**Rayat Shikshan Sanstha's**
**KARMAVEER BHAURAO PATIL COLLEGE, VASHI.**
**NAVI MUMBAI**
**(AUTONOMOUS COLLEGE)**
Sector-15- A, Vashi, Navi Mumbai - 400 703

**Syllabus for M.Sc. Information Technology –Part II**

**Program: M.Sc. Information Technology**

**Course: M.Sc. Information Technology**

**(Choice Based Credit, Grading and Semester System with effect from the academic year 2021-2022)**

AC_____

Item No._____

Rayat Shikshan Sanstha's

# KARMAVEER BHAURAO PATIL COLLEGE, VASHI, NAVI MUMBAI



## **Syllabus for Approval**

| Sr.No. | Heading | Particulars |
|---|---|---|
| 1 | Title of the Course | M.Sc Information Technology |
| 2 | Eligibility for Admission | Degree with 12th Mathemtaics |
| 3 | Passing marks | 40% |
| 4 | Ordinances/ Regulations(if any) | |
| 5 | No.of Uears/Semester | 04 Semester/02 Years |
| 6 | Level | P.G |
| 7 | Pattern | Semester |
| 8 | Status | New |
| 9 | To be implemented from Academic Year | 2021-2022 |

| Date: | | Signature: |
|---|---|---|

Name of BOS Chairperson / Dean : _____

**Preamble of the Syllabus:**

The subject of Information Technology is one of the important application tool which can be applied to different areas in teaching, training and learning which is considered to be important in terms of human resource development, Information Processing and Decision Making which enhances the development of a Nation.

Information Technology as an application science is studied to be applied for other areas, right from Mathematics to other basic sciences, applied sciences, social sciences and each and every aspect of human life.

The main aim of the course is to focus on the technological tools and concepts available and how they can be applied to the developmental processes

The various concepts include Embedded System, Information Security Management, Virtualization, Ethical Hacking, Artificial Intelligence, IT Infrastructure Management, Computer Forensics, Cloud Management, Project and so on..

Information Technology Experts are very much required right from academic institutions, Research and Development to Industries both Public and Private Sectors. The two year programme of M.Sc. (Information Technology) is prescribed according to the credit system of University of Mumbai from the academic year 2018-19. The course has been divided in to four semesters. The programme has a total 16 theory papers, and four in each semester.

The programme is designed to provide students a focused elaborate training in Information Technology concepts and tools as well as exposing them to the advanced fields. In addition to theoretical knowledge, significant emphasis has been given to provide hands on experience to the students in the frontier areas of Information Technology. A multidisciplinary approach has been employed to provide best leverage to students to enable.

# Syllabus for M.Sc. Part-2 Information Technology

## Objectives of the Course:

A few years after graduation, students with a M.Sc in Information Technology will be able to::

- Prepare highly qualified specialists for the Saudi industry in the field of information technology.
- Develop interpersonal skills, teamwork skills, leadership skills, and project management skills.
- Learn how to operate a professional IT practice
- Study a broad context of advanced contemporary IT issues

## Course Outcome:

**By the end of the course, a student should develop the ability:**

Upon graduation, students with a M.Sc in Information Technology will be able to:

- Students will develop ability to use IT skills in decision making, by analyzing problems, developing solutions and explaining findings.
- Students can recognize ethical and professional responsibilities in IT.
- Students can design an IT solution using best practices and standard methodologies in the field.
- Student can easily implement, and test an IT solution, and evaluate its effectiveness.
- Student can use and apply current technical concepts and practices in the core information technologies of networking, data management, software engineering, computer security.
- Student can demonstrate a deep understanding of the IT methodologies and frameworks used to solve complex computing problems related to at least one IT Body-of-Knowledge
- Student will build the ability to identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems.
- Student can effectively integrate IT-based solutions into the user environment.
- Student will developed and implement optimal solutions to complex computing problems using industry-recognized best practices and standards.
- Student can apply ethical decision making in the development, implementation, and management of IT systems.

