CBSE | DEPARTMENT OF SKILL EDUCATION
CURRICULUM FOR SESSION 2023-2024

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 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:
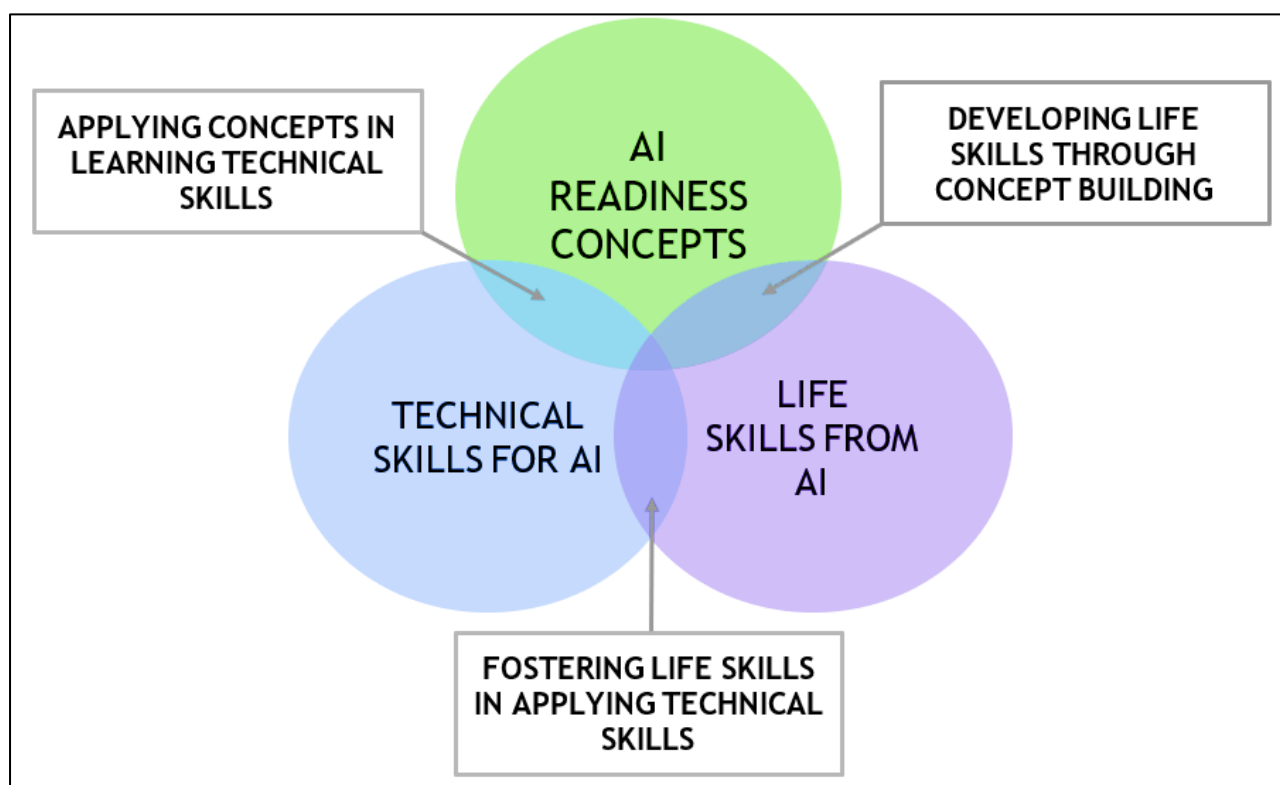
SCHEME OF STUDIES:

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 – IX (SESSION 2023-2024)
Total Marks: 100 (Theory-50 + Practical-50)

