<p>Unit 6: The process of building a cognitive application Emerging cognitive platform, defining the objective, defining the domain, understanding the intended users and their attributes, questions and exploring insights, training and testing. Building a cognitive health care application: Foundations of cognitive computing for healthcare, constituents in healthcare ecosystem, learning from patterns in healthcare Data, building on a foundation of big data analytics, cognitive applications across the health care ecosystem, starting with a cognitive application for healthcare.</p>	[7]
<p>Text Books:</p> <ol style="list-style-type: none">1. Judith H Hurwitz, Marcia Kaufman, Adrian Bowles, "Cognitive computing and Big Data" (O'Reilly)2. Daniel Jurafsky, James H. Martin, "Speech and Language Processing", Stanford University	
<p>Reference Books:</p> <ol style="list-style-type: none">1. Vijay V. Raghavan, Heikki Topi, "Cognitive Computing: Theory and Applications", Elsevier.2. Peter Fingar, "Cognitive Computing: A Brief Guide for Game Changers", Meghan-Kiffer Press	




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Elective-II

23AD3603C	PEC	Big Data Analytics	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Database Management System, Data Structures

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

CO1	Outline big data with challenges and nature of data.
CO2	Explain data streaming and sampling with its process.
CO3	Demonstrate different case studies in big data.
CO4	Summarize framework Hadoop to store and process big data.
CO5	Illustrate the applications of big data using MapReduce.
CO6	Illustrate the applications of big data using Pig and Hive.

Course Contents:

Unit I: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent Data Analysis, Nature of Data.	[6]
Unit II: Analytic Processes and Tools - Analysis vs. Reporting, 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.	[6]
Unit III: Counting Oneness in a Window, Decaying Window Real Time Analytics Platform (RTAP) Applications - Case Studies -Real Time Sentiment Analysis- Stock Market Predictions.	[6]
Unit IV: Introduction of Hadoop- the Hadoop Distributed File System, Components of Hadoop, Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS Java interfaces to HDFS Basics- Developing a Map Reduce Application.	[6]
Unit V: How Map Reduce Works-Anatomy of a Map Reduce Job run- Failures- Job Scheduling- Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features Hadoop environment.	[6]



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Unit VI: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and Zoo Keeper	[6]
Text Book: - <ol style="list-style-type: none">1. "Big Data: Principles and Paradigms" By Rajkumar Buyya, Rodrigo N. Calheiros, Amir Vahid Dastjerdi (Morgan Kaufmann / Elsevier)2. "Big Data Analytics" By Seema Acharya & Subhashini Chellappan (Wiley India)3. "Big Data Fundamentals: Concepts, Drivers & Techniques" By Thomas Erl, Wajid Khattak, Paul Buhler (Prentice Hall)	
Reference Books: - <ol style="list-style-type: none">1) Frank J Ohl horst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series, 2013.2) Colleen McCue, "Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis", Elsevier, Second Edition, 2015. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, Second Edition, 2007.	




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Elective-III

23AD3604A	PEC	Blockchain Management for AI	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: knowledge of cryptography, distributed systems, and computer networks.


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

CO1	Interpret the fundamentals and basic concepts in Blockchain
CO2	Compare the working of different blockchain platforms
CO3	Use a Crypto wallet for cryptocurrency-based transactions
CO4	Analyze the importance of blockchain in finding the solution to real-world problems.
CO5	Illustrate the Ethereum public blockchain platform
CO6	Identify a relative application where blockchain technology can be effectively used and implemented.

Course Contents:

