

CBSE | DEPARTMENT OF SKILL EDUCATION

CURRICULUM FOR SESSION 2020-2021

ARTIFICIAL INTELLIGENCE (SUB. CODE 417)

CLASS – IX & X

OBJECTIVES OF THE COURSE:

The objective of this module/curriculum - which combines both Inspire and Acquire modules is to develop a readiness for understanding and appreciating Artificial Intelligence and its application in our lives. This module/curriculum focuses on:

1. Helping learners understand the world of Artificial Intelligence and its applications through games, activities and multi-sensorial learning to become AI-Ready.
2. Introducing the learners to three domains of AI in an age appropriate manner.
3. Allowing the learners to construct meaning of AI through interactive participation and engaging hands-on activities.
4. Introducing the learners to AI Project Cycle.
5. Introducing the learners to programming skills - Basic python coding language.

LEARNING OUTCOMES:

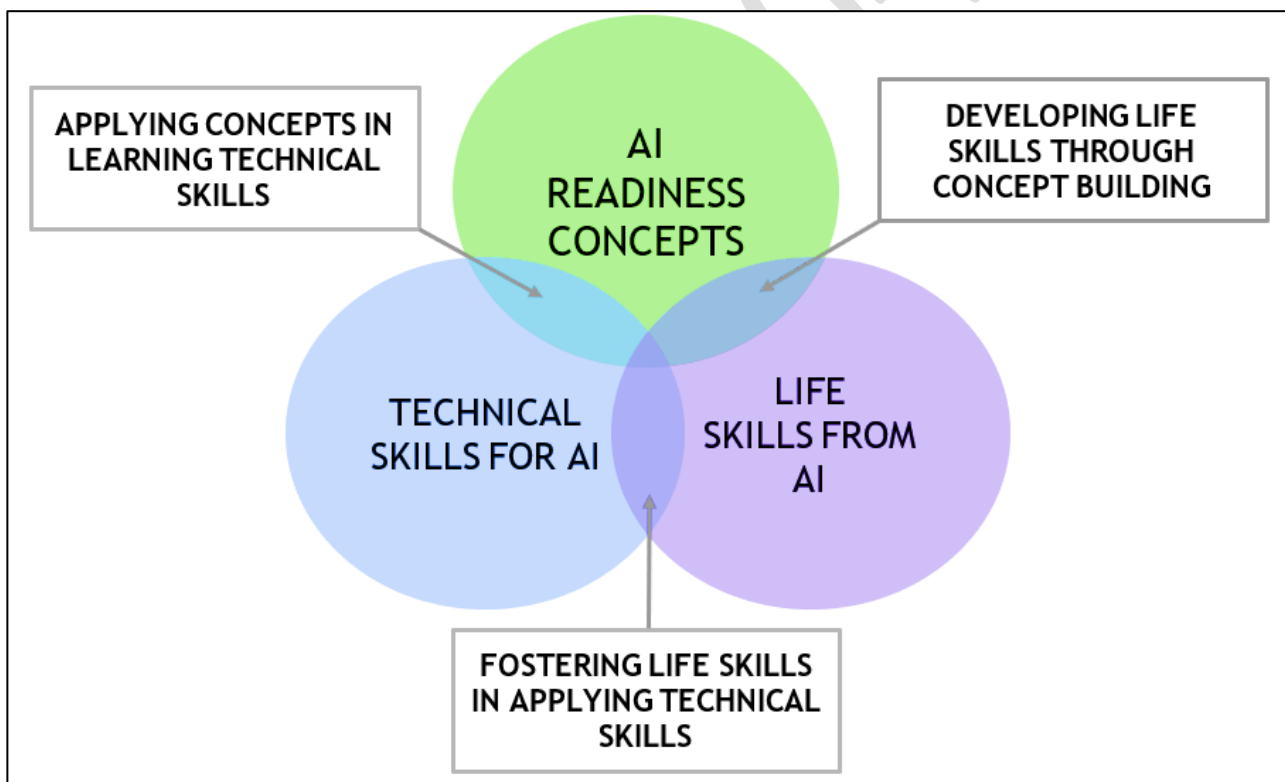
Learners will be able to

1. Identify and appreciate Artificial Intelligence and describe its applications in daily life.
2. Relate, apply and reflect on the Human-Machine Interactions to identify and interact with the three domains of AI: Data, Computer Vision and Natural Language Processing and Undergo assessment for analysing their progress towards acquired AI-Readiness skills.
3. Imagine, examine and reflect on the skills required for futuristic job opportunities.
4. Unleash their imagination towards smart homes and build an interactive story around it.
5. Understand the impact of Artificial Intelligence on Sustainable Development Goals to develop responsible citizenship.
6. Research and develop awareness of skills required for jobs of the future.
7. Gain awareness about AI bias and AI access and describe the potential ethical considerations of AI.
8. Develop effective communication and collaborative work skills.
9. Get familiar and motivated towards Artificial Intelligence and Identify the AI Project Cycle

framework.

10. Learn problem scoping and ways to set goals for an AI project and understand the iterative nature of problem scoping in the AI project cycle.
11. Brainstorm on the ethical issues involved around the problem selected.
12. Foresee the kind of data required and the kind of analysis to be done, identify data requirements and find reliable sources to obtain relevant data.
13. Use various types of graphs to visualise acquired data.
14. Understand, create and implement the concept of Decision Trees.