	UNITS	NO. OF HOURS for Theory and Practical	MAX. MARKS for Theory and Practical
PART A	**Employability Skills**		
	Unit 1: Communication Skills-I	10	2
	Unit 2: Self-Management Skills-I	10	2
	Unit 3: ICT Skills-I	10	2
	Unit 4: Entrepreneurial Skills-I	15	2
	Unit 5: Green Skills-I	05	2
	Total	**50**	**10**
PART B	**Subject Specific Skills**		
	Unit 1: Introduction to Artificial Intelligence (AI)		10
	Unit 2: AI Project Cycle		15
	Unit 3: Neural Network		05
	Unit 4: Introduction to Python		10
	Total		**40**
PART C	**Practical Work**		
	Unit 4: Introduction to Python **Practical File (minimum 15 programs)**		15
	Practical Examination • Simple programs using input and output function • Variables, Arithmetic Operators, Expressions, Data Types • Flow of control and conditions • Lists ** Any 3 programs based on the above topics*		15
	Viva Voce		5
	Total		**35**
PART D	**Project Work / Field Visit / Student Portfolio** ** relate it to Sustainable Development Goals* **(Any one has to be done)**		15
	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: Information and Communication Technology Skills-I	10
4.	Unit 4: Entrepreneurial Skills-I	15
5.	Unit 5: Green Skills-I	05
	TOTAL	**50**

NOTE: **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

UNIT 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE (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 • Learners to design a rough layout of floor plan of their dream smart home. • Recommended Activity: Make a statement about lighting and LUIS will interpret and adjust the house accordingly (https://aidemos.microsoft.com/luis/demo)

	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
		• Learners to participate in three games based on different AI domains.
		  – Game 1: Rock, Paper and Scissors (based on data) (https://next.rockpaperscissors.ai/)
		  – Game 2: Semantris (based on Natural Language Processing - NLP) (https://research.google.com/semantris/)
		  – Game 3: Quick Draw (based on Computer Vision - CV) (https://quickdraw.withgoogle.com/)

	To undergo an assessment for analysing progress towards acquired AI-Readiness skills.	Recommended Activity: • 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 • 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 • 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 • Learners to draw a floor plan of a Home/School/City and write an interactive story around it using Inklewriter. (https://www.inklewriter.com/)
Purpose	To understand the impact of Artificial Intelligence on Sustainable Development Goals to develop responsible citizenship.	Session: • Introduction to UN Sustainable Development Goals
		Recommended Activity: • Go Goals Board Game: Learners to answer questions on Sustainable Development Goals • AI for Ocean- "helping to conserve oceans is by fighting plastic pollution with machine learning." (https://code.org/oceans)
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 • 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 • 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 • Students play the role of major stakeholders, and they have to decide what is ethical and what is not for a given scenario. • Students to explore Moral Machine (https://www.moralmachine.net/) to understand more about the impact of ethical concerns

SUB-UNIT	LEARNING OUTCOMES	SESSION / ACTIVITY / PRACTICAL
	To gain awareness around AI bias and AI access.	Session: AI Bias and AI Access • Discussing about the possible bias in data collection • Discussing about the implications of AI technology
	To let the students analyse the advantages and disadvantages of Artificial Intelligence.	Recommended Activity: Balloon Debate • 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.	Session: Introduction to AI Project Cycle • Problem Scoping • Data Acquisition • Data Exploration • Modelling • Evaluation
	Learn problem scoping and ways to set goals for an AI project.	Activity: Brainstorm around the theme provided and set a goal for the AI project. • Discuss various topics within the given theme and select one. • Fill in the 4Ws problem canvas and a problem statement to learn more about the problem identified in the community/ society • List down/ Draw a mind map 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.	Activity: To set actions around the goal. • 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.	Activity: Data and Analysis • What are the data features needed? • How will the features collected affect the problem? • 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?

SUB-UNIT	LEARNING OUTCOMES	SESSION / ACTIVITY / PRACTICAL
	Share what the students have discussed so far.	Presentation: Presenting the goal, actions and data. Teamwork Activity: • Brainstorming solutions for the problem statement.
Data Acquisition	Identify data requirements and find reliable sources to obtain relevant data.	Activity: Introduction to data and its types. • Students work around the scenarios given to them and think of ways to acquire data. Activity: Data Features • Identifying the possible data features affecting the problem. Activity: System Maps • Creating system maps considering data features identified.
Data Exploration	To understand the purpose of Data Visualisation	Session: Data Visualisation • Need of visualising data • Ways to visualise data using various types of graphical tools. • Quiz Time
	Use various types of graphs to visualise acquired data.	Recommended Activities: Let's use Graphical Tools • Selecting an appropriate graphical format and presenting the graph sketched. • Understanding graphs using (https://datavizcatalogue.com/) • Listing of newly learnt data visualization techniques. • Top 10 Song Prediction: Identify the data features, collect the data and convert into graphical representation. • Collect and store data in a spreadsheet and create some graphical representations to understand the data effectively.
Modelling	Understand modeling (Rule-based & Learning-based)	Session: Modeling • Introduction to modeling and types of models (Rule-based & Learning-based)
		Recommended Activity: Rule-based & Learning-based) • Rule-based: Students can be asked to create text to speech bot using (https://theaiplayground.com/blocks/new) • Learning-based Activity: Students can be asked to use (https://teachablemachine.withgoogle.com/)
	Understand, create and implement the concept of Decision Trees.	Session: Decision Tree • To introduce basic structure of Decision Trees to students. Recommended Activity: Decision Tree • To design a Decision Tree based on the data given. (Spot the Elephant)

