The Kelkar Education Trust's

V G Vaze College of Arts, Science and Commerce

(Autonomous)

# Syllabus for M.Sc.-I.T.

CHOICE BASED (REVISED)

(June 2024 Onwards)

Programme: M.Sc.

Semester III & IV

# Subject :Information Technology

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# V G Vaze College of Arts, Science and Commerce (Autonomous)

| Semester III | | | |
|---|---|---|---|
| **Course Code** | **Course Type** | **Course Title** | **Credits** |
| VGVPSTMAI301 | **Major** | Advanced AI | 4 |
| VGVPSTMAIP301 | Major | Advanced AI Practical | 2 |
| VGVPSTMML301 | Major | Machine Learning | 4 |
| VGVPSTMMLP301 | Major | Machine Learning Practical | 2 |
| VGVPSTMSS301 | Major | Storage as a Service | 2 |
| VGVPSTEL301 | Elective 1 (Any One) | Natural Language Processing | 4 |
| VGVPSTELP301 | | Security Operations Center (PR) | 4 |
| VGVPSTELP302 | | Server Virtualization on VMWare Platform (PR) | 4 |
| VGVPSTOJT301 | **OJT/FP** | **OJT/FP** | 4 |
| | | **Total Credits** | **22** |

| Semester IV | | | |
|---|---|---|---|
| **Course Code** | **Course Type** | **Course Title** | **Credits** |
| VGVPSTMBC401 | **Major** | Blockchain | 4 |
| VGVPSTMBCP401 | Major | Blockchain Practical | 2 |
| VGVPSTMDL401 | Major | Deep Learning | 4 |
| VGVPSTMDLP401 | Major | Deep Learning Practical | 2 |
| VGVPSTELP401 | Elective 1 (Any One) | Robotic Process Automation (PR) | 4 |
| VGVPSTELP402 | | Cyber Forensics(PR) | 4 |
| VGVPSTELP403 | | Advanced IoT (PR) | 4 |
| VGVPSTRPP401 | RP | Research Project | 6 |
| | | **Total Credits** | **22** |

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# V G Vaze College of Arts, Science and Commerce (Autonomous)

| M. Sc (Information Technology) | | Semester – III | |
|---|---|---|---|
| **Course Name: Advanced Artificial Intelligence** | | Course Code: VGVPSTMAI301 | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 2½ | 60 |
| | **Internal** | -- | 40 |

| **Course Objective** |
|---|
| 1. To explore the applied branches of artificial intelligence. |
| 2. To enable the learner to understand applications of artificial intelligence. |
| 3. To enable the learner to solve the problem aligned with derived branches of artificial intelligence. |
| 4. To enable the learner understand the basics of Intelligent Agent. |
| 5. To enable the learner understand the concept of NLP. |

| Unit | Details | Lectures |
|---|---|---|
| I | **Review of AI:** History, foundation and Applications **Expert System and Applications:** Phases in Building Expert System, Expert System Architecture, Expert System versus Traditional Systems, Rule based Expert Systems, Blackboard Systems, Truth Maintenance System, Application of Expert Systems, Shells and Tools.<br>**Probability Theory:** joint probability, conditional probability, Bayes's theorem, probabilities in rules and facts of rule based system, cumulative probabilities, rule based system and Bayesian method | **15** |
| II | **Fuzzy Sets and Fuzzy Logic:** Fuzzy Sets, Fuzzy set operations, Types of Member ship Functions, Multivalued Logic, Fuzzy Logic, Linguistic variables and Hedges, Fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems, possibility theory and other enhancement to Logic.<br>**Machine Learning Paradigms:** Machine Learning systems, supervised and un-supervised learning, inductive learning, deductive learning, clustering, support vector machines, cased based reasoning andlearning. | **15** |
| III | **Artificial Neural Networks:** Artificial Neural Networks, Single-Layer feed forward networks, multi-layer feed- forward networks, radial basis function networks, design issues of artificial neural networks and recurrent networks.<br>**Evolutionary Computation:** Soft computing, genetic algorithms, genetic programming concepts, evolutionary programming, swarm intelligence, ant colony paradigm, particle swarm optimization and applications of evolutionary algorithms. | **15** |

| | | |
|---|---|---|
| **IV** | **Intelligent Agents:** Agents vs software programs, classification of agents, working of an agent, single agent and multiagent systems, performance evaluation, architecture, agent communication language, applications.<br>**Advanced Knowledge Representation Techniques:** Conceptual dependency theory, script structures, CYC theory, script structure, CYC theory, case grammars, semantic web. | **15** |

**Books and References:**

| Sr. No. | Title | Author/s | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1. | Artificial Intelligence | Saroj Kaushik | Cengage | 1st | 2019 |
| 2. | Artificial Intelligence: A Modern Approach | A. Russel, Peter Norvig | | 1st | |
| 3. | Artificial Intelligence | Elaine Rich,Kevin Knight,Shivashankar B. Nair | Tata Mc-Grawhill | 3rd | |

**Course Outcomes**

After completion of course the learner will:

1. be able to understand the fundamentals concepts of expert system and its applications.
2. be able to use probability and concept of fuzzy sets for solving AI based problems.
3. be able to understand the applications of Machine Learning. The learner can also apply fuzzy system for solving problems.
4. be able to apply to understand the applications of genetic algorithms in different problems related to artificial intelligence.
5. A learner can use knowledge representation techniques in natural language processing.

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## (Autonomous)

| **M. Sc (Information Technology)** | | **Semester – III** | |
|---|---|---|---|
| **Course Name: Advanced Artificial Intelligence Practical** | | **Course Code:** VGVPSTMAIP301 | |
| **Periods per week (1 Period is 120 minutes)** | | 2 | |
| **Credits** | | 2 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 3 | 100 |

| | |
|---|---|
| 1. | Design an Expert system using AIML<br>E.g: An expert system for responding the patient query for identifying the flu. |
| 2. | Design a bot using AIML. |
| 3. | Implement Bayes Theorem using Python. |
| 4. | Implement Conditional Probability and joint probability using Python. |
| 5. | Write a program for to implement Rule based system. |
| 6. | Design a Fuzzy based application using Python / R. |
| 7. | Write an application to simulate supervised and un-supervised learning model. |
| 8. | Write an application to implement clustering algorithm. |
| 9. | Write an application to implement support vector machine algorithm. |
| 10. | Simulate artificial neural network model with both feedforward and backpropagation approach. [You can add some functionalities to enhance the model]. |
| 11. | Simulate genetic algorithm with suitable example using Python / R or any other platform. |
| 12. | Design an Artificial Intelligence application to implement intelligent agents. |
| 13. | Design an application to simulate language parser. |
| 14. | Design an application to simulate semantic web. |

