

# **CBSE | DEPARTMENT OF SKILL EDUCATION**

## **CURRICULUM FOR SESSION 2021-2022**

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### **ARTIFICIAL INTELLIGENCE (SUB. CODE 417)**

#### **CLASS – 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.

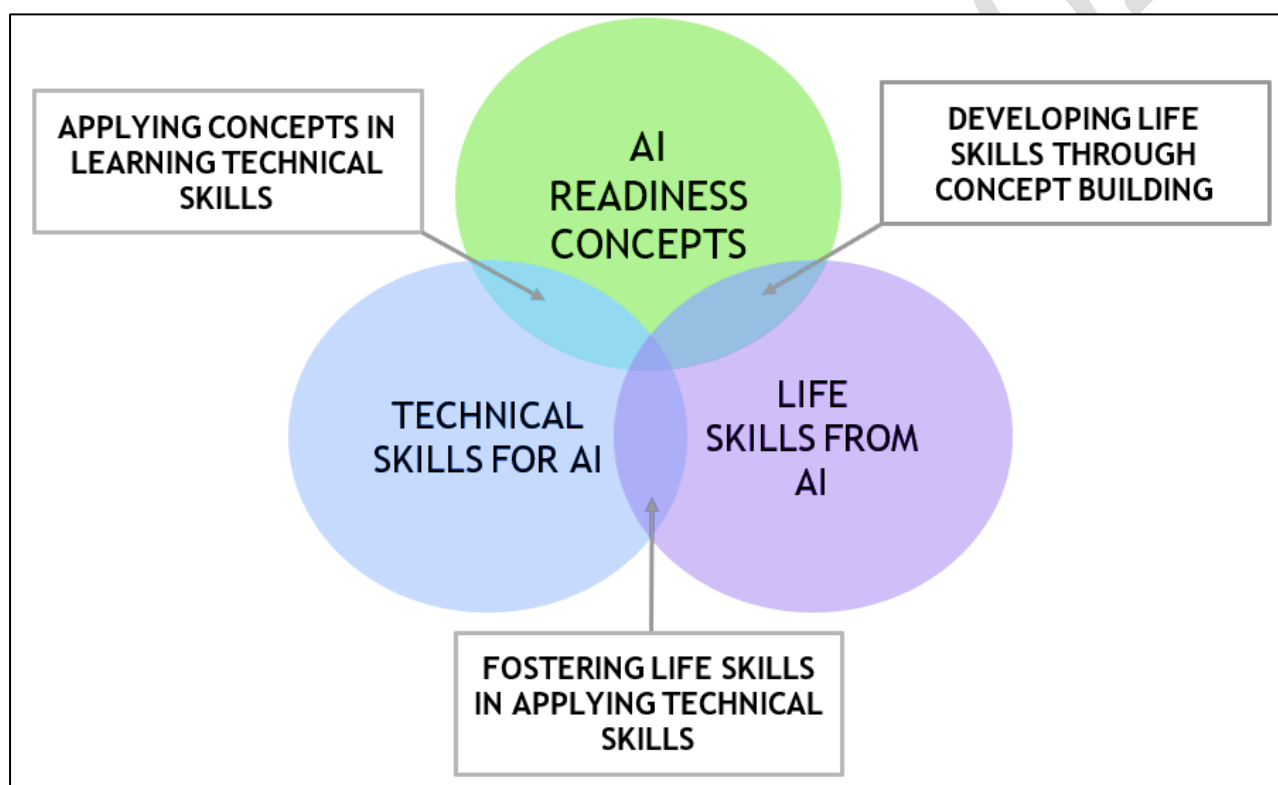
#### **LEARNING OUTCOMES:**

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 visualize acquired data.
14. Understand, create and implement the concept of Decision Trees.
15. Understand and visualize 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 STUDIES:**

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 & X is as follows:

# ARTIFICIAL INTELLIGENCE (SUBJECT CODE 417)

## CLASS – X (SESSION 2021-2022)

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

	TERM	UNITS	NO. OF HOURS for Theory and Practical	MAX. MARKS for Theory and Practical
PART A	Employability Skills			
	TERM I	Unit 1: Communication Skills-II	10	5
		Unit 2: Self-Management Skills-II	10	
		Unit 3: ICT Skills-II	10	
	TERM II	Unit 4: Entrepreneurial Skills-II	15	5
		Unit 5: Green Skills-II	05	
	Total		50	10
PART B	Subject Specific Skills			Marks
	TERM I	Unit 1: Introduction to Artificial Intelligence		10
		Unit 2: AI Project Cycle		10
		Unit 3: Advance Python* (*To be assessed in Practicals only)		
	TERM II	Unit 4: Data Science* (*To be assessed in Practicals only)		
		Unit 5: Computer Vision* (*To be assessed in Practicals only)		
		Unit 6: Natural Language Processing		10
		Unit 7: Evaluation		10
	Total			40
PART C		<b>Practical Work:</b> <ul style="list-style-type: none"> <li>Unit 3: Advance Python</li> <li>Unit 4: Data Science</li> <li>Unit 5: Computer Vision</li> </ul>		20
		Practical Examination		10
		Viva Voce		5
	Total			35
PART D		<b>Project Work / Field Visit / Practical File / Student Portfolio</b>		10
		Viva Voce		5
	Total			15
		<b>GRAND TOTAL</b>	<b>200</b>	<b>100</b>

## 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: Information and Communication Technology Skills-II	10
4.	Unit 4: Entrepreneurial Skills-II	15
5.	Unit 5: Green Skills-II	05
	<b>TOTAL</b>	<b>50</b>

**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 through Practicals)
- ❖ Unit 4: Data Science (To be assessed through Practicals)
- ❖ Unit 5: Computer Vision (To be assessed through Practicals)
- ❖ Unit 6: Natural Language Processing
- ❖ Unit 7: Evaluation

UNIT	SUB-UNIT	SESSION/ ACTIVITY/ PRACTICAL
<b>1. INTRODUCTION TO AI</b>	Foundational concepts of AI	<b>Session:</b> What is Intelligence?
		<b>Session:</b> Decision Making. <ul style="list-style-type: none"> <li>• How do you make decisions?</li> <li>• Make your choices!</li> </ul>
		<b>Session:</b> what is Artificial Intelligence and what is not?
	Basics of AI: Let's Get Started	<b>Session:</b> Introduction to AI and related terminologies. <ul style="list-style-type: none"> <li>• Introducing AI, ML &amp; DL.</li> <li>• Introduction to AI Domains (Data, CV &amp; NLP)</li> </ul>
		<b>Session:</b> Applications of AI – A look at Real-life AI implementations
		<b>Session:</b> AI Ethics
<b>2. AI PROJECT CYCLE</b>	Introduction	<b>Session:</b> Introduction to AI Project Cycle
	Problem Scoping	<b>Session:</b> Understanding Problem Scoping & Sustainable Development Goals
	Data Acquisition	<b>Session:</b> Simplifying Data Acquisition
	Data Exploration	<b>Session:</b> Visualising Data

UNIT	SUB-UNIT	SESSION/ ACTIVITY/ PRACTICAL
	Modelling	<b>Session:</b> Introduction to modelling <ul style="list-style-type: none"> <li>• Introduction to Rule Based &amp; Learning Based AI Approaches</li> <li>• Introduction to Supervised Unsupervised &amp; Reinforcement Learning Models</li> <li>• Neural Networks</li> </ul>
	Evaluation	<b>Session:</b> Evaluating the idea!
<b>3. ADVANCE PYTHON</b> (To be assessed through Practicals)	Recap	<b>Session:</b> Jupyter Notebook
		<b>Session:</b> Introduction to Python
		<b>Session:</b> Python Basics
<b>4. DATA SCIENCES</b> (To be assessed through Practicals)	Introduction	<b>Session:</b> Introduction to Data Science
		<b>Session:</b> Applications of Data Science
		<b>Session:</b> Revisiting AI Project Cycle
	Concepts of Data Sciences	<b>Session:</b> Python for Data Sciences
		<b>Session:</b> Statistical Learning & Data Visualisation
	K-nearest neighbour model	<b>Activity:</b> Personality Prediction
		<b>Session:</b> Understanding K-nearest neighbour model
<b>5. COMPUTER VISION</b> (To be assessed through Practicals)	Introduction	<b>Session:</b> Introduction to Computer Vision
		<b>Session:</b> Applications of CV
	Concepts of Computer Vision	<b>Session &amp; Activity:</b> Understanding CV Concepts <ul style="list-style-type: none"> <li>• Pixels</li> <li>• How do computers see images?</li> <li>• Image Features</li> </ul>
	OpenCV	<b>Session:</b> Introduction to OpenCV
		<b>Hands-on:</b> Image Processing
	Convolution Operator	<b>Session:</b> Understanding Convolution operator
		<b>Activity:</b> Convolution Operator
	Convolution Neural Network	<b>Session:</b> Introduction to CNN
		<b>Session:</b> Understanding CNN <ul style="list-style-type: none"> <li>• Kernel</li> <li>• Layers of CNN</li> </ul>
		<b>Activity:</b> Testing CNN
<b>6. NATURAL LANGUAGE PROCESSING</b>	Introduction	<b>Session:</b> Introduction to Natural Language Processing
		<b>Session:</b> NLP Applications
		<b>Session:</b> Revisiting AI Project Cycle
	Chatbots	<b>Activity:</b> Introduction to Chatbots
	Language Differences	<b>Session:</b> Human Language VS Computer Language