SUB-UNIT	LEARNING OUTCOMES	SESSION / ACTIVITY / PRACTICAL
	Understand and visualise computer's ability to identify alphabets and handwritings.	Recommended Activity: Pixel It • 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 • Relation between the neural network and nervous system in human body • Describing the function of neural network.
	Recommended Activity: Creating a Human Neural Network • 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. Teamwork Activity: • Students in groups shall be assigned the task to create and present the neural networks on a cardboard/chart paper.

UNIT 4: INTRODUCTION TO PYTHON:

LEARNING OUTCOMES	SESSION / ACTIVITY / PRACTICAL
Learn basic programming skills through gamified platforms.	Recommended Activity: • Introduction to programming using Online Gaming portals like Code Combat.
Acquire introductory Python programming skills in a very user-friendly format.	Session: • Introduction to Python language • Introducing python programming and its applications
	Theory + Practical: Python Basics • Students go through lessons on Python Basics (Variables, Arithmetic Operators, Expressions, Comparison Operators, logical operators, Assignment Operators, Data Types - integer, float, strings, type conversion, using print() and input() functions) • Students will try some simple problem-solving exercises on Python Compiler.

LEARNING OUTCOMES	SESSION / ACTIVITY / PRACTICAL
	Practical: Flow of control and conditions
	1. Students go through lessons on conditional and iterative statements (if, for and while)
	2. Students will try some basic problem-solving exercises using conditional and iterative statements on Python Compiler.
	Practical: Python Lists
	3. Students go through lessons on Python Lists (Simple operations using list)
	4. Students will try some basic problem-solving exercises using lists on Python Compiler.

PART-C: PRACTICAL WORK

UNIT 4: INTRODUCTION TO PYTHON: Suggested Program List

PRINT	• To print personal information like Name, Father's Name, Class, School Name. • To print the following patterns using multiple print commands-
	• To find square of number 7 • To find the sum of two numbers 15 and 20. • To convert length given in kilometers into meters. • To print the table of 5 up to five terms. • To calculate Simple Interest if the principle_amount = 2000 rate_of_interest = 4.5 time = 10
INPUT	• To calculate Area and Perimeter of a rectangle • To calculate Area of a triangle with Base and Height • To calculating average marks of 3 subjects • To calculate discounted amount with discount % • To calculate Surface Area and Volume of a Cuboid

LIST	• Create a list in Python of children selected for science quiz with following names- Arjun, Sonakshi, Vikram, Sandhya, Sonal, Isha, Kartik
	Perform the following tasks on the list in sequence-
	   ○ Print the whole list
	   ○ Delete the name "Vikram" from the list
	   ○ Add the name "Jay" at the end
	   ○ Remove the item which is at the second position.
	• Create a list num=[23,12,5,9,65,44]
	   ○ Print the length of the list
	   ○ Print the elements from second to fourth position using positive indexing
	   ○ Print the elements from position third to fifth using negative indexing

	• Create a list of first 10 even numbers, add 1 to each list item and print the final list. • Create a list List_1=[10,20,30,40]. Add the elements [14,15,12] using extend function. Now sort the final list in ascending order and print it.
IF, FOR, WHILE	• Program to check if a person can vote • To check the grade of a student • Input a number and check if the number is positive, negative or zero and display an appropriate message • To print first 10 natural numbers • To print first 10 even numbers • To print odd numbers from 1 to n • To print sum of first 10 natural numbers • Program to find the sum of all numbers stored in a list
Important Links	• https://cbseacademic.nic.in/web_material/Curriculum21/publication/secondary/Python_Content_Manual.pdf • http://bit.ly/loops_jupyter • https://bit.ly/40uovYK