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# V G Vaze College of Arts, Science and Commerce (Autonomous)

| M. Sc (Information Technology) | | Semester – III | |
|---|---|---|---|
| **Course Name: Machine Learning** | | **Course Code:** VGVPSTMML301 | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 2½ | 60 |
| | **Internal** | -- | 40 |

| **Course Objective** |
|---|
| 1. Understanding Human learning aspects. |
| 2. Understanding primitives in learning process by computer. |
| 3. Understanding nature of problems solved with Machine Learning |
| 4. Understand the working of various models. |
| 5. Understand trends in Machine Learning. |

| Unit | Details | Lectures |
|---|---|---|
| I | **Introduction:** Machine learning, Examples of Machine Learning Problems, Structure of Learning, learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, Machine learning Models: Geometric Models, Logical Models, Probabilistic Models. Features: Feature types, Feature Construction and Transformation, Feature Selection. **Classification:** Binary Classification- Assessing Classification performance, Class probability Estimation Assessing class probability Estimates, Multiclass Classification. | **15** |
| II | **Regression**: Assessing performance of Regression- Error measures, Overfitting- Catalysts for Overfitting, Case study of Polynomial Regression. **Theory of Generalization:** Effective number of hypothesis, Bounding the Growthfunction, VC Dimensions, Regularization theory. **Linear Models:** Least Squares method, Multivariate LinearRegression, Regularized Regression, Using Least Square regression for Classification. Perceptron, Support Vector Machines, Soft Margin SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non-Linearity. | **15** |
| III | **Logic Based and Algebraic Model: Distance Based Models:** Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm, Hierarchical clustering. **Rule Based Models:** Rule learning for subgroup discovery, Association rule mining. **Tree Based Models:** Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees. | **15** |

| | | |
|---|---|---|
| **IV** | **Probabilistic Model:**<br>Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier, Discriminative learning with Maximum likelihood, Probabilistic Models with Hidden variables: Estimation-Maximization Methods, Gaussian Mixtures, and Compression based Models.<br>**Trends In Machine Learning :** Model and Symbols- Bagging and Boosting, Multitask learning, Online learning and Sequence Prediction, Data Streams and Active Learning, Deep Learning, Reinforcement Learning. | **15** |

**Books and References:**

| Sr. No. | Title | Author/s | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1. | Machine Learning: The Art and Science of Algorithms that Make Sense of Data | Peter Flach | Cambridge University Press | | 2012 |
| 2. | Introduction to Statistical Machine Learning with Applications in R | Hastie, Tibshirani, Friedman | Springer | 2nd | 2012 |
| 3. | Introduction to Machine Learning | Ethem Alpaydin | PHI | 2nd | 2013 |

**Course Outcomes**

After completion of the course, a learner should be able to:

1. Understand the key issues in Machine Learning and its associated applications in intelligent business and scientific computing.
2. Acquire the knowledge about classification and regression techniques where a learner will be able to explore his skill to generate data base knowledge using the prescribed techniques.
3. Understand and implement the techniques for extracting the knowledge using machine learning methods.
4. Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.
5. Understand the statistical approach related to machine learning. He will also Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

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## (Autonomous)

| **M. Sc (Information Technology)** | | **Semester – III** | |
|---|---|---|---|
| **Course Name: Machine Learning Practical** | | **Course Code:** VGVPSTMMLP301 | |
| **Periods per week (1 Period is 120 minutes)** | | 2 | |
| **Credits** | | 2 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 3 | 100 |

| **List of Practicals** | |
|---|---|
| 1. | a. Design a simple machine learning model to train the training instances and test the same.<br>b. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file |
| 2. | a. Perform Data Loading, Feature selection (Principal Component analysis) and Feature Scoring and Ranking.<br>b. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples. |
| 3. | a. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.<br>b. Write a program to implement Decision Tree and Random forest with Prediction, Test Score and Confusion Matrix. |
| 4. | a. For a given set of training data examples stored in a .CSV file implement Least Square Regression algorithm.<br>b. For a given set of training data examples stored in a .CSV file implement Logistic Regression algorithm. |
| 5. | a. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.<br>b. Write a program to implement k-Nearest Neighbour algorithm to classify the iris dataset. |
| 6. | a. Implement the different Distance methods (Euclidean) with Prediction, Test Score and Confusion Matrix.<br>b. Implement the classification model using clustering for the following techniques with K means clustering with Prediction, Test Score and Confusion Matrix. |
| 7. | a. Implement the classification model using clustering for the following techniques with hierarchical clustering with Prediction, Test Score and Confusion Matrix |

| | |
|---|---|
| | b. Implement the Rule based method and test the same. |
| 8. | a. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.<br>b. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs. |
| 9. | a. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.<br>b. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. |
| 10. | a. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.<br>b. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets. |
| 11. | Perform Text pre-processing, Text clustering, classification with Prediction, Test Score and Confusion Matrix |

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# V G Vaze College of Arts, Science and Commerce (Autonomous)

| M. Sc (Information Technology) | | Semester – III | |
|---|---|---|---|
| **Course Name: Storage as a Service** | | **Course Code:** VGVPSTMSS301 | |
| **Periods per week (1 Period is 60 minutes)** | | 2 | |
| **Credits** | | 2 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 2½ | 60 |
| | **Internal** | -- | 40 |

| **Course Objective** |
|---|
| 1. Understand the need for Storage Area Network and Data protection to satisfy the information explosion requirements. |
| 2. Study storage technologies: SAN, NAS, IP storage etc., which will bridge the gap between the emerging trends in industry and academics. |
| 3. To get an insight of Storage area network architecture, protocols and its infrastructure. |
| 4. To study and discuss the applications of SAN to fulfill the needs of the storage management in the heterogeneous environment. |
| 5. Study and understand the management of Storage Networks |

| Unit | Details | Lectures |
|---|---|---|
| I | **Introduction to Information Storage** Information Storage Data Types of Data Big Data Information Storage Evolution of Storage Architecture Data Center Infrastructure Core Elements of a Data Center Key Characteristics of a Data Center Managing a Data Center Virtualization and Cloud Computing Data Center Environment Application Database Management System (DBMS) Host (Compute) Operating System Memory Virtualization Device Driver 20 Volume Manager File System Compute Virtualization Connectivity Physical Components of Connectivity Interface Protocols IDE/ATA and Serial ATA 28 SCSI and Serial SCSI Fiber Channel Internet Protocol (IP) Storage Disk Drive Components Platter Spindle Read/Write Head Actuator Arm Assembly Drive Controller Board Physical Disk Structure Zoned Bit Recording Logical Block Addressing Disk Drive Performance Disk Service Time Seek Time Rotational Latency Data Transfer Rate Disk I/O Controller Utilization Host Access to Data Direct-Attached Storage DAS Benefit and Limitations Storage Design Based on Application Requirements and Disk Performance Disk Native Command Queuing Introduction to Flash Drives Components and Architecture of Flash Drives Features of Enterprise Flash Drives Concept in Practice: VMware ESXi Data Protection: RAID RAID Implementation Methods Software RAID Hardware RAID Array Components RAID Techniques Striping Mirroring Parity RAID Levels RAID 0 RAID 1 Nested RAID RAID 3 RAID 4 RAID 5 | **15** |