Unit I: Mathematical Foundation for Blockchain Cryptography: Symmetric Key Cryptography and Asymmetric Key Cryptography, Elliptic Curve Cryptography (ECC), Cryptographic Hash Functions: SHA256, Digital Signature Algorithm (DSA), Merkel Trees. Case Studies: Compare the Symmetric and Asymmetric Cryptography algorithms	[6]
Unit II: Feature Engineering History, Centralized Vs. Decentralized Systems, Layers of Blockchain: Application Layer, Execution Layer, Semantic Layer, Propagation Layer, Consensus Layer, Why is Block chain important? Limitations of Centralized Systems, Blockchain Adoption So Far. Case Studies: Study of a research paper based on Blockchain.	[6]
Unit III: Blockchain Platforms and Consensus in Blockchain Types of Blockchain Platforms: Public, Private, and Consortium, Bitcoin, Ethereum, Hyperledger, IoT, Corda, R3. Consensus in Blockchain: Consensus Approach, Consensus Elements, Consensus Algorithms, Proof of Work, Byzantine Generals Problem, Proof of Stake, Proof of Elapsed Time, Proof of Activity, Proof of Burn. Case Studies: Compare different consensus algorithms used in Blockchain Technology.	[6]
Unit IV: Cryptocurrency– Bitcoin and Token Introduction, Bitcoin and the cryptocurrency, Cryptocurrency Basics, Types of	[6]




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<p>Cryptocurrencies, Cryptocurrency Usage, Crypto wallets: MetaMask, Coinbase, Binance. Case Studies: Create your own wallet for cryptocurrency using any of the Blockchain Platforms.</p>	
<p>Unit V: Blockchain in Ethereum Platform using Solidity What is Ethereum, Types of Ethereum Networks, EVM (Ethereum Virtual Machine), Introduction to smart contracts, Purpose and types of Smart Contracts, Implementing and deploying smart contracts using Solidity, Swarm (Decentralized Storage Platform), Whisper (Decentralized Messaging Platform) Case Studies: Study Truffle Development Environment.</p>	[6]
<p>Unit V: Blockchain Case Studies Blockchain Applications, Retail, Banking and Financial Services, Government Sector, Healthcare, IOT, Energy and Utilities, Blockchain Integration with other Domains. Case Studies: Study use cases of Blockchain and write a detailed report on every aspect implemented in the same</p>	[6]
<p>Text Books: -</p> <ol style="list-style-type: none"> 1. Draft version of "S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, Blockchain Technology: Cryptocurrency and Applications, Oxford University Press, 2019. 2. Melanie Swan, "Blockchain: Blueprint for a New Economy, "O'Reilly, 2015. 3. Josh Thompson, Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming, Create Space Independent Publishing Platform, 2017. 	
<p>Reference Books: -</p> <ol style="list-style-type: none"> 1. Daniel Drescher, "Blockchain Basics", Apress; 1st Edition, 2017. 2. Anshul Kaushik, "Blockchain and Crypto Currencies", Khanna Publishing House, Delhi. 3. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer", Import, 2018. 	




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Elective-III

23AD3604B	PEC	Computer Vision	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Python, Linear Algebra, Digital Image Processing, ML

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

CO1	Understanding and explaining the fundamentals of computer vision, including image formation, sensing, and pre-processing techniques.
CO2	Understanding of image formation fundamentals and transformations.
CO3	Applying key features to images and understanding key point detection algorithms
CO4	Understanding and applying image segmentation techniques for identifying regions and objects.
CO5	Applying clustering algorithms for pattern analysis and recognizing patterns in images.
CO6	Applying basic morphological operations such as erosion, dilation, and transformations.

Course Contents:

Unit I- Foundation of Computer Vision Computer Vision Overview - Computer Imaging Systems – Lenses - Image Formation and Sensing - Image Analysis - Pre-processing and Binary Image Analysis - Mathematical morphology.	[6]
Unit II-Image Formation and Processing Fundamentals of Image Formation - Transformation: Orthogonal – Euclidean – Affine and Projective. Edge Detection - Edge Detection Performance - Corner Detection - Fourier Transform - Convolution and Filtering - Image Enhancement - Restoration - Histogram Processing.	[6]
Unit III-Feature Extraction Edges - Canny - LOG, Line Detectors (Hough Transform), Corners - Harris and Hessian A fine, Orientation Histogram - SIFT, HOG, SURF, Scale - Space Analysis - Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT. Case study: Human Iris location - Generalized Hough Transform (GHT) - Spatial Matched Filtering - GHT for ellipse detection - GHT for feature collation	[6]