PART-D: Project Work / Field Visit / Student Portfolio
(relate it to Sustainable Development Goals)

Suggested Projects/ Field Visit / Portfolio (Any one has to be done)

Suggested Projects	1. Create an AI Model using tools like-
	    ○ Teachable Machine (https://teachablemachine.withgoogle.com/)
	    ○ Machine Learning For Kids (https://machinelearningforkids.co.uk/)
	2. Choose an issue that pertains to the objectives of sustainable development and carry out the actions listed below.
	    ○ To understand more about the problem identified, create a 4Ws problem canvas.
	    ○ Identify the data features and create a system map to understand relationship between them
	    ○ Visualize the data collected graphically (Spreadsheet software to be used store and visualize the data)
	    ○ Suggest an AI enabled solution to it (Prototype/Research Work)

Suggested Field Visit	Visit to an industry or IT company or any other place that is creating or using AI applications and present the report for the same. Visit can be in physical or virtual mode.
Suggested Student Portfolio	Maintaining a record of all AI activities and projects (For Example Letter to Futureself, Smart Home Floor Plan, Future Job Advertisement, Research Work on AI for SDGs and AI in Different Sectors, 4Ws canvas, System Map). **(Minimum 5 Activities)**

ARTIFICIAL INTELLIGENCE (SUBJECT CODE 417)
CLASS – X (SESSION 2023-2024)

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

	UNITS	NO. OF HOURS for Theory and Practical	MAX. MARKS for Theory and Practical
PART A	**Employability Skills**		
	Unit 1: Communication Skills-II	10	2
	Unit 2: Self-Management Skills-II	10	2
	Unit 3: ICT Skills-II	10	2
	Unit 4: Entrepreneurial Skills-II	15	2
	Unit 5: Green Skills-II	05	2
	Total	**50**	**10**
PART B	**Subject Specific Skills**		
	Unit 1: Introduction to Artificial Intelligence (AI)		7
	Unit 2: AI Project Cycle		9
	Unit 3: Advance Python *(To be assessed in Practicals only)*		--
	Unit 4: Data Science (Introduction, Applications of Data Sciences, Data Science: Getting Started (up to Data Access), *remaining portion is to be assessed in practical*		4
	Unit 5: Computer Vision (Introduction, Applications of Computer Vision, Computer Vision: Getting Started (up to RGB Images), *remaining portion is to be assessed in practical*		4
	Unit 6: Natural Language Processing		8
	Unit 7: Evaluation		8
	Total		**40**
PART C	**Practical Work:**		
	Practical File with minimum 15 Programs		15
	Practical Examination		5
	• Unit 3: Advance Python		5
	• Unit 4: Data Science		5
	• Unit 5: Computer Vision		
	Viva Voce		5
	Total		**35**
PART D	Project Work / Field Visit / Student Portfolio (Any one to be done)		10
	Viva Voce		5
	Total		**15**
	GRAND TOTAL	**200**	**100**

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
	TOTAL	**50**

Note: The 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
- ❖ Unit 4: Data Science
- ❖ Unit 5: Computer Vision
- ❖ Unit 6: Natural Language Processing
- ❖ Unit 7: Evaluation

UNIT 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Foundational concepts of AI	Understand the concept of human intelligence and its various components such as reasoning, problem-solving, and creativity	**Session**: What is Intelligence?
		Session: Decision Making. ● How do you make decisions? ● Make your choices!
		Session: what is Artificial Intelligence and what is not?
Basics of AI: Let's Get Started	Understand the concept of Artificial Intelligence (AI) and its domains	**Session**: Introduction to AI and related terminologies. ● Introducing AI, ML & DL. ● Introduction to AI Domains (Data Sciences, CV & NLP) ● Gamified tools for each domain- ○ Data Sciences- Impact Filter (Impact of rise in temperature on different species) https://artsexperiments.withgoogle.com/impactfilter/ ○ CV- Autodraw (It pairs machine learning with drawings from talented artists to help you draw stuff fast.) https://www.autodraw.com/