| | | |
|---|---|---|
| | RAID 6 RAID Impact on Disk Performance Application IOPS and RAID Configurations RAID Comparison Hot Spares<br>**Intelligent Storage Systems** Components of an Intelligent Storage System Front End Cache Structure of Cache Read Operation with Cache Write Operation with Cache Implementation Cache Management Cache Data Protection Back End Physical Disk Storage Provisioning Traditional Storage Provisioning LUN Expansion: MetaLUN Virtual Storage Provisioning 82 Comparison between Virtual andTraditional Storage Provisioning Use Cases for Thin and Traditional LUNs LUNMasking Types of Intelligent Storage Systems High-End StorageSystems Midrange Storage Systems | |
| **II** | **Fiber Channel Storage Area Networks** Fiber Channel: Overview The SAN and Its Evolution Components of FC SAN Node Ports Cables and Connectors Contents Interconnect Devices SAN Management Software FC Connectivity Point-to-Point<br>Fiber Channel Arbitrated Loop Fiber Channel Switched Fabric FC-SW Transmission Switched Fabric Ports Fiber Channel Architecture Fiber Channel Protocol Stack FC-4 Layer FC-2 Layer FC-1 Layer FC-0 Layer Fiber Channel Addressing World Wide Names FC Frame 110. Structure and Organization of FC Data Flow Control BB_Credit EE_Credit Classes of Service Fabric Services Switched Fabric Login Types Zoning Types of Zoning FC SAN Topologies Mesh Topology Core-Edge Fabric Benefits and Limitations of Core- Edge Fabric Virtualization in SAN Block-level Storage Virtualization Virtual SAN (VSAN)<br>**IP SAN and FCoE** iSCSI Components of iSCSI iSCSI Host Connectivity iSCSI Topologies Native iSCSI Connectivity<br>Bridged iSCSI Connectivity Combining FC and Native iSCSI Connectivity iSCSI Protocol Stack iSCSI PDU 6 iSCSI Discovery iSCSI Names iSCSI Session iSCSI Command Sequencing FCIP FCIP Protocol Stack FCIP Topology FCIP Performance and Security FCoE I/O Consolidation Using FCoE Components of an FCoE Network Converged Network Adapter Cables FCoE Switches FCoE Frame Structure FCoE Frame Mapping FCoE Enabling Technologies Priority-Based Flow Control (PFC) EnhancedTransmission Selection (ETS) Congestion Notification (CN) Data Center Bridging Exchange Protocol (DCBX)<br>**Network-Attached Storage** General-Purpose Servers versus NAS Devices Benefits of NAS File Systems and Network File Sharing Accessing a File System Network File Sharing Components of NAS NAS I/O Operation NAS Implementations Unifi ed NAS Unifi ed NAS Connectivity 164 Gateway NAS Gateway NAS Connectivity Scale-Out NAS Scale-Out NAS Connectivity NAS File-Sharing | **15** |

| | | |
|---|---|---|
| | Protocols NFS CIFS Factors Affecting NAS Performance File-Level Virtualization Object-Based and Unified Storage Object-Based Storage Devices Object-Based Storage Architecture Components of OSD Object Storage and Retrieval in OSD Benefits of Object-Based Storage Common Use Cases for Object-Based Storage Content-Addressed Storage CAS | |

**Books and References:**

| Sr. No. | Title | Author/s | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1. | Information Storage and Management: Storing, Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments | EMC | John Wiley & Sons | 2nd | 2012 |

**Course Outcomes**

After completion of the course, a learner should be able to:

1. Understand different techniques of storage and RAID Technologies
2. Understand different intelligent storage technologies. Also, understand the benefits of Fibre Channel Storage Networks along with iSCSI.
3. Understand the architecture of NAS and deployment along with Object based and unified storage technologies. Also, the learner will be able to configure the storage devices tomaintain highest level of availability
4. Understand Replication and Migration techniques and implement them.
5. Understand Different techniques for managing and securing storage infrastructure.

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# V G Vaze College of Arts, Science and Commerce (Autonomous)

| M. Sc (Information Technology) | | Semester – III | |
|---|---|---|---|
| **Course Name: Natural Language Processing** | | **Course Code:** VGVPSTEL301 | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 2½ | 60 |
| | **Internal** | -- | 40 |

| **Course Objective** |
|---|
| 1. The prime objective of this course is to introduce the learners to the field of Language Computing and its applications ranging from classical era to modern context. |
| 2. To provide understanding of various NLP tasks and NLP abstractions such as Morphological analysis, POS tagging, concept of syntactic parsing, semantic analysis etc. |
| 3. To provide knowledge of different approaches/algorithms for carrying out NLP tasks. |
| 4. To highlight the concepts of Language grammar and grammar representation in Computational Linguistics. |
| 5. To understand various parsing approaches. |

| Unit | Details | Lectures |
|---|---|---|
| I | **Packets of thought**<br>Natural language vs. programming language, The magic,Practical applications,Language through a computer's "eyes", word order and grammar, A chatbot natural language pipeline<br>**Language Processing and Python:** Computing with Language, Closer Look at Python: Texts as Lists of Words,<br>**Computing with Language:** Simple Statistics, Automatic Natural Language Understanding<br>**Accessing Text Corpora and Lexical Resources :** Accessing Text Corpora, Conditional Frequency Distributions, More Python: Reusing Code, Lexical Resources,<br>WordNet<br>**Processing Raw Text:** Accessing Text from the Web and from Disk, Strings: Text Processing at the Lowest Level, Text Processing with Unicode, Regular Expressions for Detecting Word Patterns, Useful Applications of Regular Expressions, Normalizing Text, Regular Expressions for Tokenizing Text, Segmentation Formatting: From Lists to Strings | **15** |