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Unit IV-Image Segmentation Region Growing - Edge Based approaches to segmentation - Graph-Cut - Mean Shift - MRFs, Texture Segmentation - Object detection - 3D object recognition - 3D reconstruction - Introduction to Motion - Parametric motion – Spline-based motion.	[6]
Unit V-Pattern Analysis Clustering: Clustering: K-Means - K-Medoids - Mixture of Gaussians - Classification: Discriminant Function, Supervised - Unsupervised - Semi supervised; Classifiers: Bayes – KNN - ANN models; Dimensionality Reduction: PCA – LDA – ICA - Non-parametric methods.	[6]
Unit VI- Morphological Image Processing Preliminaries, Erosion and Dilation, opening and closing, Hit-or-miss transform, and some basic morphological algorithms. Feature Extraction: Background, Boundary preprocessing (Boundary following & Chain codes only). Image pattern Classification: Background, Patterns, and classes, Pattern classification by prototype matching (Minimum distance classifier only).	[6]
Text Books: 1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011. 2. 2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003	
Reference Books: - 1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004 2. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990. 3. D. L. Baggio et al., "Mastering OpenCV with Practical Computer Vision Projects", Packt Publishing, 2012.	



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Elective-III

23AD3604C	PEC	Distributed System	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Database Management Systems, Computer Networks, and Security

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

CO1	Summarize the theoretical aspects of distributed database systems
CO2	Construct queries using SQL in database creation and interaction
CO3	Construct algorithms for Transaction and Deadlock management
CO4	Experiment with Distributed and Parallel Database
CO5	Analyze Distributed Object Database Management Systems and Object-Oriented Data Model
CO6	Elaborate current Trends in distributed databases

Course Contents:

<p>Unit I: Introduction Distributed Data Processing, Distributed Database Systems, Promises of DDBSs, Problem areas. Distributed DBMS Architecture: Architectural Models for Distributed DBMS, DDMBS Architecture, Distributed Database Design: Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.</p>	[6]
<p>Unit II: Query processing and decomposition Query processing and decomposition: Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data. Distributed query Optimization: Query optimization, centralized query optimization, distributed query optimization algorithms</p>	[6]
<p>Unit III: Transaction Management Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.</p>	[6]
<p>Unit IV: Distributed DBMS Reliability Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning.</p>	[6]




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Parallel Database Systems: Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.	
Unit V: Distributed object Database Management Systems Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing. Object Oriented Data Model: Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS	[6]
Unit VI: Current Trends in Distributed Database Data Delivery Alternatives Data Warehousing World Wide Web Push-based Technologies Mobile Databases. Real Application Clusters(RAC) Cloud based databases	[6]
Text Book:- 1. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001. 2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.	
Reference Book:- 1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: "Database Systems: The Complete Book", Second Edition, Pearson International Edition	




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23AD3605	PCC	Machine Learning Laboratory	0-0-2	1 Credits
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Teaching Scheme	Evaluation Scheme
Practical: 2hr/week	CA I: 15 Marks CA II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Python Programming, Data Science

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

CO1	Make use of supervised learning algorithms to build Machine Learning Models.
CO2	Build Machine Learning Model using clustering technique.
CO3	Design a recommendation system by extracting and analyzing item features.
CO4	Design and implement a simple neural network using backpropagation for classification tasks.

List of Experiments:

1.	Develop Machine Learning model using Linear Regression.
2.	Develop Machine Learning model using Decision Tree.
3.	Develop Machine Learning model using K-Nearest Neighbor.
4.	Build Machine Learning classifier using Logistic Regression.
5.	Develop Machine Learning model using Support Vector Machine.
6.	Construct a Machine Learning Model using the Naïve Bayes Algorithm.
7.	Use K-Means Algorithm for performing clustering task.
8.	Develop a Recommendation system.
9.	Develop a Machine Learning model using Ensemble Learning.
10.	Build a simple neural network using backpropagation.



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23AD3606	PCC	Web Technology Laboratory	0-0-2	1 Credits
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Teaching Scheme	Evaluation Scheme
Practical: 2hr/week	CA I: 15 Marks CA II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Database Management Systems, Computer Networks, and Security

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

CO1	Implement and analyze behavior of web pages using HTML and CSS
CO2	Apply the client-side technologies for web development
CO3	Analyze the concepts of Servlet and JSP
CO4	Analyze the Web services and frameworks
CO4	Apply the server-side technologies for web development
CO5	Create the effective web applications for business functionalities using latest web development platforms.