| Semester – III | | |
|---|---|---|
| **Course Code** | **Course Title** | **Credits** |
| PGIT301 | Technical Writing and Entrepreneurship Development | 4 |
| PGIT302 | Applied Artificial Intelligence | 4 |
| PGIT303 | Machine Learning | 4 |
| PGIT304 | Robotic Process Automation | 4 |
| PGIT3P1 | Project Documentation and Viva | 2 |
| PGIT3P2 | Applied Artificial Intelligence Practical | 2 |
| PGIT3P3 | Machine Learning Practical | 2 |
| PGIT3P4 | Robotic Process Automation Practical | 2 |
| | **Total Credits** | **24** |

| Semester – IV | | |
|---|---|---|
| **Course Code** | **Course Title** | **Credits** |
| PGIT401 | Blockchain | 4 |
| PGIT402 | Natural Language Processing | 4 |
| PGIT403 | Deep Learning | 4 |
| PGIT404 | Human Computer Interaction | 4 |
| PGIT4P1 | | 2 |
| PGIT4P2 | Natural Language Processing Practical | 2 |
| PGIT4P3 | Deep Learning Practical | 2 |
| PGIT4P4 | Project Implementation and Viva | 2 |
| | **Total Credits** | **24** |

# SEMESTER III

| M. Sc (Information Technology) | Semester – III |
|---|---|
| **Course Name:** Technical Writing and Entrepreneurship Development | **Course Code: PGIT301** |

| | | | |
|---|---|---|---|
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 2½ | 60 |
| | **Internal** | -- | 40 |

Course Objectives:

- This course aims to provide conceptual understanding of developing strong foundation in general writing, including research proposal and reports.
- It covers the technological developing skills for writing Article, Blog, E-Book, Commercial web Page design, Business Listing Press Release, E-Listing and Product Description.
- This course aims to provide conceptual understanding of innovation and entrepreneurship development.

| Unit | Details | Lectures | Outcome |
|---|---|---|---|
| I | Introduction to Technical Communication: What Is Technical Communication? The Challenges of Producing Technical Communication, Characteristics of a Technical Document, Measures of Excellence in Technical Documents, Skills and Qualities Shared by Successful Workplace Communicators, How Communication Skills and Qualities Affect Your Career? **Understanding Ethical and Legal Considerations:** A Brief Introduction to Ethics, Your Ethical Obligations, Your Legal Obligations, The Role of Corporate Culture in Ethical and Legal Conduct, Understanding Ethical and Legal Issues Related to Social Media, Communicating Ethically Across Cultures, Principles for Ethical Communication **Writing Technical Documents:** Planning, Drafting, Revising, Editing, Proofreading **Writing Collaboratively:** Advantages and Disadvantages of Collaboration, Managing Projects, Conducting Meetings, Using Social Media and Other Electronic Tools in Collaboration, Importance of Word Press Website, Gender and Collaboration, Culture and Collaboration. | 12 | CO1 |
| II | **Introduction to Content Writing:** Types of Content (Article, Blog, E-Books, Press Release, Newsletters Etc), Exploring Content Publication Channels. Distribution of your content across various channels. **Blog Creation:** | 12 | CO2 |

| | Understand the psychology behind your web traffic, | | |

| | | | |
|---|---|---|---|
| | Creating killing landing pages which attract users, Using Landing Page Creators, Setting up Accelerated Mobile Pages, Identifying UI UX Experience of your website or blog. **Organizing Your Information:** Understanding Three Principles for Organizing Technical Information, Understanding Conventional Organizational Patterns, **Emphasizing Important Information:** Writing Clear, Informative Titles, Writing Clear, Informative Headings, Writing Clear Informative Lists, Writing Clear Informative Paragraphs. | | |
| III | **Creating Graphics:** The Functions of Graphics, The Characteristics of an Effective Graphic, Understanding the Process of Creating Graphics, Using Color Effectively, Choosing the Appropriate Kind of Graphic, Creating Effective Graphics for Multicultural Readers. **Researching Your Subject:** Understanding the Differences Between Academic and Workplace Research, Understanding the Research Process, Conducting Secondary Research, Conducting Primary Research, **Research and Documentation:** Literature Reviews, Interviewing for Information, Documenting Sources, Copyright, Paraphrasing, Questionnaires. **Report Components:** Abstracts, Introductions, Tables of Contents, Executive Summaries, Feasibility Reports, Investigative Reports, Laboratory Reports, Test Reports, Trip Reports, Trouble Reports | 12 | CO3 |
| IV | **Writing Proposals:** Understanding the Process of Writing Proposals, The Logistics of Proposals, The ―Deliverables‖ of Proposals, Persuasion and Proposals, Writing a Proposal, The Structure of the Proposal. **Writing Informational Reports:** Understanding the Process of Writing Informational Reports, Writing Directives, Writing Field Reports, Writing Progress and Status Reports, Writing Incident Reports, Writing Meeting Minutes. **Writing Recommendation Reports:** Understanding the Role of Recommendation Reports, Using a Problem-Solving Model for Preparing Recommendation Reports, Writing Recommendation Reports. **Reviewing, Evaluating, and Testing Documents and Websites:** Understanding Reviewing, Evaluating, and Testing, Reviewing Documents and Websites, Conducting Usability Evaluations, Conducting Usability Tests, Using Internet tools to check writing Quality, Duplicate Content Detector, What is Plagiarism?, How to avoid writing plagiarism content? **Innovation management: an introduction:** The importance of innovation, Models of innovation, Innovation as a management process. **Market adoption** | 12 | CO4 |