| | | |
|---|---|---|
| **II** | **Categorizing and Tagging Words:** Using a Tagger, Tagged Corpora, Mapping Words to Properties Using Python Dictionaries, Automatic Tagging, N-Gram Tagging, Transformation-Based Tagging, How to Determine the Category of a Word<br>**Learning to Classify Text:** Supervised Classification, Further Examples of Supervised Classification, Evaluation, Decision Trees , Naive Bayes Classifiers, Maximum Entropy Classifiers , Modeling Linguistic Patterns,<br>**Extracting Information from Text :** Information Extraction, Chunking, Developing and Evaluating Chunkers, Recursion in Linguistic Structure, Named Entity Recognition, Relation Extraction | **15** |
| **III** | **Analyzing Sentence Structure:**<br>Some Grammatical Dilemmas, What's the Use of Syntax?, Context-Free Grammar, Parsing with Context-Free Grammar, Dependencies and Dependency Grammar, Grammar Development<br>**Building Feature-Based Grammars:**<br>Grammatical Features, Processing Feature Structures, Extending a Feature-Based Grammar<br>**Analyzing the Meaning of Sentences:**<br>Natural Language Understanding, Propositional Logic, First-Order Logic, The Semantics of English Sentences, Discourse Semantics | **15** |
| **IV** | **Math with words (TF-IDF vectors) :** Bag of words, Vectorizing, Zipf's Law, Topic modeling<br>**Finding meaning in word counts (semantic analysis):** From word counts to topic scores, Latent semantic analysis, Singular value decomposition, Principal component analysis, Latent Dirichlet allocation (LDiA), Distance and similarity, Steering with feedback, Topic vector power<br>**Information extraction (named entity extraction and question answering) :** Named entities and relations, Regular patterns, Information worth extracting, Extracting relationships (relations), In the real world | **15** |

| List of Practical: | |
|---|---|
| 1. | a. Install NLTK<br>b. Convert the given text to speech<br>c. Convert audio file Speech to Text. |
| 2. | a. Study of various Corpus – Brown, Inaugural, Reuters, udhr with various methods like fields, raw, words, sents, categories,<br>b. Create and use your own corpora(plaintext, categorical)<br>c. Study Conditional frequency distributions<br>Study of tagged corpora with methods like tagged_sents, tagged_words.<br>d. Write a program to find the most frequent noun tags.<br>e. Map Words to Properties Using Python Dictionaries<br>f. Study DefaultTagger, Regular expression tagger, UnigramTagger<br>g. Find different words from a given plain text without any space by comparing this text with a given corpus of words. Also find the score of words. |
| 3. | a. Study of Wordnet Dictionary with methods as synsets, definitions, examples, antonyms.<br>b. Study lemmas, hyponyms, hypernyms, entailments,<br>c. Write a program using python to find synonym and antonym of word "active" using Wordnet<br>d. Compare two nouns<br>e. Handling stopword.<br>Using nltk Adding or Removing Stop Words in NLTK's Default Stop Word List<br>Using Gensim Adding and Removing Stop Words in Default Gensim Stop Words List<br>Using Spacy Adding and Removing Stop Words in Default Spacy Stop Words List |
| 4. | Text Tokenization<br>a. Tokenization using Python's split() function<br>b. Tokenization using Regular Expressions (RegEx)<br>c. Tokenization using NLTK<br>d. Tokenization using the spaCy library<br>e. Tokenization using Keras<br>f. Tokenization using Gensim |
| 5. | Important NLP Libraries for Indian Languages and perform:<br>a. word tokenization in Hindi<br>b. Generate similar sentences from a given Hindi text input<br>c. Identify the Indian language of a text |
| 6. | Illustrate part of speech tagging.<br>a. Part of speech Tagging and chunking of user defined text.<br>b. Named Entity recognition of user defined text.<br>c. Named Entity recognition with diagram using NLTK corpus – treebank |
| 7. | a. Define grammer using nltk. Analyze a sentence using the same.<br>b. Accept the input string with Regular expression of FA: 101+<br>c. Accept the input string with Regular expression of FA: (a+b)*bba<br>d. Implementation of Deductive Chart Parsing using context free grammar and a given sentence. |
| 8. | Study PorterStemmer, LancasterStemmer, RegexpStemmer, SnowballStemmer<br>Study WordNetLemmatizer |
| 9. | Implement Naive Bayes classifier |

| | |
|---|---|
| 10. | Speech Tagging:<br>a. Speech tagging using spacy<br>b. Speech tagging using nktl<br>Statistical parsing:<br>a. Usage of Give and Gave in the Penn Treebank sample<br>b. probabilistic parser<br>Malt parsing:<br>Parse a sentence and draw a tree using malt parsing. |
| 11. | a. Multiword Expressions in NLP<br>b. Normalized Web Distance and Word Similarity<br>c. Word Sense Disambiguation |

| **Course Outcomes** |
|---|
| After completion of the course, a learner should be able to: |
| 1. Learners will get idea about know-hows, issues and challenge in Natural Language Processing and NLP applications and their relevance in the classical and modern context. |
| 2. Learner will get understanding of Computational techniques and approaches for solving NLP problems and develop modules for NLP tasks and tools such as Morph Analyzer, POS tagger, Chunker, Parser, WSD tool etc. |
| 3. Learners will also be introduced to various grammar formalisms, which they can apply in different fields of study. |
| 4. Learners can take up project work or work in R&D firms working in NLP and its allied areas. |
| 5. Learner will be able to understand applications in different sectors. |

| **Books and References:** | | | | | |
|---|---|---|---|---|---|
| Sr. No. | Title | Author/s | Publisher | Edition | Year |
| 1. | Natural Language ProcessingWith Python | Steven Bird, Edward Loper | O'Reilly Media | 2nd | 2016 |
| 2. | Applied Text Analysis with Python | Benjamin Bengfort, Rebecca Bilbro, and Tony Ojeda | O'Reilly | 1st | 2018 |
| 3. | Natural Language Processing in Action Understanding, analyzing, and generating text with Python | Hobson Lane, Cole Howard, Hannes Max Hapke | Manning Publications | | 2019 |
| 4. | Speech and Language Processing | Martin, J. H., & Jurafsky, D. | Pearson Education India | 2nd | 2013 |
| 5. | Foundations of Statistical Natural Language Processing | Manning, Christopher and Heinrich, Schutze | MIT Press | 1st | 1997 |
| 6. | Video Links<br>1. http://www.nptelvideos.in/2012/11/natural-language-processing.html | | | | |

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## (Autonomous)

| **M. Sc (Information Technology)** | | **Semester – III** | |
|---|---|---|---|
| **Course Name: Security Operations Centre Practical** | | **Course Code:** VGVPSTELP301 | |
| **Periods per week (1 Period is 120 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 3 | 100 |

| **List of Practical :** | |
|---|---|
| 1. | Encrypting and Decrypting Data Using OpenSSL |
| 2. | Demonstrate the use of Snort and Firewall Rules |
| 3. | Demonstrate Extract an Executable from a PCAP |
| 4. | Demonstrate Analysis of DNS Traffic |
| 5. | Create your own syslog Server |
| 6. | Configure your Linux system to send syslog messages to a syslog server and Read them |
| 7. | Install and Run Splunk on Linux |
| 8. | Install and Configure ELK on Linux |
| 9. | Install and Configure GrayLog on Linux |
| 10. | Demonstrate Conversion of Data into a Universal Format. |

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# V G Vaze College of Arts, Science and Commerce