15. Understand and visualise computer's ability to identify alphabets and handwritings.
16. Understand and appreciate the concept of Neural Network through gamification and learn basic programming skills through gamified platforms.
17. Acquire introductory Python programming skills in a very user-friendly format.

SKILLS TO BE DEVELOPED:



SCHEME OF UNITS (SESSION 2020-2021)

Total Marks: 100 (Theory-50 + Practical-50)

This course is a planned sequence of instructions consisting of units meant for developing employability and vocational competencies of students of Class IX opting for skill subject along with other education subjects. The unit-wise distribution of hours and marks for class IX is as follows:

ARTIFICIAL INTELLIGENCE (417)			
Class IX (Session 2020-21)			
	UNITS	NO. OF HOURS for Theory and Practical 200	MAX. MARKS for Theory and Practical 100
PART A	Employability Skills		
	Unit 1 : Communication Skills-I	10	10
	Unit 2 : Self-Management Skills-I	10	
	Unit 3 : ICT Skills-I	10	
	Unit 4 : Entrepreneurial Skills-I	15	
	Unit 5 : Green Skills-I	05	
	Total	50	
PART B	Subject Specific Skills		Marks
	Unit 1: Introduction to Artificial Intelligence (AI)		40
	Unit 2: AI Project Cycle		
	Unit 3: Neural Network		
	Unit 4: Introduction to Python* (* To be assessed in Practicals only)		
	Total		
PART C	Practical Work – PYTHON		
	Unit 4: Introduction to Python		
	Practical Examination		35
	Viva Voce		
Total		35	
PART D	Project Work/Field Visit		
	Practical File/ Student Portfolio		15
	Viva Voce		
	Total		15
GRAND TOTAL		200	100

ARTIFICIAL INTELLIGENCE (417)
Class X (Session 2020-21)

	UNITS	NO. OF HOURS for Theory and Practical 200	MAX. MARKS for Theory and Practical 100
PART A	Employability Skills		
	Unit 1 : Communication Skills-II	10	10
	Unit 2 : Self-Management Skills-II	10	
	Unit 3 : ICT Skills-II	10	
	Unit 4 : Entrepreneurial Skills-II	15	
	Unit 5 : Green Skills-II	05	
	Total	50	
PART B	Subject Specific Skills		Marks
	Unit 1: Introduction to Artificial Intelligence (AI)		40
	Unit 2: AI Project Cycle		
	Unit 3: Advance Python* (*To be assessed in Practicals only)		
	Unit 4: Data Science		
	Unit 5: Computer Vision		
	Unit 6: Natural Language Processing		
	Unit 7: Evaluation		
	Total		
PART C	Practical Work – PYTHON (Unit 3: Advance Python)		
	Practical Examination		35
	Viva Voce		
	Total		35
PART D	Project Work/Field Visit		
	Practical File/ Student Portfolio		15
	Viva Voce		
	Total		15
	GRAND TOTAL	200	100