| | **and technology diffusion:** Time lag between innovation and useable product, Innovation and the market , | | |
|---|---|---|---|

| | Innovation and market vision ,Analysing internet search data to help adoption and forecasting sales ,Innovative new products and consumption patterns, Crowd sourcing for new product ideas, Frugal innovation and ideas from everywhere, Innovation diffusion theories. | | |
|---|---|---|---|
| **V** | **Managing innovation within firms:** Organisations and innovation, The dilemma of innovation management, Innovation dilemma in low technology sectors, Dynamic capabilities, Managing uncertainty, Managing innovation projects **Operations and process innovation:** Operations management, The nature of design and innovation in the context of operations, Process design, Process design and innovation<br>**Managing intellectual property:** Intellectual property, Trade secrets, An introduction to patents, Trademarks, Brand names, Copyright **Management of research and development:** What is research and development?, R&D management and the industrial context, R&D investment and company success, Classifying R&D, R&D management and its link with business strategy, Strategic pressures on R&D, Which business to support and how?, Allocation of funds to R&D, Level of R&D expenditure<br>**Managing R&D projects:** Successful technology management, The changing nature of R&D management, The acquisition of external technology, Effective R&D management, The link with the product innovation process, Evaluating R&D projects. | **12** | **CO5** |

| Books and References: | | | | | |
|---|---|---|---|---|---|
| Sr. No. | Title | Author/s | Publisher | Edition | Year |
| 1. | Technical Communication | Mike Markel | Bedford/St. Martin's | 11 | 2014 |
| 2. | Innovation Management and New Product Development | Paul Trott | Pearson | 06 | 2017 |
| 3. | Handbook of Technical Writing | Gerald J. Alred , Charles T. Brusaw , Walter E. Oliu | Bedford/St. Martin's | 09 | 2008 |
| 4. | Technical Writing 101: A Real-World Guide to Planning and Writing Technical Content | Alan S. Pringle and Sarah S. O'Keefe | scriptorium | 03 | 2009 |
| 5. | Innovation and Entrepreneurship | Peter Drucker | Harper Business | 03 | 2009 |

## Course Outcomes:

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

**CO1:** Develop technical documents that meet the requirements with standard guidelines. Understanding the essentials and hands-on learning about effective Website Development.
**CO2:** Write Better Quality Content Which Ranks faster at Search Engines. Build effective Social Media Pages.
**CO3:** Evaluate the essentials parameters of effective Social Media Pages.
**CO4:** Understand importance of innovation and entrepreneurship.
**CO5:** Analyze research and development projects.

| M. Sc (Information Technology) | | Semester – III | |
|---|---|---|---|
| **Course Name: Project Documentation and Viva** | | **Course Code: PGIT3P1** | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 2 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 2 | 50 |
| | **Internal** | -- | -- |

The learners are expected to develop a project beyond the undergraduate level. Normal web sites, web applications, mobile apps are not expected. Preferably, the project should be from the elective chosen by the learner at the post graduate level. In semester three. The learner is supposed to prepare the synopsis and documentation. The same project has to be implemented in Semester IV.