## (Autonomous)

| **M. Sc (Information Technology)** | | **Semester – III** | |
|---|---|---|---|
| **Course Name: Server Virtualization on VMWare Platform Practical** | | **Course Code:** VGVPSTELP302 | |
| **Periods per week (1 Period is 120 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 3 | 100 |

| **List of Practicals** | |
|---|---|
| 1. | a. Configure and use vCenter Server Appliance.<br>b. Assign roles and permissions to Active Directory users to perform functions in vCenter Server Appliance. |
| 2. | a. Create a standard switch and a port group.<br>b. Configure access to an iSCSI datastore. |
| 3. | a. Create and manage VMFS datastores.<br>b. Configure access to an NFS datastore.<br>c. Deploy a new virtual machine from a template and clone a virtual machine. |
| 4. | a. Create a content library to clone and deploy virtual machines.<br>b. Modify a virtual machine's hardware and add a raw LUN to a virtual machine. |
| 5. | Use vSphere vMotion and vSphere Storage vMotion to migrate virtual machines. |
| 6. | Perform virtual machine management tasks. |
| 7. | a. In vCenter Server, create and use resource pools on an ESXi host.<br>b. Use the system monitoring tools to reflect the CPU workload. |
| 8. | Use the vCenter Server Appliance alarm feature. |
| 9. | Use vSphere HA functionality. |
| 10. | a. Implement a vSphere DRS cluster.<br>b. Install, configure, and use vSphere Update Manager. |

The Kelkar Education Trust's

# V G Vaze College of Arts, Science and Commerce

## (Autonomous)

| **M. Sc (Information Technology)** | | **Semester – IV** | |
|---|---|---|---|
| **Course Name: Field Project Implementation and Viva** | | **Course Code:** VGVPSTOJT301 | |
| **Periods per week (1 Period is 120 minutes)** | | 4 | |
| **Credits** | | 6 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Examination** | 3 | 100 |

The field project dissertation and Viva Voce details are given in Appendix 1.

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# SEMESTER IV

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# V G Vaze College of Arts, Science and Commerce
# (Autonomous)

| **M. Sc (Information Technology)** | | **Semester – IV** | |
|---|---|---|---|
| **Course Name: Blockchain** | | **Course Code:** VGVPSTMBC401 | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 2½ | 60 |
| | **Internal** | -- | 40 |

| **Course Objective** |
|---|
| 1. To provide conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable. |
| 2. To cover the technological underpinnings of blockchain operations as distributed data structures and decision-making systems, their functionality and different architecture types. |
| 3. To provide a critical evaluation of existing "smart contract" capabilities and platforms, and examine their future directions, opportunities, risks and challenges. |
| 4. To understand the solidity programming. |
| 5. To understand the Blockchain application development. |

| Unit | Details | Lectures |
|---|---|---|
| I | **Blockchain:** Introduction, History, Centralised versus Decentralised systems, Layers of blockchain, Importance of blockchain, Blockchain uses and use cases.<br>**Working of Blockchain:** Blockchain foundation, Cryptography, Game Theory, Computer Science Engineering, Properties of blockchain solutions, blockchain transactions, distributed consensus mechanisms, Blockchain mechanisms, Scaling blockchain<br>**Working of Bitcoin:** Money, Bitcoin, Bitcoin blockchain, bitcoin network, bitcoin scripts, Full Nodes and SVPs, Bitcoin wallets. | **15** |
| II | **Ethereum:** three parts of blockchain, Ether as currency and commodity, Building trustless systems, Smart contracts, Ethereum Virtual Machine, The Mist browser, Wallets as a Computing Metaphor, The Bank Teller Metaphor, Breaking with Banking History, How Encryption Leads to Trust, System Requirements, Using Parity with Geth, Anonymity in Cryptocurrency, Central Bank Network, Virtual Machines, EVM Applications, State Machines, Guts of the EVM, Blocks, Mining's Place in the State Transition Function, Renting Time on the EVM, Gas, Working with Gas, Accounts, Transactions, and Messages, Transactions and Messages, Estimating Gas Fees for Operations, Opcodes in the EVM. **Solidity Programming:** Introduction, Global Banking Made Real, | **15** |

| | | |
|---|---|---|
| | Complementary Currency, Programming the EVM, Design Rationale, Importance of Formal Proofs, Automated Proofs, Testing, Formatting Solidity Files, Reading Code, Statements & Expressions in Solidity,Value Types,Global Special Variables,Units, & Functions. | |
| **III** | **Hyperledger:** Overview, Fabric, composer, installing hyperledger fabric and composer, deploying, running the network, error troubleshooting.<br>**Smart Contracts and Tokens:** EVM as Back End, Assets Backed by Anything, Cryptocurrency Is a Measure of Time, Function of Collectibles in Human Systems, Platforms for High-Value Digital Collectibles, Tokens as Category of Smart Contract, Creating a Token, Deploying the Contract, Playing with Contracts.<br>**Mining Ether:** Why? Ether's Source, Defining Mining, Difficulty, Self-Regulation, and the Race for Profit, How Proof of Work Helps Regulate Block Time, DAG and Nonce, Faster Blocks, Stale Blocks, Difficulties, Ancestry of Blocks and Transactions, Ethereum and Bitcoin, Forking, Mining, Geth on Windows, Executing Commands in the EVM via the Geth Console, Launching Geth with Flags, Mining on the Testnet, GPU Mining Rigs, Mining on a Pool with Multiple GPUs. | **15** |
| **IV** | **Cryptoecnomics:** Introduction, Usefulness of cryptoeconomics,Speed of blocks, Ether Issuance scheme, Common Attack Scenarios.<br>**Blockchain Application Development:** Decentralized Applications, Blockchain Application Development, Interacting with the Bitcoin Blockchain, Interacting Programmatically with Ethereum— Sending Transactions, Creating a Smart Contract, Executing SmartContract Functions, Public vs. Private Blockchains, DecentralizedApplication Architecture, **Building an Ethereum DApp:** The DApp,Setting Up a Private Ethereum Network, Creating the Smart Contract,Deploying the Smart Contract, Client Application,<br>**DAppdeployment:** Seven Ways to Think About Smart Contracts, Dapp Contract Data Models, EVM back-end and front-end communication,JSON-RPC, Web 3, JavaScript API, Using Meteor with the EVM,Executing Contracts in the console,Recommendations forPrototyping, Third-Party Deployment Libraries, **Creating Private Chains.** | **15** |

| Books and References: | | | | | |
|---|---|---|---|---|---|
| **Sr. No.** | **Title** | **Author/s** | **Publisher** | **Edition** | **Year** |
| 1. | Beginning Blockchain A Beginner's Guide to Building Blockchain Solutions | Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda | Apress | | 2018 |
| 2. | Introducing Ethereum and Solidity | Chris Dannen | Apress | | 2017 |
| 3. | The Blockchain Developer | Elad Elrom | Apress | | 2019 |
| 4. | Mastering Ethereum | Andreas M. Antonopoulos Dr. Gavin Wood | O'Reilly | First | 2018 |
| 5. | Blockchain Enabled Applications | Vikram Dhillon David Metcalf Max Hooper | Apress | | 2017 |

| **Course Outcomes** |
|---|
| After completion of the course, a learner should be able to: |
| 1. The learners would understand the structure of a blockchain and why/when it is better than a simple distributed database. |
| 2. Analyze the incentive structure in a blockchain based system and critically assess its functions, benefits and vulnerabilities. |
| 3. Evaluate the setting where a blockchain based structure may be applied, its potential and its limitations. |
| 4. Understand what constitutes a "smart" contract, what are its legal implications and what it can and cannot do, now and in the near future. |
| 5. Develop blockchain DApps. |