List of Experiments:

1	Create a simple web page using HTML that includes: Headings, Paragraphs, Line breaks, Colors (background, text), Fonts, Links, Images and Tables.
2	Create a simple form with input fields, radio buttons, and a submit button.
3	Add CSS to style a button and apply hover effects.
4	Create a simple web page layout using Bootstrap.
5	Design and implement a simple calculator using JavaScript for operations like addition, multiplication, subtraction, division, square of a number, etc.
6	Write a simple servlet that prints "Hello World" when accessed through a browser.
7	Write a program that uses DOM (Document Object Model) to parse an XML document and extract data.
8	Create a simple JSP page that displays a message.
9	Write a simple PHP program to demonstrate variables, data types, and basic arithmetic operations.
10	Write a program of conditional statements using Ruby.




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23AD3607	PCC	Advanced Data Visualization	0-0-4	2 Credits
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Teaching Scheme	Evaluation Scheme
Practical: 2hr/week	CA I: 15 Marks CA II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites:

Course Outcomes:

CO1	Understand Power BI fundamentals and data visualization concepts.
CO2	Apply ETL techniques in Power BI for data transformation.
CO3	Apply data modeling techniques and basic DAX expressions in Power BI.
CO4	Design and develop interactive data visualizations in Power BI.
CO5	Apply dashboard design and storytelling techniques in Power BI.
CO6	Apply Power BI Service features for report publishing and collaboration.

List of Experiment:

1	Introduction to Power BI Interface and Data Loading
2	Importing and Transforming Data using Power Query Editor
3	Creating Basic Visualizations: Bar, Column, and Pie Charts
4	Designing Interactive Dashboards using Slicers and Filters
5	Working with Time Series Data: Line and Area Charts
6	Visualizing Geographical Data using Map Visuals
7	Creating Hierarchies and Implementing Drill-Down Features
8	Using DAX to Create Calculated Columns and Measures
9	Building KPIs and Summary Cards for Business Insights
10	Publishing and Sharing Reports on Power BI Service




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23AD3608	PROJ	Capstone Project Phase I	0-0-4	2 Credits
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Teaching Scheme	Evaluation Scheme
Practical: 4hr/week	CA I: 25 Marks CA II: 25 Marks End Semester Exam: 50 Marks

Pre-Requisites: All courses

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

CO1	State the exact title of the project and problem definition.
CO2	Explain the motivation, objectives and scope of the project.
CO3	Review the literature related to the selected topic of the project.
CO4	Design the mechanism, components of the system and prepare detailed drawings.
CO5	Evaluate the cost considering different materials/manufacturing processes.

Course Contents:

The students in a group of not more than FOUR will work under the guidance of the faculty member on the project work undertaken by them. The completion of work, the submission of the report and assessment should be done at the end of VII Sem.

The project work should consist of any of the following or appropriate combination:

1. A comprehensive and up-to-date survey of literature related to study of a phenomenon or product.
2. Design of any equipment and / or its fabrication and testing.
3. Critical Analysis of any design or process for optimizing the same.
4. Experimental verification of principles used in applications related to various specializations related to Mechanical Engineering.
5. Software development for particular applications.
6. A combination of the above.

It is expected that the students should complete at least 50% of the total project work in VI Semester. The objective is to prepare the students to examine any design or process or phenomenon from all angles, to encourage the process of independent thinking and working and to expose them to industry. The students may preferably select the project works from their opted elective subjects. The students should submit the report in a prescribed format, before the end of VII semester. The report shall be comprehensive and presented typed on A4 size sheets and bound. Number of copies to be submitted is number of students plus two. The assessment would be carried out by the panel of examiners for both, term work and oral examinations.