More details about the project is given is Appendix 1.

| M. Sc (Information Technology) | | Semester – III | |
|---|---|---|---|
| **Course Name: <mark>Applied Artificial Intelligence</mark>** | | Course Code: PGIT302 | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | Theory Examination | 2½ | 60 |
| | Internal | -- | 40 |

Course Objectives:
- To explore the applied branches of artificial intelligence
- To enable the learner to understand applications of artificial intelligence
- To enable the student to solve the problem aligned with derived branches of artificial intelligence.

| Unit | Details | Lectures | Outcome |
|---|---|---|---|
| I | **Review of AI:** History, foundation and Applications<br>**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 | 12 | CO1 |
| II | **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<br>**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 | 12 | CO2 |
| III | **Machine Learning Paradigms:** Machine Learning systems, supervised and un-supervised learning, inductive learning, deductive learning, clustering, support vector machines, cased based reasoning and learning.<br>**Artificial Neural Networks:** Artificial Neural Networks, Single-Layer feedforward networks, multi-layer feed-forward networks, radial basis function networks, design issues of artificial neural networks and recurrent networks | 12 | CO3 |

| | | | |
|---|---|---|---|
| **IV** | **Evolutionary Computation:** Soft computing, genetic algorithms, genetic programming concepts, evolutionary programming, swarm intelligence, ant colony paradigm, particle swarm optimization and applications of evolutionary algorithms.<br>**Intelligent Agents:** Agents vs software programs, classification of agents, working of an agent, single agent and multiagent systems, performance evaluation, architecture, | **12** | **CO4** |

| | agent communication language, applications | | |
|---|---|---|---|
| **V** | Advanced Knowledge Representation Techniques:<br>Conceptual dependency theory, script structures, CYC theory, script structure, CYC theory, case grammars, semantic web.<br>Natural Language Processing:<br>Sentence Analysis phases, grammars and parsers, types of parsers, semantic analysis, universal networking language, dictionary | **12** | **CO5** |

**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 | |

| **M. Sc (Information Technology)** | | **Semester – III** | |
|---|---|---|---|
| **Course Name: Artificial Intelligence Practical** | | **Course Code: PGIT3P2** | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 2 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 2 | 50 |
| | **Internal** | -- | -- |

**List of Practical:**
**10 practicals covering the entire syllabus must be performed. The detailed list of practical will be circulated later in the official workshop.**

## Course Outcomes:

After completion of course the learner will:
**CO1:** be able to understand the fundamentals concepts of expert system and its applications.
**CO2:** be able to use probability and concept of fuzzy sets for solving AI based problems.
**CO3:** be able to understand the applications of Machine Learning. The learner can also apply fuzzy system for solving problems.
**CO4:** learner will be able to apply to understand the applications of genetic algorithms in different problems related to artificial intelligence.
**CO5:** A learner can use knowledge representation techniques in natural language processing.

| M. Sc (Information Technology) | | Semester – III | |
|---|---|---|---|
| **Course Name:** <mark>Machine Learning</mark> | | **Course Code:** PGIT303 | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 2½ | 60 |
| | **Internal** | -- | 40 |

## Course Objectives:

Understanding Human learning aspects.

Understanding primitives in learning process by computer.

Understanding nature of problems solved with Machine Learning

| Unit | Details | Lectures | Outcome |
|---|---|---|---|
| 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. | 12 | CO1 |
| II | **Classification and Regression: Classification:** Binary Classification- Assessing Classification performance, Class probability Estimation Assessing class probability Estimates, Multiclass Classification. **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 Growth function, VC Dimensions, Regularization theory. | 12 | CO2 |
| III | **Linear Models:** Least Squares method, Multivariate Linear Regression, 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. | 12 | CO2 CO3 |

| IV | **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. | 12 | CO2 CO3 CO4 |

| V | Probabilistic Model: 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. **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. | 12 | CO5 |
|---|---|---|---|

| **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 |

| **M. Sc (Information Technology)** | | **Semester – III** | |
|---|---|---|---|
| **Course Name: Machine Learning Practical** | | **Course Code: PGIT3P3** | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 2 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 2 | 50 |
| | **Internal** | -- | - |

**List of Practical:**
**10 practicals covering the entire syllabus must be performed. The detailed list of practical will be circulated later in the official workshop.**

## Course Outcomes:

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

**CO1**: Understand the key issues in Machine Learning and its associated applications in intelligent business and scientific computing.