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# V G Vaze College of Arts, Science and Commerce

## (Autonomous)

| M. Sc (Information Technology) | | Semester – IV | |
|---|---|---|---|
| **Course Name: Blockchain Practical** | | **Course Code:** VGVPSTMBCP401 | |
| **Periods per week (1 Period is 120 minutes)** | | 2 | |
| **Credits** | | 2 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 3 | 100 |

| **List of Practicals** | |
|---|---|
| **1.** | Write the following programs for Blockchain in Python:<br>A simple client class that generates the private and public keys by using the in Python RSA algorithm and test it.<br>b. A transaction class to send and receive money and test it.<br>c. Create multiple transactions and display them.<br>d. Create a blockchain, a genesis block and execute it.<br>e. Create a mining function and test it.<br>f. Add blocks to the miner and dump the blockchain. |
| **2.** | Install and configure Go Ethereum and the Mist browser. Develop and test a sample application. |
| **3.** | Implement and demonstrate the use of the following in Solidity:<br>Variable, Operators, Loops, Decision Making, Strings, Arrays, Enums, Structs, Mappings, Conversions, Ether Units, Special Variables.<br>b. Functions, Function Modifiers, View functions, Pure Functions, Fallback Function, Function Overloading, Mathematical functions, Cryptographic functions. |
| **4.** | Implement and demonstrate the use of the following in Solidity:<br>Withdrawal Pattern, Restricted Access.<br>b. Contracts, Inheritance, Constructors, Abstract Contracts, Interfaces.<br>c. Libraries, Assembly, Events, Error handling. |
| **5.** | Install hyperledger fabric and composer. Deploy and execute the application. |
| **6.** | Write a program to demonstrate mining of Ether. |
| **7.** | Demonstrate the running of the blockchain node. |
| **8.** | Demonstrate the use of Bitcoin Core API. |
| **9.** | Create your own blockchain and demonstrate its use. |
| **10.** | Build Dapps with angular. |

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# V G Vaze College of Arts, Science and Commerce (Autonomous)

| M. Sc (Information Technology) | | Semester – IV | |
|---|---|---|---|
| **Course Name: Deep Learning** | | **Course Code:** VGVPSTMDL401 | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 2½ | 60 |
| | **Internal** | -- | 40 |

| **Course Objective** |
|---|
| 1. To present the mathematical, statistical and computational challenges of building neural networks. |
| 2. To study the concepts of deep learning |
| 3. To enable the learners to know deep learning techniques to support real-time applications. |
| 4. To understand the deep learning research. |
| 5. To learn deep generative models. |

| Unit | Details | Lectures |
|---|---|---|
| **I** | **Applied Math and Machine Learning Basics:** Linear Algebra: Scalars, Vectors, Matrices and Tensors , Multiplying Matrices and Vectors , Identity and Inverse Matrices, Linear Dependence and Span , norms, special matrices and vectors, eigen decompositions. **Numerical Computation:** Overflow and under flow, poor conditioning, Gradient Based Optimization, Constraint optimization. | **15** |
| **II** | **Deep Networks:** Deep feedforward network, regularization for deep learning , Optimization for Training deep models Convolutional Networks | **15** |
| **III** | Sequence Modelling, Applications Deep Learning Research: Linear Factor Models, Autoencoders, representation learning | **15** |
| **IV** | Approximate Inference, Deep Generative Models | **15** |

**Books and References:**

| Sr. No. | Title | Author/s | Publisher | Edition | Year |
|---|---|---|---|---|---|
| 1. | Deep Learning | Ian Goodfellow, Yoshua Bengio, Aaron Courvile | An MIT Press book | 1st | 2016 |
| 2. | Fundamentals of Deep Learning | Nikhil Buduma | O'Reilly | 1st | 2017 |
| 3. | Deep Learning: Methods and Applications | Deng & Yu | Now Publishers | 1st | 2013 |
| 4. | Deep Learning CookBook | Douwe Osinga | O'Reilly | 1st | 2017 |

| Course Outcomes |
| --- |
| After completion of the course, a learner should be able to: |
| 1. Describes basics of mathematical foundation that will help the learner to understand the concepts of Deep Learning. |
| 2. Understand and describe model of deep learning. |
| 3. Design and implement various deep supervised learning architectures for text & image data. |
| 4. Design and implement various deep learning models and architectures. |
| 5. Apply various deep learning techniques to design efficient algorithms for real-world applications. |

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# V G Vaze College of Arts, Science and Commerce (Autonomous)

| **M. Sc (Information Technology)** | | **Semester – IV** | |
|---|---|---|---|
| **Course Name: Deep Learning Practical** | | **Course Code:** VGVPSTMDLP401 | |
| **Periods per week (1 Period is 120 minutes)** | | 2 | |
| **Credits** | | 2 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 3 | 100 |

| **List of Practicals** | |
|---|---|
| 1. | Performing matrix multiplication and finding eigen vectors and eigen values using TensorFlow |
| 2. | Solving XOR problem using deep feed forward network. |
| 3. | Implementing deep neural network for performing binary classification task. |
| 4. | a Using deep feed forward network with two hidden layers for performing multiclass classification and predicting the class.<br>b. Using a deep feed forward network with two hidden layers for performing classification and predicting the<br>probability of class.<br>c. Using a deep feed forward network with two hidden layers for performing linear regression and predicting values. |
| 5. | a. Evaluating feed forward deep network for regression using KFold cross validation.<br>b Evaluating feed forward deep network for multiclass Classification using KFold cross-validation. |
| 6. | Implementing regularization to avoid overfitting in binary classification. |
| 7. | Demonstrate recurrent neural network that learns to perform sequence analysis for stock price. |
| 8. | Performing encoding and decoding of images using deep autoencoder. |
| 9. | Implementation of convolutional neural network to predict numbers from number images |
| 10. | Denoising of images using autoencoder. |