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Multidisciplinary Minor

23ADMDA4	MDM	Data Science for Business	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Database Management Systems, Computer Networks and Security

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

CO1	Understand Fundamental Concepts of Data Science
CO2	Apply Data Science in Business Decision-Making
CO3	Summarize Business Data Collection, Storage, and Preprocessing
CO4	Evaluating Business Analytics & Descriptive Analytics
CO5	Outline Prescriptive Analytics & Optimization Techniques.
CO6	Demonstrate Ethical, Privacy, and Responsible AI Considerations

Course Contents:

<p>UNIT I: Introduction to Data Science Definition of Data Science- Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Overfitting. Basics of R: Introduction, R Environment Setup, Programming with R, Basic Data Types.</p>	[6]
<p>Unit II: Introduction to Data Science for Business 1 Fundamentals of Data Science & Business Intelligence 2 Role of AI & ML in Business Decision-Making 3 Data-Driven vs. Rule-Based Decision-Making 4 Case Studies: How Businesses Leverage AI & Data Science 5 Key Challenges in Business Data Science Implementation 6 Industry Applications: Finance, Retail, Healthcare & Marketing</p>	[6]
<p>Unit III: Business Data Collection, Storage & Preprocessing 1 Business Data Sources (CRM, ERP, Web, IoT, social media, etc.) 2 Data Warehousing & Data Lake Concepts 3 Data Cleaning: Handling Missing, Duplicate & Noisy Data 4 Feature Engineering: Creating Business-Relevant Features 5 Structured vs. Unstructured Data Handling (SQL vs. NoSQL) 6 Cloud-Based Data Storage & Management (AWS, Google Cloud, Azure)</p>	[6]



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Unit IV: Business Analytics & Descriptive Analytics 1 Key Performance Indicators (KPIs) & Business Metrics 2 Customer Behavior Analytics & Market Basket Analysis 3 Financial Data Analysis & Forecasting for Business Decision-Making 4 Dashboards & Reports for Business Intelligence 5 Customer Lifetime Value (CLV) & Retention Analysis 6 Sentiment Analysis for Brand Reputation & Customer Insights	[6]
Unit V: Prescriptive Analytics & Optimization for Business 1 Prescriptive Analytics: From Insights to Business Actions 2 Decision Trees & Random Forests for Business Strategies 3 Optimization Techniques for Business Resource Allocation 4 AI-driven Pricing Strategies & Dynamic Pricing Models	[6]
Unit VI: Ethics, Privacy, and Responsible AI in Business Data Science 1 Ethical Considerations in Business AI & Data Science 2 Data Privacy Laws: GDPR, CCPA & Business Compliance 3 Bias & Fairness in AI Decision-Making for Business 4 AI Explainability & Interpretability for Business Models 5 Cyber security Challenges in Business AI Systems 6 Ethical AI Governance & Risk Management	[6]
Text Books: - 1. "Data Science for Business" – Foster Provost & Tom Fawcett 2. "Business Analytics: Data Analysis & Decision Making" – S. Christian Albright, Wayne L. Winston 3. "Artificial Intelligence in Business: Creating Value with Machine Learning" – Ajay Agrawal, Joshua Gans, Avi Goldfarb	
Reference Books: - 1. "Data Science for Marketing Analytics" – Mirza Rahim Baig, Gururajan Govindan 2. "Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst" – Dean Abbott	



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Multidisciplinary Minor

23ADMDB4	MDM	Medical Image Processing	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Database Management Systems, Computer Networks and Security

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

CO1	Recall basic medical imaging modalities and data formats
CO2	Explain image enhancement and filtering methods used in medical imaging
CO3	Understand different segmentation approaches in medical images
CO4	Describe feature representation and basic classification concepts in medical image analysis
CO5	Understand the role of AI and ML in medical diagnosis
CO6	Interpret basic case studies and current trends in medical image processing

Course Contents:

Unit I: Introduction to Medical Imaging History and applications of medical image processing, Types of imaging modalities (X-ray, CT, MRI, PET, Ultrasound), Basics of image acquisition and DICOM format, Image resolution, intensity, contrast, Challenges in handling medical images	[6]
Unit II: Image Preprocessing & Enhancement Types of noise in medical images, Noise reduction: Mean, Median, Gaussian filtering, Contrast enhancement: Histogram equalization, CLAHE, Geometric corrections and resizing.	[6]
Unit III: Image Segmentation Role of segmentation in diagnosis, Threshold-based segmentation, Region-based and edge-based segmentation, Introduction to watershed algorithm	[6]
Unit IV: Feature Representation & Classification Importance of features in classification, Basic shape, intensity, and texture features, Introduction to ML-based classification (overview only), Concepts of training/testing and accuracy.	[6]
Unit V: AI in Medical Imaging Role of AI in diagnosis (overview), Applications in cancer, pneumonia, brain imaging, Common tools and frameworks (basic idea), Ethics, privacy, and data bias in healthcare AI	[6]