DETAILED CURRICULUM/TOPICS FOR CLASS IX:

Part-A: EMPLOYABILITY SKILLS

S. No.	Units	Duration in Hours
1.	Unit 1: Communication Skills-I	10
2.	Unit 2: Self-management Skills-I	10
3.	Unit 3: Basic Information and Communication Technology Skills-I	10
4.	Unit 4: Entrepreneurial Skills-I	15
5.	Unit 5: Green Skills-I	05
	TOTAL	50

NOTE: For Detailed Curriculum/ Topics to be covered under Part A: Employability Skills can be downloaded from CBSE website.

Part-B – SUBJECT SPECIFIC SKILLS

- Unit 1: Introduction to Artificial Intelligence (AI)
- Unit 2: AI Project Cycle
- Unit 3: Neural Network
- Unit 4: Introduction To Python (to be assessed through Practicals)

UNIT 1: INTRODUCTION TO AI

SUB-UNIT	LEARNING OUTCOMES	SESSION / ACTIVITY / PRACTICAL
Excite	To identify and appreciate Artificial Intelligence and describe its applications in daily life.	Session: Introduction to AI and setting up the context of the curriculum Ice Breaker Activity: Dream Smart Home idea <ul style="list-style-type: none">• Learners to design a rough layout of floor plan of their dream smart home.
	To relate, apply and reflect on the Human-Machine Interactions. To identify and interact with the three domains of AI: Data, Computer Vision and Natural Language Processing.	Recommended Activity: The AI Game <ul style="list-style-type: none">• Learners to participate in three games based on different AI domains.<ul style="list-style-type: none">- Game 1: Rock, Paper and Scissors (based on data)- Game 2: Mystery Animal (based on Natural Language Processing - NLP)- Game 3: Emoji Scavenger Hunt (based on Computer Vision - CV)
	To undergo an assessment for analysing progress towards acquired AI-Readiness skills.	Recommended Activity: <ul style="list-style-type: none">• AI Quiz (Paper Pen/Online Quiz)

SUB-UNIT	LEARNING OUTCOMES	SESSION / ACTIVITY / PRACTICAL
	To imagine, examine and reflect on the skills required for futuristic job opportunities.	Recommended Activity: To write a letter Writing a Letter to one's future self <ul style="list-style-type: none"> Learners to write a letter to self-keeping the future in context. They will describe what they have learnt so far or what they would like to learn someday
Relate	Learners to relate to application of Artificial Intelligence in their daily lives.	Video Session: To watch a video <ul style="list-style-type: none"> Introducing the concept of Smart Cities, Smart Schools and Smart Homes
	To unleash their imagination towards smart homes and build an interactive story around it. To relate, apply and reflect on the Human-Machine Interactions.	Recommended Activity: Write an Interactive Story <ul style="list-style-type: none"> Learners to draw a floor plan of a Home/School/City and write an interactive story around it using Story Speaker extension in Google docs.
Purpose	To understand the impact of Artificial Intelligence on Sustainable Development Goals to develop responsible citizenship.	Session: <ul style="list-style-type: none"> Introduction to UN Sustainable Development Goals
		Recommended Activity: Go Goals Board Game <ul style="list-style-type: none"> Learners to answer questions on Sustainable Development Goals
Possibilities	To research and develop awareness of skills required for jobs of the future. To imagine, examine and reflect on the skills required for the futuristic opportunities. To develop effective communication and collaborative work skills.	Session: Theme-based research and Case Studies <ul style="list-style-type: none"> Learners will listen to various case-studies of inspiring start-ups, companies or communities where AI has been involved in real-life. Learners will be allotted a theme around which they need to search for present AI trends and have to visualise the future of AI in and around their respective theme.
		Recommended Activity: Job Ad Creating activity <ul style="list-style-type: none"> Learners to create a job advertisement for a firm describing the nature of job available and the skill-set required for it 10 years down the line. They need to figure out how AI is going to transform the nature of jobs and create the Ad accordingly.
AI Ethics	To understand and reflect on the ethical issues around AI.	Video Session: Discussing about AI Ethics Recommended Activity: Ethics Awareness <ul style="list-style-type: none"> Students play the role of major stakeholders and they have to decide what is ethical and what is not for a given scenario.
	To gain awareness around AI bias and AI access.	Session: AI Bias and AI Access <ul style="list-style-type: none"> Discussing about the possible bias in data collection Discussing about the implications of AI technology