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# V G Vaze College of Arts, Science and Commerce (Autonomous)

| M. Sc (Information Technology) | | Semester – IV | |
|---|---|---|---|
| **Course Name: Robotic Process Automation Practical** | | **Course Code:** VGVPSTELP401 | |
| **Periods per week (1 Period is 120 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 3 | 100 |

| List of Practicals | |
|---|---|
| 1. | a. Create a simple sequence based project.<br>b. Create a flowchart-based project.<br>c. Create an UiPath Robot which can empty a folder in Gmail solely on basis of recording. |
| 2. | a. Automate UiPath Number Calculation (Subtraction, Multiplication, Division of numbers).<br>b. Create an automation UiPath project using different types of variables (number, datetime, Boolean, generic, array, data table) |
| 3. | a. Create an automation UiPath Project using decision statements.<br>b. Create an automation UiPath Project using looping statements. |
| 4. | a. Automate any process using basic recording.<br>b. Automate any process using desktop recording.<br>c. Automate any process using web recording. |
| 5. | a. Consider an array of names. We have to find out how many of them start with the letter "a". Create an automation where the number of names starting with "a" is counted and the result is displayed. |
| 6. | a. Create an application automating the read, write and append operation on excel file.<br>b. Automate the process to extract data from an excel file into a data table and vice versa |
| 7. | a. Implement the attach window activity.<br>b. Find different controls using UiPath.<br>c. Demonstrate the following activities in UiPath:<br>i. Mouse (click, double click and hover)<br>ii. Type into<br>iii. Type Secure text |
| 8. | a. Demonstrate the following events in UiPath:<br>i. Element triggering event<br>ii. Image triggering event<br>iii. System Triggering Event<br>b. Automate the following screen scraping methods using UiPath<br>i. Full Test<br>ii. Native<br>iii. OCR<br>c. Install and automate any process using UiPath with the following plug-ins: |

| | |
|---|---|
| | i. Java Plugin<br>ii. Mail Plugin<br>iii. PDF Plugin<br>iv. Web Integration<br>v. Excel Plugin<br>vi. Word Plugin<br>vii. Credential Management |
| 9. | a. Automate the process of send mail event (on any email).<br>b. Automate the process of launching an assistant bot on a keyboard event.<br>c. Demonstrate the Exception handing in UiPath.<br>d. Demonstrate the use of config files in UiPath. |
| 10 | a. Automate the process of logging and taking screenshots in UiPath.<br>b. Automate any process using State Machine in UiPath.<br>c. Demonstrate the use of publish utility.<br>d. Create and provision Robot using Orchestrator. |

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# V G Vaze College of Arts, Science and Commerce (Autonomous)

| M. Sc (Information Technology) | | Semester – IV | |
|---|---|---|---|
| **Course Name: Cyber Forensics Practical** | | **Course Code:** VGVPSTELP402 | |
| **Periods per week (1 Period is 120 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 3 | 100 |

| **List of Practical:** | |
|---|---|
| 1. | File System Analysis using The SleuthKit (Autospy, fsstat, istat, fls and img_stat) |
| 2. | a. Explore Windows forensic tools (OSForensics)<br>b. Forensics Investigation Using Encase<br>c. Using Mobile Forensics software tools<br>Exploring Mobiledit Forensics |
| 3. | Using Forensic Toolkit(FTK) &Writing report usingFTK (AccessData FTK) |
| 4. | a. Using File Recovery Tools [FTK Imager] Creating Image<br>Recover Deleted files using Recuva, PC Inspector File Recovery, Recover My Files, R Studio |
| 5. | a. Using Web attack detectiontools [Wireshark]<br>b. Using Log & Traffic Capturing & Analysis Tools [Wireshark]<br>c. Using Network Forensic Analysis Tool (NetworkMiner)<br>Using Network Traffic Analyser tool Iris |
| 6. | Dump Memory contents using PMdump |
| 7. | Using Data Acquisition Tools [ProDiscover Pro] |
| 8. | a. Using Steganography Tools [S-Tools]<br>Using Whitespace Stegnography tool SNOW |
| 9. | a. Performing Password Cracking [Cain & Abel]<br>Performing Sniffing [Cain & Abel] |
| 10. | a. Managing Remote Registry, Network Enumeration, Services, s. IDs [Cain &Abel]<br>b. Scan Registry using RegScanner<br>Study Registry Viewer tool (Alien Registry Viewer) |

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# V G Vaze College of Arts, Science and Commerce (Autonomous)

| **M. Sc (Information Technology)** | | **Semester – IV** | |
|---|---|---|---|
| **Course Name: Advanced IoT Practical** | | **Course Code:** VGVPSTELP403 | |
| **Periods per week (1 Period is 120 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 3 | 100 |

| **List of Practicals** | |
|---|---|
| 1. | Loading Raspbian and Windows IoT Core on Raspberry Pi and executing applications on it using Python and node.js. |
| 2. | Create a home automation system and control the devices remotely. |
| 3. | Create the programs using the Microsoft Cognitive APIs for IoT. |
| 4. | Create blockchain on Raspberry Pi and implement and test it. Authenticate IoT with blockchain. |
| 5. | Implement Microservices on IoT device. |
| 6. | Build your own IoT platform. |
| 7. | Use IoT device with AWS. |
| 8. | Send telemetry from a device to an IoT hub and read it with a service application. |
| 9. | Use the Azure CLI and Azure portal to configure IoT Hub message routing. |
| 10 | Face Detection using IoT device. (Pi Camera or anything else). |

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# V G Vaze College of Arts, Science and Commerce

## (Autonomous)

| **M. Sc (Information Technology)** | | **Semester – IV** | |
|---|---|---|---|
| **Course Name: Research Project Implementation and Viva** | | **Course Code:** VGVPSTRPP401 | |
| **Periods per week (1 Period is 120 minutes)** | | 4 | |
| **Credits** | | 6 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Examination** | 3 | 100 |

The project dissertation and Viva Voce details are given in Appendix 1.