**CO2**: 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.

**CO3**: Understand and implement the techniques for extracting the knowledge using machine learning methods.

**CO4**: Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.

**CO5**: 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.

| M. Sc (Information Technology) | | Semester – III | |
|---|---|---|---|
| **Course Name: <mark>Robotic Process Automation</mark>** | | **Course Code: PGIT304** | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | Theory Examination | 2½ | 60 |
| | Internal | -- | 40 |

## Course Objectives:

To make the students aware about the automation today in the industry.

To make the students aware about the tools used for automation.

To help the students automate a complete process

| Unit | Details | Lectures | Outcome |
|---|---|---|---|
| I | **Robotic Process Automation:** Scope and techniques of automation, About UiPath<br>**Record and Play:** UiPath stack, Downloading and installing UiPath Studio, Learning UiPath Studio, Task recorder, Step-by-step examples using the recorder. | 12 | CO1 |
| II | **Sequence, Flowchart, and Control Flow:** Sequencing the workflow, Activities, Control flow, various types of loops, and decision making, Step-by-step example using Sequence and Flowchart, Step-by-step example using Sequence and Control flow<br>**Data Manipulation:** Variables and scope, Collections, Arguments – Purpose and use, Data table usage with examples, Clipboard management, File operation with step-by-step example, CSV/Excel to data table and vice versa (with a step-by-step example) | 12 | CO2 |
| III | **Taking Control of the Controls :** Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Working with UiExplorer, Handling events, Revisit recorder, Screen Scraping, When to use OCR, Types of OCR available, How to use OCR, Avoiding typical failure points<br>**Tame that Application with Plugins and Extensions:** Terminal plugin, SAP automation, Java plugin, Citrix automation, Mail plugin, PDF plugin, Web integration, | 12 | CO3 |

| | | | | |
|---|---|---|---|---|
| | Excel and Word plugins, Credential management, Extensions – Java, Chrome, Firefox, and Silverlight | | | |
| IV | **Handling User Events and Assistant Bots:** What are assistant bots?, Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger ,Monitoring image and element triggers, An example of monitoring email, Example of monitoring a copying event and blocking it, Launching an assistant bot on a keyboard event<br>**Exception Handling, Debugging, and Logging:** Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots, Debugging techniques, Collecting crash dumps, Error reporting | 12 | CO4 | |
| V | **Managing and Maintaining the Code:** Project organization, Nesting workflows, Reusability of workflows, Commenting techniques, State Machine, When to use Flowcharts, State Machines, or Sequences, Using config files and examples of a config file, Integrating a TFS server<br>**Deploying and Maintaining the Bot:** Publishing using publish utility, Overview of Orchestration Server, Using Orchestration Server to control bots, Using Orchestration Server to deploy bots, License management, Publishing and managing updates | 12 | CO5 | |

| Books and References: | | | | | |
|---|---|---|---|---|---|
| Sr. No. | Title | Author/s | Publisher | Edition | Year |
| 1. | Learning Robotic Process Automation | Alok Mani Tripathi | Packt | 1st | 2018 |
| 2. | Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation | Srikanth Merianda | Createspace Independent Publishing | 1st | 2018 |
| 3. | The Simple Implementation Guide to Robotic Process Automation (Rpa): How to Best Implement Rpa in an Organization | Kelly Wibbenmeyer | iUniverse | 1st | 2018 |

| M. Sc (Information Technology) | | Semester – III | |
|---|---|---|---|
| **Course Name: Robotic Process Automation** | | **Course Code: pgIT3P4** | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 2 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 2 | 50 |
| | **Internal** | -- | - |

**List of Practical:**

10 practicals covering the entire syllabus must be performed. The detailed list of practical will be circulated later in the official workshop.

## Course Outcomes:

After completing the course, a learner will be able to:

**CO1:** Understand the mechanism of business process and can provide the solution in an optimize way.

**CO2:** Understand the features use for interacting with database plugins.

**CO3:** Use the plug-ins and other controls used for process automation.

**CO4:** Use and handle the different events, debugging and managing the errors.

**CO5:** Test and deploy the automated process.

# SEMESTER-IV

| M. Sc (Information Technology) | | Semester – IV | |
|---|---|---|---|
| **Course Name:** Blockchain | | **Course Code: PGIT401** | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 2½ | 60 |
| | **Internal** | -- | 40 |

## Course Objectives:

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.

To cover the technological underpinnings of blockchain operations as distributed data structures and decision-making systems, their functionality and different architecture types.