SUB-UNIT	LEARNING OUTCOMES	SESSION / ACTIVITY / PRACTICAL
	To let the students analyse the advantages and disadvantages of Artificial Intelligence.	<p>Recommended Activity: Balloon Debate</p> <ul style="list-style-type: none"> Students divide in teams of 3 and 2 teams are given same theme. One team goes in affirmation to AI for their section while the other one goes against it. They have to come up with their points as to why AI is beneficial/ harmful for the society.

UNIT 2: AI PROJECT CYCLE:

SUB-UNIT	LEARNING OUTCOMES	SESSION / ACTIVITY / PRACTICAL
Problem Scoping	Identify the AI Project Cycle framework.	<p>Session: Introduction to AI Project Cycle</p> <ul style="list-style-type: none"> Problem Scoping Data Acquisition Data Exploration Modelling Evaluation
	Learn problem scoping and ways to set goals for an AI project.	<p>Activity: Brainstorm around the theme provided and set a goal for the AI project.</p> <ul style="list-style-type: none"> Discuss various topics within the given theme and select one. List down/ Draw a mindmap of problems related to the selected topic and choose one problem to be the goal for the project.
	Identify stakeholders involved in the problem scoped. Brainstorm on the ethical issues involved around the problem selected.	<p>Activity: To set actions around the goal.</p> <ul style="list-style-type: none"> List down the stakeholders involved in the problem. Search on the current actions taken to solve this problem. Think around the ethics involved in the goal of your project.
	Understand the iterative nature of problem scoping for in the AI project cycle. Foresee the kind of data required and the kind of analysis to be done.	<p>Activity: Data and Analysis</p> <ul style="list-style-type: none"> What are the data features needed? Where can you get the data? How frequent do you have to collect the data? What happens if you don't have enough data? What kind of analysis needs to be done? How will it be validated? How does the analysis inform the action?
	Share what the students have discussed so far.	<p>Presentation: Presenting the goal, actions and data.</p>

SUB-UNIT	LEARNING OUTCOMES	SESSION / ACTIVITY / PRACTICAL
Data Acquisition	Identify data requirements and find reliable sources to obtain relevant data.	Activity: Introduction to data and its types. <ul style="list-style-type: none"> Students work around the scenarios given to them and think of ways to acquire data.
Data Exploration	To understand the purpose of Data Visualisation	Session: Data Visualisation <ul style="list-style-type: none"> Need of visualising data Ways to visualise data using various types of graphical tools.
	Use various types of graphs to visualise acquired data.	Recommended Activity: Let's use Graphical Tools <ul style="list-style-type: none"> To decide what kind of data is required for a given scenario and acquire the same. To select an appropriate graphical format to represent the data acquired. Presenting the graph sketched.
Modelling	Understand, create and implement the concept of Decision Trees.	Session: Decision Tree <ul style="list-style-type: none"> To introduce basic structure of Decision Trees to students.
		Recommended Activity: Decision Tree <ul style="list-style-type: none"> To design a Decision Tree based on the data given.
	Understand and visualise computer's ability to identify alphabets and handwritings.	Recommended Activity: Pixel It <ul style="list-style-type: none"> To create an "AI Model" to classify handwritten letters. Students develop a model to classify handwritten letters by dividing the alphabets into pixels. Pixels are then joined together to analyse a pattern amongst same alphabets and to differentiate the different ones.