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Unit VI: Case Studies and Research Trends Examples from open-source datasets: NIH Chest X-ray, BraTS, Use of tools: 3D Slicer, ITK-SNAP (demo-level knowledge), Overview of recent papers in AI for imaging, Federated learning and current research highlights.	[6]
Text Books: <ol style="list-style-type: none">1. Isaac N. Bankman, Handbook of Medical Image Processing and Analysis, Academic Press, 2nd Edition, 2008.2. Rafael C. Gonzalez and Richard E. Woods, <i>Digital Image Processing</i>, Pearson Education, 4th Edition, 2018.3. S. Jayaraman, S. Esakkirajan, T. Veerakumar, <i>Digital Image Processing</i>, Tata McGraw Hill, 1st Edition, 2009.	
Reference Books: <ol style="list-style-type: none">1. Deepak L. V., Suresh Chandra Satapathy, <i>Medical Image Processing and Machine Learning</i>, Springer, 2021.2. M. Sonka, V. Hlavac, R. Boyle, <i>Image Processing, Analysis, and Machine Vision</i>, Cengage Learning, 4th Edition, 2014.3. K. Doi, <i>Computer-Aided Diagnosis in Medical Imaging: Historical Review, Current Status and Future Potential</i>, Computerized Medical Imaging and Graphics, Elsevier.4. Recent IEEE, Elsevier, Springer conference/journal articles related to AI in Medical Imaging.	




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Multidisciplinary Minor

23ADMDC4	MDM	Engineering Econometrics	3-0-0	3 Credits
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Teaching Scheme	Evaluation Scheme
Lecture:3hrs/week	CA 1: 10 Marks CA 2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Database Management Systems, Computer Networks, and Security

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

CO1	Build adequate competency in the frontier areas of economic theory and methods.
CO2	Apply basic econometric estimation techniques such as Ordinary Least Squares to estimate bivariate and multivariate regression models.
CO3	Examine about the statistical significance of individual explanatory variable and also over all model.
CO4	Estimation of panel data models, generalized method of moments, discrete response models, censored regression models and estimation of average treatment effects.

Course Contents:

Unit I: Nature of Econometrics and Economic Data Definition of Econometrics – Steps in Empirical Economic Analysis - Econometric Model –The Role of Measurement in Economics – The Structure of Economic Data: Cross-Sectional data, Time Series data, Pooled Cross-Section data, Panel Data.	[6]
Unit II: Simple Regression Model Two Variable Linear Regression Model: Assumptions, Estimation of Parameters, Tests of Significance and Properties of Estimators – Functional forms of Regression models – Loglinear models, Semi-log models and Reciprocal models – Choice of Functional Form.	[6]
Unit III: The General Linear Model Review of Assumptions, Estimation and Properties of Estimators: Un-biasness, BLUEs and Tests of significance of estimates – Analysis of Variance - Dummy variables - Nature of Dummy variables – Use of Dummy Variables – Errors in Variables and its consequences.	[6]
Unit IV: Auto-regressive and Distributed Lag Models Introduction – Types of Lag schemes - Koyck's lag model, Almon's Lag scheme, Partial. Adjustment and Expectations models - Causality in Economics – The Granger Causality Test.	[6]