To provide a critical evaluation of existing ―smart contract‖ capabilities and platforms, and examine their future directions, opportunities, risks and challenges.

| Unit | Details | Lectures | Outcome |
|---|---|---|---|
| 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. | 12 | CO1 |
| II | **Ethereum:** three parts of blockchain, Ether as currency and commodity, Building trustless systems, Smart contracts, Ethereum Virtual Machine, The Mist | 12 | CO2 |

| | | | |
|---|---|---|---|
| | 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.<br>**Solidity Programming:** Introduction, Global Banking Made Real, Complementary Currency, Programming the EVM, Design Rationale, Importance of Formal Proofs, Automated Proofs, Testing, Formatting Solidity Files, Reading Code, Statements and Expressions in Solidity, Value Types, Global Special Variables, Units, and 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. | **12** | **CO3** |
| **IV** | **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.<br>**Cryptoecnomics:** Introduction, Usefulness of cryptoeconomics, Speed of blocks, Ether Issuance scheme, Common Attack Scenarios. | **12** | **CO4** |

| V | **Blockchain Application Development:** Decentralized Applications, Blockchain Application Development, Interacting with the Bitcoin Blockchain, Interacting Programmatically with Ethereum—Sending Transactions, Creating a Smart Contract, Executing Smart Contract Functions, Public vs. Private Blockchains, Decentralized Application Architecture, **Building an Ethereum DApp:** The DApp, Setting Up a Private Ethereum Network, Creating the Smart Contract, Deploying the Smart Contract, Client | 12 | CO5 |
| --- | --- | --- | --- |

| | | | | | |
|---|---|---|---|---|---|
| | Application, **DApp deployment:** 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 for Prototyping, Third-Party Deployment Libraries, **Creating Private Chains.** | | | | |

| Books and References: | | | | | |
|---|---|---|---|---|---|
| Sr. No. | Title | Author/s | Publisher | Edition | Year |
| 1. | Beginning Blockchain A Beginner's Guide to Building Blockchain Solutions | Bikramadity a 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 |

| M. Sc (Information Technology) | | Semester – III | |
|---|---|---|---|
| **Course Name: Blockchain** | | **Course Code: PGIT4P1** | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 2 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 2 | 50 |
| | **Internal** | -- | - |

**List of Practical:**
**10 practicals covering the entire syllabus must be performed. The detailed list of** ~~practical will be circulated later in the official workshop.~~

## Course Outcomes:

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

**CO1:** The students would understand the structure of a blockchain and why/when it is better than a simple distributed database.

**CO2:** Analyze the incentive structure in a blockchain based system and critically assess its functions, benefits and vulnerabilities

**CO3:** Evaluate the setting where a blockchain based structure may be applied, its potential and its limitations

**CO4:** Understand what constitutes a ―smart‖ contract, what are its legal implications and what it can and cannot do, now and in the near future

**CO5:** Develop blockchain DApps.

| M. Sc (Information Technology) | | Semester – IV | |
|---|---|---|---|
| **Course Name:** <mark>Natural Language Processing</mark> | | **Course Code: PGIT402** | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 2½ | 60 |
| | **Internal** | -- | 40 |

## Course Objectives:

The prime objective of this course is to introduce the students to the field of Language Computing and its applications ranging from classical era to modern context.

To provide understanding of various NLP tasks and NLP abstractions such as Morphological analysis, POS tagging, concept of syntactic parsing, semantic analysis etc.

To provide knowledge of different approaches/algorithms for carrying out NLP tasks.

To highlight the concepts of Language grammar and grammar representation in Computational Linguistics.

| Unit | Details | Lectures | Outcome |
|---|---|---|---|
| I | Introduction to NLP, brief history, NLP applications: Speech to Text(STT), Text to Speech(TTS), Story Understanding, NL Generation, QA system, Machine Translation, Text Summarization, Text classification, Sentiment Analysis, Grammar/Spell Checkers etc., challenges/Open Problems, NLP abstraction levels, Natural Language (NL) Characteristics and NL computing approaches/techniques and steps, NL tasks: Segmentation, Chunking, tagging, NER, Parsing, Word Sense Disambiguation, NL Generation, Web 2.0 Applications : Sentiment Analysis; Text Entailment; Cross Lingual Information Retrieval (CLIR). | 12 | CO1 |
| II | Text Processing Challenges, Overview of Language Scripts and their representation on Machines using | 12 | CO2 |