UNIT	SUB-UNIT	SESSION/ ACTIVITY/ PRACTICAL
	Concepts of Natural Language Processing	<b>Hands-on:</b> Text processing <ul style="list-style-type: none"> <li>• Data Processing</li> <li>• Bag of Words</li> <li>• TFIDF</li> <li>• NLTK</li> </ul>
<b>7. EVALUATION</b>	Introduction	<b>Session:</b> Introduction to Model Evaluation
	Confusion Matrix	<b>Session &amp; Activity:</b> Confusion Matrix
	Evaluation Score Calculation	<b>Session:</b> Understanding Accuracy, Precision, Recall & F1 Score
		<b>Activity:</b> Practice Evaluation

**\* NOTE: Unit 3, 4 & 5 should be assessed through Practicals only and should not be assessed with the Theory Exam.**

#### **LIST OF ITEMS/ EQUIPMENTS (MINIMUM REQUIREMENTS):**

The equipment / materials listed below are required to conduct effective hands-on learning sessions while delivering the AI curriculum to class 10 students. The list below consists of minimal configuration required to execute the AI curriculum for class 10 and create social impact real time solutions/ projects. The quantities mentioned here are recommended for a batch of 20 students keeping the human-machine ratio as 2:1. An exhaustive list may be compiled by the teacher(s) teaching the subject.

S. NO.	ITEM NAME, DESCRIPTION & SPECIFICATION
<b>A</b>	<b>SYSTEM SPECIFICATIONS</b>
1	Processor: Intel® Core™ i5-7300U Processor or equivalent with minimum SYSmark® 2018 Rating of 750 or higher
2	Graphic Card: Integrated graphics
3	Form Factor: - USFF (Ultra Small Form factor) System chassis volume less than One Litre
4	RAM: 8GB DDR4 – 2400MHz or above
5	Storage: 500 GB HDD – 7200 rpm
6	Display: 18.5" LED Monitor with HDMI, in-built-speaker,
7	Keyboard: Keyboard with numerical keypad (recommended)
8	Mouse: Optical Mouse
9	Webcam: Full HD Camera
10	Headphones with Mic
11	Dual Band Wireless Connectivity Min 800 Mbps
12	Bluetooth V4.2 or Higher
13	Ports: 4 USB 3.0 ports, dual high-definition display ports (HDMI 2.0/DP/thunderbolt 3.0 ports), High definition 8-channel audio through HDMI interface or through audio jack.
14	VPU: - Integrated or support for VPU - vision processing unit to accelerate AI machine vision applications.
<b>B</b>	<b>SOFTWARE SPECIFICATIONS</b>
1	Operating System: Any
2	Anti-Virus Activated

S. NO.	ITEM NAME, DESCRIPTION & SPECIFICATION
3	Internet Browser: Google Chrome
4	Productivity Suite: Any (Google+ Suite recommended)
5	Anaconda Navigator Distribution ( <a href="https://bit.ly/AI-installation-guide">https://bit.ly/AI-installation-guide</a> )
6	Conceptual installations ( <a href="https://bit.ly/AI-installation-guide">https://bit.ly/AI-installation-guide</a> )
7	Intel OpenVINO tools
8	Python

**NOTE:** In keeping with the spirit of Recycle, Upcycle and Reuse, it is recommended to make use of any equipment/ devices/ accessories from the existing inventory in school.

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

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.

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*\* 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.*

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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 Headmaster/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.