UNIT 3: NEURAL NETWORK:

LEARNING OUTCOMES	SESSION / ACTIVITY / PRACTICAL
Understand and appreciate the concept of Neural Network through gamification.	Session: Introduction to neural network <ul style="list-style-type: none"> Relation between the neural network and nervous system in human body Describing the function of neural network.
	Recommended Activity: Creating a Human Neural Network <ul style="list-style-type: none"> Students split in four teams each representing input layer (X students), hidden layer 1 (Y students), hidden layer 2 (Z students) and output layer (1 student) respectively. Input layer gets data which is passed on to hidden layers after some processing. The output layer finally gets all information and gives meaningful information as output.

UNIT 4: INTRODUCTION TO PYTHON:

NOTE: Python should be assessed through Practicals only and should not be assessed with the Theory Exam.

LEARNING OUTCOMES	SESSION / ACTIVITY / PRACTICAL
Learn basic programming skills through gamified platforms.	Recommended Activity: <ul style="list-style-type: none">• Introduction to programming using Online Gaming portals like Code Combat.
Acquire introductory Python programming skills in a very user-friendly format.	Session: <ul style="list-style-type: none">• Introduction to Python language• Introducing python programming and its applications
	Practical: Python Basics <ul style="list-style-type: none">• Students go through lessons on Python Basics (Variables, Arithmetic Operators, Expressions, Data Types - integer, float, strings, using print() and input() functions)• Students will try some simple problem solving exercises on Python Compiler.
	Practical: Python Lists <ul style="list-style-type: none">• Students go through lessons on Python Lists (Simple operations using list)• Students will try some basic problem solving exercises using lists on Python Compiler.

DETAILED CURRICULUM/TOPICS FOR CLASS X:

Part-A: EMPLOYABILITY SKILLS

S. No.	Units	Duration in Hours
1.	Unit 1: Communication Skills-II	10
2.	Unit 2: Self-management Skills-II	10
3.	Unit 3: Basic Information and Communication Technology Skills-II	10
4.	Unit 4: Entrepreneurial Skills-II	15
5.	Unit 5: Green Skills-II	05
	TOTAL	50

NOTE: For Detailed Curriculum/ Topics to be covered under Part A: Employability Skills can be downloaded from CBSE website.

Part-B – SUBJECT SPECIFIC SKILLS

- Unit 1: Introduction to Artificial Intelligence (AI)
- Unit 2: AI Project Cycle
- Unit 3: Advance Python* (To be assessed in Practicals only)
- Unit 4: Data Science
- Unit 5: Computer Vision
- Unit 6: Natural Language Processing
- Unit 7: Evaluation

UNIT	SUB-UNIT	SESSION/ ACTIVITY/ PRACTICAL
INTRODUCTION TO AI	Let's Get Started	Session: Introduction to AI and related terminologies. <ul style="list-style-type: none">• Introducing AI, ML & DL.• Introduction to AI Domains (Data, CV & NLP)
		Session: Applications of AI – A look at Real-life AI implementations
		Session: AI Ethics
AI PROJECT CYCLE	Introduction	Session: Introduction to AI Project Cycle
	Problem Scoping	Session: Understanding Problem Scoping & Sustainable Development Goals
	Data Acquisition	Session: Simplifying Data Acquisition
	Data Exploration	Session: Visualising Data
	Modelling	Session: Introduction to modelling <ul style="list-style-type: none">• Introduction to Rule Based & Learning Based AI Approaches• Introduction to Supervised Unsupervised & Reinforcement Learning Models• Neural Networks
Evaluation	Session: Evaluating the idea!	