| | Character Sets, Language, Corpus and Application Dependence issues, Segmentation: word level(Tokenization), Sentence level. Regular Expression and Automata Morphology, Types, Survey of English and Indian Languages Morphology, Morphological parsing FSA and FST, Porter stemmer, Rule based and Paradigm based Morphology, Human Morphological Processing, Machine Learning approaches. | | |
|---|---|---|---|
| III | Word Classes ad Part-of-Speech tagging(POS), survey of POS tagsets, Rule based approaches (ENGTOWL), Stochastic approaches(Probabilistic, N-gram and HMM), TBL morphology, unknown word handling, evaluation metrics: Precision/Recall/F-measure, error analysis. | 12 | CO3 |
| IV | NL parsing basics, approaches: TopDown, BottomUp, Overview of Grammar Formalisms: constituency and dependency school, Grammar notations CFG, LFG, PCFG, LTAG, Feature- Unification, overview of English CFG, Indian Language Parsing in Paninian Karaka Theory, CFG parsing using Earley's and CYK algorithms, Probabilistic parsing, Dependency Parsing: Covington algorithm, MALT parser, MST parser. | 12 | CO4 |
| V | Concepts and issues in NL, Theories and approaches for Semantic Analysis, Meaning Representation, word similarity, Lexical Semantics, word senses and relationships, WordNet (English and IndoWordnet), Word Sense Disambiguation: Lesk Algorithm Walker's algorithm, Coreferences Resolution:Anaphora, Cataphora. | 12 | CO5 |

| Books and References: | | | | | |
|---|---|---|---|---|---|
| Sr. No. | Title | Author/s | Publisher | Edition | Year |
| 1. | Handbook of Natural Language Processing | Indurkhya, N., & Damerau, F. J. | CRC Press Taylor and Francis Group | 2nd | 2010 |
| 2. | Speech and Language Processing | Martin, J. H., & Jurafsky, D. | Pearson Education India | 2nd | 2013 |
| 3. | Foundations of Statistical Natural Language Processing | Manning, Christopher and Heinrich, Schutze | MIT Press | 1st | 1997 |

| 4. | Natural Language Processing With Python | Steven Bird, Edward Loper | O'Reilly Media | 2nd | 2016 |
|----|------------------------------------------|----------------------------|----------------|------|------|
| 5. | Video Links | http://www.nptelvideos.in/2012/11/natural-language-processing.html | | | |

| M. Sc (Information Technology) | | Semester – IV | |
|---|---|---|---|
| **Course Name: Natural Language Processing Practical** | | **Course Code: PGIT4P2** | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 2 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 2 | 50 |
| | **Internal** | -- | - |

**List of Practical:**
**10 practicals covering the entire syllabus must be performed. The detailed list of** ~~practical will be circulated later in the official workshop.~~

## Course Outcomes:

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

**CO1**: Students 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.

**CO2**: Student 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.

**CO3**: Students will also be introduced to various grammar formalisms, which they can apply in different fields of study.

**CO4**: Students can take up project work or work in R&D firms working in NLP and its allied areas.

**CO5**: Student will be able to understand applications in different sectors

| M. Sc (Information Technology) | | Semester – IV | |
|---|---|---|---|
| **Course Name: <mark>Deep Learning</mark>** | | **Course Code: PGIT403** | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 2½ | 60 |
| | **Internal** | -- | 40 |

## Course Objectives:

To present the mathematical, statistical and computational challenges of building neural networks

To study the concepts of deep learning

To enable the students to know deep learning techniques to support real-time applications

| Unit | Details | Lectures | Outcome |
|---|---|---|---|
| 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. | 12 | CO1 |
| II | **Deep Networks:** Deep feedforward network , regularization for deep learning , Optimization for Training deep models | 12 | CO2 |
| III | Convolutional Networks, Sequence Modelling, Applications | 12 | CO3 |
| IV | Deep Learning Research: Linear Factor Models, Autoencoders, representation learning | 12 | CO4 |
| V | Approximate Inference, Deep Generative Models | 12 | CO5 |

| **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 |

| M. Sc (Information Technology) | | Semester – IV | |
|---|---|---|---|
| **Course Name: Deep Learning Practical** | | **Course Code: PGIT4P3** | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 2 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Practical Examination** | 2 | 50 |
| | **Internal** | -- | - |

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**List of Practical:**

**10 practicals covering the entire syllabus must be performed. The detailed list of** ~~practical will be circulated later in the official workshop.~~

Course Outcomes:

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

**CO1**: Describes basics of mathematical foundation that will help the learner to understand the    concepts of Deep Learning.