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Unit V: Simultaneous Equation Models Specification – Simultaneous Bias – Inconsistency of OLS Estimators - The concept of Identification, Rank and Order conditions for Identification – Indirect Least Squares - Two-stage Least Squares (without proof), Problems.	[6]
Unit VI: Time series econometrics Stochastic processes, spurious regression, test of stationarity, unit root test, transforming non stationary time series, economic forecasting; AR, MR and ARIMA modeling of time series data, Box- Jenkins methodology, vector auto regression (VAR), testing causality using VAR: the Granger causality test, impulse response function, measuring volatility in financial time series; the ARCH and GARCH models.	[6]
Text Books: - 1. Jeffrey M. Wooldridge (2012), Introductory Econometrics: A Modern Approach, 4/e (Paperback), Cengage Learning India. 2. William H. Greene (2003), Econometric Analysis 5/e (Paperback), Pearson Education.	
Reference Books: - 1. Jeffrey M. Wooldridge (2010), Econometric Analysis of Cross Section and Panel Data, 2/e, Cambridge, MA: MIT Press. 2. Dougherty, Christopher (2011), Introduction to Econometrics. Fourth Edition. 3. James D. Hamilton (1994), Time Series Analysis, Princeton University Press. 4. Maddala, G. S. (1997), Econometrics, McGraw-Hill, New York.	




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23HSSM07	VEC	Aptitude Skills-IV	1-0-0	Audits
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Teaching Scheme	Evaluation Scheme
Lecture: 1 hrs/week	CA I: 25marks CAII: 25mark

Pre-Requisites: Aptitude Skills I, II, and III

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

CO1	Solve the questions on ordering of words & Parts of Speech
CO2	Organize contents of Business Communications such as CV, emails, and letters.
CO3	Solve the questions based on jumbled paragraphs and reading comprehension.
CO4	Solve the questions on spotting errors and sentence correction.
CO5	Summarize proceedings of any event or conference.
CO6	Discuss about current and critical issues during group discussion.

Course Contents:

Unit I: Parts of Speech, Punctuation Word Family (Using the same word as different Parts of Speech)	[4]
Unit II: Analogy, Letter Writing (Formal), E-Mail Writing, CV Writing	[2]
Unit III: Reading Comprehension, Paragraph Jumbles	[2]
Unit IV: Spotting Errors (in different parts of sentence), Subject-Verb Agreement Sentence Correction, Sentence Completion	[4]
Unit V: One Word Substitution, Narrating Events/Reports, Summary/Precis Writing	[2]
Unit VI: Dialogue writing, Group Discussion, Interview Skills (Using formal notations & gestures, etc.)	[2]
Text Books: 1. Raymond Murphy, Essential English Grammar with Answers, Murphy 2. Objective General English by R.S.Aggarwal, S Chand Publishing; Revised edition(15March2017)	




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Reference Books:

1. Raoand, D. V, Prasada, Wren& Composition Book, S Chand Publishing, 2017
2. Murphy. Intermediate English Grammar with Answers, Cambridge University Press; Second edition




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23HSSM08	VEC	Language Skills-IV	0-0-2	Audit
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Teaching Scheme	Evaluation Scheme
Practical: 2 hrs/week	CA I:25marks CAII:25mark

Pre-Requisites: Language Skills I, II, and III

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

CO1	Make use of Function in Python Programming.
CO2	Make use of Python collections.
CO3	Make use of classes and their objects in Python.
CO4	Make use of file and its handling functions.

Course Contents:

1. Write a Python program to define a user-defined function that takes a number as input and returns whether it is even or odd. Call the function and display the result. <i>o Concepts: Function definition, arguments, return value.</i>	[2]
2. Create a Python program to define and call a function with default arguments and keyword arguments. <i>o Concepts: Function calling, argument types.</i>	[2]
3. Write a Python program using a lambda function to compute the square, cube, and factorial of a given number. <i>o Concepts: Lambda function basics</i>	[2]
4. Write a Python program to demonstrate list operations such as creation, adding items, removing an item, slicing, and sorting. <i>o Concepts: List constructor, change, remove, sort, list comprehension</i>	[2]
5. Write a Python program to demonstrate the use of tuples and sets. Perform operations such as checking membership, adding/removing elements (set), and iterating. <i>o Concepts: Tuple immutability, set operations.</i>	[2]
6. Write a Python program to create a dictionary of employees with their ID as key and name as value. Perform operations like adding a new entry, updating existing, and deleting one. <i>o Concepts: Dictionary operations, loop through dictionary.</i>	[2]



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