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# V G Vaze College of Arts, Science and Commerce (Autonomous)

## Evaluation Scheme

### 1. *Internal Evaluation (40 Marks)*

**The internal assessment marks shall be awarded as follows:**

1. **30 marks (Any one of the following):**
   a. **Written Test or**
   b. **SWAYAM (Advanced Course) of minimum 20 hours and certification exam completed or**
   c. **NPTEL (Advanced Course) of minimum 20 hours and certification exam completed or**
   d. **Valid International Certifications (Prometric, Pearson, Certiport, Coursera, Udemy and the like)**
   e. **One certification marks shall be awarded one course only. For four courses, the learners will have to complete four certifications.**
2. **10 marks**
   **The marks given out of 40 (30 in Semester 4) for publishing the research paper should be divided into four course and should awarded out of 10 in each of the four course.**

i. **Suggested format of Question paper of 30 marks for the written test.**

| | | |
|---|---|---|
| **Q1.** | **Attempt *any two* of the following:** | **16** |
| **a.** | | |
| **b.** | | |
| **c.** | | |
| **d.** | | |
| | | |
| **Q2.** | **Attempt *any two* of the following:** | **14** |
| **a.** | | |
| **b.** | | |
| **c.** | | |
| **d.** | | |

ii. **10 marks from every course coming to a total of 40 marks, shall be awarded on publishing of research paper in UGC approved / Other Journal with plagiarism less than 10%. The marks can be awarded as per the impact factor of the journal, quality of the paper, importance of the contents published, social value.**

### 2. External Examination: (60 marks)(2 credit Course)

| | | |
|---|---|---|
| | **All questions are compulsory** | |
| **Q1** | **(Based on Unit 1) Attempt *any two* of the following:** | **20** |
| **a.** | | |
| **b.** | | |
| **c.** | | |
| **d.** | | |

| | | |
|---|---|---|
| | | |
| **Q2** | **(Based on Unit 2) Attempt *any two* of the following:** | **20** |
| **Q3** | **(Based on whole syllabus) Attempt *any two* of the following:** | **20** |

### 3. External Examination: (60 marks)(4 credit Course)

| | | |
|---|---|---|
| | **All questions are compulsory** | |
| **Q1** | **(Based on Unit 1) Attempt *any two* of the following:** | **20** |
| **a.** | | |
| **b.** | | |
| **c.** | | |
| **d.** | | |
| | | |
| **Q2** | **(Based on Unit 2) Attempt *any two* of the following:** | **20** |
| **Q3** | **(Based on Unit 3) Attempt *any two* of the following:** | **20** |
| **Q4** | **(Based on Unit 4) Attempt *any two* of the following:** | |

## 4. Practical Evaluation (100 marks)

**A Certified copy of hard-bound journal is essential to appear for the practical examination.**

| | | |
|---|---|---|
| **1.** | **Practical Question 1** | **40** |
| **2.** | **Practical Question 2** | **40** |
| **3.** | **Journal** | **10** |
| **4.** | **Viva Voce** | **10** |

**OR**

| | | |
|---|---|---|
| **1.** | **Practical Question** | **80** |
| **2.** | **Journal** | **10** |
| **3.** | **Viva Voce** | **10** |

**Project Documentation and Viva Voce Evaluation**

The documentation should be checked for plagiarism and as per UGC guidelines, should be less than 10%.

| | | |
|---|---|---|
| **1.** | **Documentation Report (Chapter 1 to 4)** | **20** |
| **2.** | **Innovation in the topic** | **10** |
| **3.** | **Documentation/Topic presentation and viva voce** | **20** |

**Project Implementation and Viva Voce Evaluation**

| | | |
|---|---|---|
| **1.** | **Documentation Report (Chapter 5 to last)** | **20** |
| **2.** | **Implementation** | **10** |
| **3.** | **Relevance of the topic** | **10** |
| **4.** | **Viva Voce** | **10** |

**Appendix – 1**

**Project Documentation and Viva-voce (Semester III) andProject Implementation and Viva-Voce (Semester IV)**

**Goals of the course Field/Reseaech Project Documentation and Viva-Voce**

**The learner should:**

- be able to apply relevant knowledge and abilities, within the main field of study, to a given problem
- within given constraints, even with limited information, independently analyse and discuss complex inquiries/problems and handle larger problems on the advanced level within the main field of study
- reflect on, evaluate and critically review one's own and others' scientific results
- be able to document and present one's own work with strict requirements on structure, format, and language usage
- be able to identify one's need for further knowledge and continuously develop one's own knowledge

**To start the project:**

- Start thinking early in the programme about suitable projects.
- Read the instructions for the project.
- Attend and listen to other learner´s final oral presentations.
- Look at the finished reports.
- Talk to senior master learners.
- Attend possible information events (workshops / seminars / conferences etc.) about the related topics.

**Application and approval:**

- Read all the detailed information about project.
- Finalise finding a place and supervisor.
- Check with the coordinator about subject/project, place and supervisor.
- Write the project proposal and plan along with the supervisor.
- Fill out the application together with the supervisor.
- Hand over the complete application, proposal and plan to the coordinator.
- Get an acknowledgement and approval from the coordinator to start the project.

**During the project:**

- Search, gather and read information and literature about the theory.
- Document well the practical work and your results.
- Take part in seminars and the running follow-ups/supervision.
- Think early on about disposition and writing of the final report.
- Discuss your thoughts with the supervisor and others.
- Read the SOP and the rest you need again.
- Plan for and do the mid-term reporting to the coordinator/examiner.

- Do a mid-term report also at the work-place (can be a requirement in some work-places).
- Write the first draft of the final report and rewrite it based on feedback from the supervisorand possibly others.
- Plan for the final presentation of the report.

**Finishing the project:**

- Finish the report and obtain an OK from the supervisor.
- Ask the supervisor to send the certificate and feedback form to the coordinator.
- Attend the pre-final oral presentation arranged by the Coordinator.
- Rewrite the final report again based on feedback from the opponents and possibly others.
- Prepare a title page and a popular science summary for your report.
- Send the completed final report to the coordinator (via plagiarism software)
- Rewrite the report based on possible feedback from the coordinator.
- Appear for the final exam.

**Project Proposal/research plan**

- The learner should spend the first 1-2 weeks writing a 1-2 pages project plan containing:
    - Short background of the project
    - Aims of the project
    - Short description of methods that will be used
    - Estimated time schedule for the project
- The research plan should be handed in to the supervisor and the coordinator.
- Writing the project plan will help you plan your project work and get you started in findinginformation and understanding of methods needed to perform the project.

**Project Documentation**

The documentation should contain:

- Introduction - that should contain a technical and social (when possible) motivation of theproject topic.
- Description of the problems/topics.
- Status of the research/knowledge in the field and literature review.
- Description of the methodology/approach. (The actual structure of the chapters heredepends on the topic of the documentation.)
- Results - must always contain analyses of results and associated uncertainties.
- Conclusions and proposals for the future work.
- Appendices (when needed).
- Bibliography - references and links.

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# V G Vaze College of Arts, Science and Commerce (Autonomous)

**KET's V. G. Vaze College(Autonomous) Board of Studies – Information Technology comprised of following members**

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Mrs. Rakhee D Rane, Member
Mrs. Nanda A Rupnar, Member
Ms. Mohini Bhole, Member
Ms. Pranali Pawar, Member
Dr. Hiren Dand , VC nominee
Professor (Dr.) Ajay S Patil, Subject Expert, North Maharashtra University
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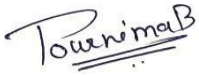
Mr. Tejpal Khachane, Industry Expert
Mr. Abhishek Ghorpade, Postgraduate meritorious alumnus



Mrs. Pournima P Bhangale
Chairperson

Dr. Hiren Dand
VC Nominee