**CO2**: Understand and describe model of deep learning

**CO3**: Design and implement various deep supervised learning architectures for text & image data.

**CO4**: Design and implement various deep learning models and architectures.

**CO5**: Apply various deep learning techniques to design efficient algorithms for real-world applications.

| M. Sc (Information Technology) | | Semester – IV | |
|---|---|---|---|
| **Course Name:** Human Computer Interaction | | **Course Code: PGIT404** | |
| **Periods per week (1 Period is 60 minutes)** | | 4 | |
| **Credits** | | 4 | |
| | | **Hours** | **Marks** |
| **Evaluation System** | **Theory Examination** | 2½ | 60 |
| | **Internal** | -- | 40 |

## Course Objectives:

Understand the important aspects of implementation of human-computer interfaces.

Identify the various tools and techniques for interface analysis, design, and evaluation.

Identify the impact of usable interfaces in the acceptance and performance utilization of information systems

| Unit | Details | Lectures | Outcome |
|---|---|---|---|
| I | **The Interaction:** Models of interaction, Design Focus, Frameworks and HCI, Ergonomics, Interaction styles, Elements of the WIMP interface,Interactivity **Paradigms:** Introduction, Paradigms for interaction **Interaction design basics:** What is design?, The process of design, User focus, Cultural probes, Navigation design, the big button trap, Modes, Screen design and layout, Alignment and layout matters, Checking screen colors, Iteration and prototyping **HCI in the software process**: The software life cycle, Usability engineering , Iterative design and prototyping, Prototyping in practice, Design rationale | 12 | CO1 |
| II | **Design**: Principles to support usability, Standards, Guidelines, Golden rules and heuristics, HCI patterns | 12 | CO2 |

| | | | |
|---|---|---|---|
| | **Implementation support:** Elements of windowing systems, Programming the application, Going with the grain, Using toolkits, User interface management systems<br>**Evaluation techniques:** What is evaluation?, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method | | |
| III | **Universal design:** Universal design principles, Multi-modal interaction, Designing websites for screen readers, Choosing the right kind of speech, Designing for diversity<br>**User support:** Requirements of user support, Approaches to user support, Adaptive help systems, Designing user support systems<br>**Cognitive models:** Goal and task hierarchies, Linguistic models, The challenge of display-based systems, Physical and device models, Cognitive architectures | 12 | CO3 |
| IV | **Socio-organizational issues and stakeholder requirements:** Organizational issues, Capturing requirements<br>**Communication and collaboration models:** Face-to-face communication, Conversation, Text-based communication, Group working<br>**Task analysis:** Differences between task analysis and other techniques, Task decomposition, Knowledge-based analysis, Entity–relationship-based techniques, Sources of information and data collection, Uses of task analysis | 12 | CO4 |
| V | **Dialog notations and design:** What is dialog?, Dialog design notations, Diagrammatic notations, Textual dialog notations, Dialog semantics, Dialog analysis and design<br>**Models of the system:** Standard formalisms, Interaction models, Continuous behavior<br>**Modeling rich interaction:** Status–event analysis, Rich contexts, Low intention and sensor-based interaction | 12 | CO5 |

| Books and References: | | | | | |
|---|---|---|---|---|---|
| Sr. No. | Title | Author/s | Publisher | Edition | Year |
| 1. | Human Computer Interaction | Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale | Pearson Education | ३rd | |
| 2. | Designing the User Interface | Shneiderman B., Plaisant C., Cohen | Pearson | 5th | 2013 |

| | | M., Jacobs S. | | | |
|---|---|---|---|---|---|

# Course Outcomes:

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

**CO1:** have a clear understanding of HCI principles that influence a system's interface design, before writing any code.
**CO2:** understand the evaluation techniques used for any of the proposed system.
**CO3:** understand the cognitive models and its design.
**CO4:** able to understand how to manage the system resources and do the task analysis.
**CO5:** able to design and implement a complete system.