UNIT	SUB-UNIT	SESSION/ ACTIVITY/ PRACTICAL
ADVANCE PYTHON*	Recap	Session: Python Rewind
		Session: Introducing Jupyter Notebook
DATA SCIENCE	Introduction	Session: Introduction to Data Science
		Session: Applications of Data Science
	Data Science	Session: Python for Data Sciences
		Hands-on: Statistical Learning & Data Visualisation
		Activity: Personality Prediction
		Session: Understanding K-nearest neighbour model
AI Ethics	Session: Ethical issues around Data Science	
COMPUTER VISION	Introduction	Session: Introduction to Computer Vision
		Session: Applications of CV
	Concepts of Computer Vision	Session & Activity: Understanding CV Concepts <ul style="list-style-type: none"> • Pixels • How do computers see images? • Image Features
	OpenCV	Session: Introduction to OpenCV
		Hands-on: Image Processing
	Convolution Operator	Session: Understanding Convolution operator
		Activity: Convolution Operator
	Convolution Neural Network	Session: Introduction to CNN
		Session: Understanding CNN <ul style="list-style-type: none"> • Kernel • Layers of CNN • Model Training
		Activity: Testing CNN
	Support Vector Machines	Session: Introduction to Support Vector Machines <ul style="list-style-type: none"> • Support Vectors • Hyperplanes
AI Ethics	Session: Ethical issues around CV	
NATURAL LANGUAGE PROCESSING	Introduction	Session: Introduction to Natural Language Processing
		Session: NLP Applications
	Chatbots	Activity: Introduction to Chatbots
	Language Differences	Session: Human Language VS Computer Language
	Concepts of Natural Language Processing	Hands-on: Text processing <ul style="list-style-type: none"> • Data Processing • Bag of Words • TFIDF • NLTK
	Advanced NLP Concepts	Session: Advance NLP Concepts <ul style="list-style-type: none"> • Visualising Word Vectors • Dimensionality Reduction • Cosine Similarity
	Model training	Activity: Training the machine
	AI Ethics	Session: Ethical Issues around NLP
Activity: Construct a code of Ethics		

UNIT	SUB-UNIT	SESSION/ ACTIVITY/ PRACTICAL
EVALUATION	Introduction	Session: Introduction to Model Evaluation
	Confusion Matrix	Session & Activity: Confusion Matrix
	Evaluation Score Calculation	Session: Understanding Accuracy, Precision, Recall & F1 Score
		Activity: Practice Evaluation

*** NOTE: Python should be assessed through Practicals only and should not be assessed with the Theory Exam.**

TEACHER'S/ TRAINER'S QUALIFICATIONS:

Qualification and other requirements for appointment of teachers/trainers for teaching this subject, on contractual basis should be decided by the State/ UT. The suggestive qualifications and minimum competencies for the teacher should be as follows:

Qualification	Minimum Competencies	Age Limit
Diploma in Computer Science/ Information Technology <p style="text-align: center;">OR</p> Bachelor Degree in Computer Application/ Science/ Information Technology (BCA, B. Sc. Computer Science/ Information Technology) <p style="text-align: center;">OR</p> Graduate with PGDCA <p style="text-align: center;">OR</p> DOEACC A Level Certificate. The suggested qualification is the minimum criteria. However higher qualifications will also be acceptable.	<ul style="list-style-type: none"> • The candidate should have a minimum of 1 year of work experience in the same job role. • S/He should be able to communicate in English and local language. • S/He should have knowledge of equipment, tools, material, Safety, Health & Hygiene. 	<ul style="list-style-type: none"> • 18-37 years (as on Jan. 01 (year)) • Age relaxation to be provided as per Govt. rules

Teachers/Trainers form the backbone of Skill (Vocational) Education being imparted as an integral part of Rashtriya Madhyamik Shiksha *Abhiyan* (RMSA). They are directly involved in teaching of Skill (vocational) subjects and also serve as a link between the industry and the schools for arranging industry visits, On-the-Job Training (OJT) and placement.

These guidelines have been prepared with an aim to help and guide the States in engaging quality Teachers/Trainers in the schools. Various parameters that need to be looked into while engaging the Vocational Teachers/Trainers are mode and procedure of selection of Teachers/ Trainers, Educational Qualifications, Industry Experience, and Certification/ Accreditation.

The State may engage Teachers/Trainers in schools approved under the component of scheme of Vocationalisation of Secondary and Higher Secondary Education under RMSA in following ways:

- (i) Directly as per the prescribed qualifications and industry experience suggested by the PSS Central Institute of Vocational Education (PSSCIVE), NCERT or the respective Sector Skill Council (SSC).