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
		o NLP- Wordtune (AI writing tool that rewrites, rephrases, and rewords your writing) https://www.wordtune.com/
	Explore the use of AI in real Life.	**Session:** Applications of AI – A look at Real-life AI implementations
	Learn about the ethical concerns involved in AI development, such as AI bias, data privacy and how they can be addressed.	**Session:** AI Ethics ● Moral Machine Activity : a platform for gathering a human perspective on moral decisions made by machine intelligence, such as self-driving cars. http://moralmachine.mit.edu/

UNIT 2 : AI PROJECT CYCLE

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Introduction	Understand the stages involved in the AI project cycle, such as problem scoping, data collection, data exploration, modeling, evaluation.	**Session:** Introduction to AI Project Cycle
Problem Scoping	Learn about the importance of project planning in AI development and how to define project goals and objectives.	**Session:** Understanding Problem Scoping & Sustainable Development Goals
Data Acquisition	Develop an understanding of the importance of data collection in AI and how to choose the right data sources.	**Session:** Simplifying Data Acquisition
Data Exploration	Know various data exploration techniques and its importance	**Session:** Visualising Data
Modelling	Know about the different machine learning algorithms used to train AI models	**Session:** Introduction to modelling ● Introduction to Rule Based & Learning Based AI Approaches ● Activity : Teachable machine to demonstrate Supervised Learning https://teachablemachine.withgoogle.com/ ● Activity : Infinite Drum Machine to demonstrate Unsupervised learning https://experiments.withgoogle.com/ai/drum-machine/view/ ● Introduction to Supervised, Unsupervised & *Reinforcement Learning Models(Optional)*** ● Neural Networks
Evaluation	Know the importance of evaluation and various metrics available for evaluation	**Session:** Evaluating the idea!

UNIT 3 : ADVANCE PYTHON (To be assessed through Practicals)

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Recap	Understand to work with Jupyter Notebook, creating virtual environment, installing Python Packages.	**Session:** Jupyter Notebook
	Able to write basic Python programs using fundamental concepts such as variables, data types, operators, and control structures.	**Session:** Introduction to Python
	Able to use Python built-in functions and libraries.	**Session:** Python Basics

UNIT 4: DATA SCIENCES (To be assessed through Theory)

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Introduction	Define the concept of Data Science and understand its applications in various fields.	**Session:** Introduction to Data Science
		Session: Applications of Data Science
Getting Started	Understand the basic concepts of data acquisition, visualization, and exploration.	**Session:** Revisiting AI Project Cycle, Data Collection, Data Access Activities: Game: Rock, Paper & Scissors https://next.rockpaperscissors.ai/

UNIT 4: DATA SCIENCES (To be assessed through Practicals)

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Python Packages	Use Python libraries such as NumPy, Pandas, and Matplotlib for data analysis and visualization.	**Session**: Python for Data Sciences • Numpy • Pandas • Matplotlib
Concepts of Data Sciences	Understand the basic concepts of statistics, such as mean, median, mode, and standard deviation, and apply them to analyze data using various Python packages.	**Session:** Statistical Learning & Data Visualisation
K-nearest neighbour model (Optional)**	*Understand the basic concepts of the KNN algorithm and its applications in supervised learning.*	*Activity: Personality Prediction (Optional)*** *Session: Understanding K-nearest neighbour model (Optional)***

UNIT 5: COMPUTER VISION (To be assessed through Theory)

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Introduction	Define the concept of Computer Vision and understand its applications in various fields.	**Session:** Introduction to Computer Vision **Session:** Applications of CV
Concepts of Computer Vision	Understand the basic concepts of image representation, feature extraction, object detection, and segmentation.	**Session:** Understanding CV Concepts ● Computer Vision Tasks ● Basics of Images-Pixel, Resolution, Pixel value ● Grayscale and RGB images Activities: ● Game- Emoji Scavenger Hunt https://emojiscavengerhunt.withgoogle.com/ ● RGB Calculator: https://www.w3schools.com/colors/colors_rgb.asp ● Create your own pixel art: www.piskelapp.com ● Create your own convolutions: http://setosa.io/ev/image-kernels/

UNIT 5: COMPUTER VISION (To be assessed through Practicals)

