

## Syllabus

### a. Post: AI Trainer

The following syllabus is prescribed for the online recruitment examination for the post of AI Trainer. It is intended to assess subject knowledge, practical understanding, and training aptitude relevant to Artificial Intelligence and allied areas.

#### Detailed Syllabus

##### 1. Fundamentals of Artificial Intelligence

- Concept, meaning, and scope of Artificial Intelligence.
- History and evolution of AI.
- Types of AI: Narrow AI, General AI, and Generative AI.
- AI domains and interdisciplinary nature of AI.
- Basic AI terminology and AI life cycle.

##### 2. AI Applications

- Applications of AI in education, healthcare, agriculture, business, governance, and industry.
- Intelligent systems, recommender systems, chatbots, and virtual assistants.
- Automation, predictive systems, and decision support systems.
- Emerging trends in AI applications.

##### 3. Responsible AI

- Principles of fairness, accountability, transparency, and explainability.
- Bias in datasets and AI models.
- Ethical concerns in the design and deployment of AI systems.
- Privacy, consent, and responsible use of data.
- Social impact of AI.

##### 4. Python Programming

- Basics of Python syntax and programming constructs.
- Variables, data types, operators, conditional statements, and loops.
- Functions, modules, and packages.
- Lists, tuples, dictionaries, and sets.
- File handling and exception handling.
- Introduction to NumPy, Pandas, and Matplotlib.

##### 5. Mathematics and Statistics for AI

- Basic algebra, matrices, and vectors.
- Probability concepts and distributions.

- Descriptive statistics: mean, median, mode, variance, and standard deviation.
- Correlation and regression basics.
- Sampling techniques and hypothesis testing.
- Statistical interpretation of data.

## **6. Data Science and Analytics**

- Data collection, cleaning, preprocessing, and transformation.
- Exploratory Data Analysis.
- Data visualization techniques.
- Interpretation and presentation of analytical findings.
- Basics of data-driven decision-making.

## **7. Machine Learning**

- Concept and workflow of Machine Learning.
- Supervised, unsupervised, and reinforcement learning.
- Classification, regression, and clustering.
- Training, testing, and validation of models.
- Overfitting, underfitting, and regularization.
- Evaluation metrics and model performance.

## **8. Deep Learning**

- Introduction to neural networks.
- Perceptron and multilayer neural networks.
- Activation functions, loss functions, and optimizers.
- Basics of Convolutional Neural Networks and Recurrent Neural Networks.
- Introductory understanding of transformer models.
- Overview of TensorFlow and PyTorch.

## **9. Natural Language Processing**

- Basics of Natural Language Processing.
- Text preprocessing techniques.
- Tokenization, stemming, and lemmatization.
- Text classification and sentiment analysis.
- Chatbots and language models.
- Introductory concepts of generative AI in language tasks.

## **10. Computer Vision**

- Basics of digital images and image processing.
- Image classification and object detection.
- Image segmentation and feature extraction.
- Applications of computer vision in real-world scenarios.

## **11. Data Annotation and Curation**

- Importance of annotated data in AI systems.
- Data labeling, tagging, and validation.
- Data quality, consistency, and documentation.
- Dataset preparation and curation practices.
- Overview of annotation tools.

## **12. AI Tools and Development Environment**

- Jupyter Notebook, Google Colab, and integrated development environments.
- Version control using Git and GitHub.
- Common AI and ML libraries and platforms.
- APIs and cloud-based AI tools.
- Best practices for experimentation and reproducibility.

## **13. AI Deployment and MLOps**

- Basics of model deployment.
- Model monitoring and maintenance.
- Versioning of code, models, and datasets.
- Continuous integration and continuous deployment concepts in AI workflows.
- Basics of MLOps practices.

## **14. Cybersecurity and Responsible Use of AI**

- Safe handling of data, accounts, and credentials.
- Common cyber threats relevant to AI systems.
- Secure use of AI tools and platforms.
- Privacy protection and access control.
- Responsible digital practices in AI-enabled environments.

## **b. Post: Lab Assistant**

The following syllabus is prescribed for the online recruitment examination for the post of Lab Assistant. It is intended to assess basic conceptual knowledge, practical skills, and laboratory support capability in the field of Artificial Intelligence, with preference for hands-on experience in AI/ML using Python.

### **1. Fundamentals of Artificial Intelligence**

- Meaning, scope, and evolution of Artificial Intelligence.
- Basic AI concepts and terminology.
- Types of AI: Narrow AI, General AI, and Generative AI.
- Overview of AI domains and applications.

### **2. Introduction to Machine Learning**

- Meaning and objectives of Machine Learning.
- Supervised, unsupervised, and reinforcement learning.
- Classification and regression basics.
- Clustering basics and simple use cases.
- Training, testing, and validation concepts.

### **3. Python Programming for AI/ML**

- Basics of Python syntax and programming constructs.
- Variables, data types, operators, conditionals, and loops.
- Functions, modules, and packages.
- Lists, tuples, dictionaries, and sets.
- File handling and exception handling.
- Introduction to NumPy, Pandas, and Matplotlib.

### **4. Data Handling and Preparation**

- Data collection and data types.
- Data cleaning and preprocessing.
- Missing values, duplicates, and outliers.
- Data transformation and normalization.
- Basic exploratory data analysis.

### **5. Mathematics and Statistics for AI**

- Basics of algebra, matrices, and vectors.
- Probability and probability distributions.
- Mean, median, mode, variance, and standard deviation.
- Correlation and basic regression concepts.
- Sampling and basic hypothesis testing.

## **6. AI/ML Tools and Working Environment**

- Jupyter Notebook, Google Colab, and VS Code.
- Basic use of Git and GitHub.
- Installation and usage of Python libraries for AI/ML.
- Working with datasets and notebooks.
- Basic troubleshooting in AI/ML environments.

## **7. Practical AI/ML Concepts**

- Model development workflow.
- Feature selection and feature engineering basics.
- Model evaluation metrics.
- Overfitting and underfitting.
- Basic understanding of model tuning.

## **8. Introduction to Deep Learning**

- Basics of neural networks.
- Perceptron and multilayer neural networks.
- Activation functions, loss functions, and optimizers.
- Introductory understanding of CNN and RNN.
- Overview of TensorFlow and PyTorch.

## **9. Data Annotation and Dataset Management**

- Importance of quality data in AI.
- Data labeling and annotation concepts.
- Dataset preparation and organization.
- Data quality checks and documentation.

## **10. Responsible AI and Ethics**

- Fairness, transparency, and accountability.
- Bias in data and models.
- Privacy and confidentiality.
- Ethical use of AI tools in education and research.

## **11. Lab Support and Practical Assistance**

- Assisting in AI/ML practical sessions.
- Maintaining lab equipment and software setup.
- Supporting students/trainees in Python-based exercises.
- Managing datasets, notebooks, and learning resources.
- Basic record keeping and lab documentation.

## **12. Teaching and Communication Skills**

- Basic instructional support in laboratory sessions.
- Explanation of concepts to learners.
- Communication and problem-solving skills.
- Support for online and blended learning activities.

### **Nature of Questions**

Questions may be asked from any of the above topics to assess basic AI knowledge, Python-based practical understanding, lab assistance capability, and readiness to support teaching and training activities in the AI domain.

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(Shri K.L Nongbri, MCS)  
Joint Secretary to the Govt. of Meghalaya  
Information Technology & Communications Department  
& Member Secretary  
Meghalaya IT Society