OR

- (ii) Through accredited Vocational Training Providers accredited under the National Quality Assurance Framework (NQAF*) approved by the National Skill Qualification Committee on 21.07.2016. If the State is engaging Vocational Teachers/Trainers through the Vocational Training Provider (VTP), it should ensure that VTP should have been accredited at NQAF Level 2 or higher.

** The National Quality Assurance Framework (NQAF) provides the benchmarks or quality criteria which the different organizations involved in education and training must meet in order to be accredited by competent bodies to provide government-funded education and training/skills activities. This is applicable to all organizations offering NSQF-compliant qualifications.*

The educational qualifications required for being a Teacher/Trainer for a particular job role are clearly mentioned in the curriculum for the particular NSQF compliant job role. The State should ensure that teachers/ trainers deployed in the schools have relevant technical competencies for the NSQF qualification being delivered. Teachers/Trainers preferably should be certified by the concerned Sector Skill Council for the particular Qualification Pack/Job role which he will be teaching. Copies of relevant certificates and/or record of experience of the teacher/trainer in the industry should be kept as record.

To ensure the quality of the Teachers/Trainers, the State should ensure that a standardized procedure for selection of (Vocational) Teachers/Trainers is followed. The selection procedure should consist of the following:

- (i) Written test for the technical/domain specific knowledge related to the sector;
- (ii) Interview for assessing the knowledge, interests and aptitude of trainer through a panel of experts from the field and state representatives; and
- (iii) Practical test/mock test in classroom/workshop/laboratory.

In case of appointment through VTPs, the selection may be done based on the above procedure by a committee having representatives of both the State Government and the VTP.

The State should ensure that the Teachers/ Trainers who are recruited should undergo induction training of 20 days for understanding the scheme, NSQF framework and Vocational Pedagogy before being deployed in the schools.

The State should ensure that the existing trainers undergo in-service training of 5 days every year to make them aware of the relevant and new techniques/approaches in their sector and understand the latest trends and policy reforms in vocational education.

The Head Master/Principal of the school where the scheme is being implemented should facilitate and ensure that the (Vocational) Teachers/Trainers:

- Prepare session plans and deliver sessions which have a clear and relevant purpose and which engage the students;
- Deliver education and training activities to students, based on the curriculum to achieve the learning outcomes;
- Make effective use of learning aids and ICT tools during the classroom sessions;
- Engage students in learning activities, which include a mix of different methodologies, such as project based work, team work, practical and simulation based learning experiences;
- Work with the institution's management to organise skill demonstrations, site visits, on-job trainings, and presentations for students in cooperation with industry, enterprises and other workplaces;
- Identify the weaknesses of students and assist them in up-gradation of competency;
- Cater to different learning styles and level of ability of students;
- Assess the learning needs and abilities, when working with students with different abilities
- Identify any additional support the student may need and help to make special arrangements for that support;
- Provide placement assistance

Assessment and evaluation of (Vocational) Teachers/Trainers is very critical for making them aware of their performance and for suggesting corrective actions. The States/UTs should ensure that the performance of the (Vocational) Teachers/Trainers is appraised annually. Performance based appraisal in relation to certain pre-established criteria and objectives should be done periodically to ensure the quality of the (Vocational) Teachers/Trainers.

Following parameters may be considered during the appraisal process:

- Participation in guidance and counseling activities conducted at Institutional, District and State level;
- Adoption of innovative teaching and training methods;
- Improvement in result of vocational students of Class X or Class XII;
- Continuous up-gradation of knowledge and skills related to the vocational pedagogy, communication skills and vocational subject;
- Membership of professional society at District, State, Regional, National and International level;
- Development of teaching-learning materials in the subject area;
- Efforts made in developing linkages with the Industry/Establishments;
- Efforts made towards involving the local community in Vocational Education
- Publication of papers in National and International Journals;
- Organisation of activities for promotion of vocational subjects;
- Involvement in placement of students/student support services.