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
OpenCV	Use Python libraries such as OpenCV for basic image processing and computer vision tasks.	**Session:** Introduction to OpenCV **Hands-on:** Image Processing
*Convolution Operator (Optional)**	*Apply the convolution operator to process images and extract useful features.*	*Session: Understanding Convolution operator (Optional)*** *Activity: Convolution Operator (Optional)**
*Convolution Neural Network (Optional)**	*Understand the basic architecture of a CNN and its applications in computer vision and image recognition.*	*Session: Introduction to CNN (Optional)*** *Session: Understanding CNN (Optional)*** ● *Kernel* ● *Layers of CNN* *Activity: Testing CNN (Optional)**

UNIT 6: NATURAL LANGUAGE PROCESSING

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Introduction	Understand the concept of Natural Language Processing (NLP) and its importance in the field of Artificial Intelligence (AI).	**Session:** Introduction to Natural Language Processing Activity : Use of Google Translate for same spelling words
		Session: NLP Applications
		Session: Revisiting AI Project Cycle
Chatbots	Explore the various applications of NLP in everyday life, such as chatbots, sentiment analysis, and automatic summarization	**Activity:** Introduction to Chatbots
Language Differences	Gain an understanding of the challenges involved in understanding human language by machine.	**Session:** Human Language VS Computer Language
Concepts of Natural Language Processing	Learn about the Text Normalization technique used in NLP and popular NLP model - Bag-of-Words	**Session: Data Processing** • Text Normalisation • Bag of Words **Hands-on:** Text processing ● Data Processing ● Bag of Words ● *TFIDF (Optional)*** ● *NLTK (Optional)***

UNIT 7: EVALUATION

SUB-UNIT	LEARNING OUTCOMES	SESSION/ ACTIVITY/ PRACTICAL
Introduction	Understand the role of evaluation in the development and implementation of AI systems.	**Session:** Introduction to Model Evaluation ● What is Evaluation? ● Different types of Evaluation techniques- Underfit, Perfect Fit, OverFit
Model Evaluation Terminology	Learn various Model Evaluation Terminologies	**Session:** Model Evaluation Terminologies ● The Scenario - Prediction, Reality, True Positive, True Negative, False Positive, False Negative ● Confusion Matrix ● Activity- to make a confusion matrix based on data given for Containment Zone Prediction Model
Confusion Matrix	Learn to make a confusion matrix for given Scenario	**Session & Activity:** Confusion Matrix
Evaluation Methods	Learn about the different types of evaluation techniques in AI, such as Accuracy, Precision, Recall and F1 Score, and their significance.	**Session:** Evaluation Methods ● Accuracy ● Precision ● Recall ● Which Metric is Important? - Precision or Recall ● F1 Score
		Activity: Practice Evaluation

PART-C: PRACTICAL WORK

Suggested Programs List	- Write a program to add the elements of the two lists. - Write a program to calculate mean, median and mode using Numpy - Write a program to display line chart from (2,5) to (9,10). - Write a program to display a scatter chart for the following points (2,5), (9,10),(8,3),(5,7),(6,18). - Read csv file saved in your system and display 10 rows. - Read csv file saved in your system and display its information - Write a program to read an image and display using Python - Write a program to read an image and identify its shape using Python
Important Links	- https://cbseacademic.nic.in/web_material/Curriculum21/publication/secondary/Class10_Facilitator_Handbook.pdf - Link to AI Activities & Jupyter Notebooks (including sample projects) https://bit.ly/class_X_activities_jupyter_notebooks

PART-D: Project Work / Field Visit / Student Portfolio
 * relate it to Sustainable Development Goals
 Suggested Projects/ Field Visit / Portfolio (any one activity to be one)

Sample Projects	1. Student Marks Prediction Model 2. CNN Model on Smoke and Fire Detection
Field Work	Students' participation in the following- - AI for Youth Bootcamp - AI Fests/ Exhibition - Participation in any AI training sessions - Virtual tours of companies using AI to get acquainted with real-life usage
Student Portfolio (to be continued from class IX)	- Maintaining a record of all AI activities - Hackathons - Competitions (CBSE/Interschool) Note: Portfolio should contain minimum 5 activities

**NOTE: Optional components shall not be assessed. They are for extra knowledge

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
A	**SYSTEM SPECIFICATIONS**
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	**SOFTWARE SPECIFICATIONS**
1	Operating System: Any
2	Anti-Virus Activated
3	Internet Browser: Google Chrome
4	Productivity Suite: Any (Google+ Suite recommended)
5	Anaconda Navigator Distribution (https://bit.ly/AI-installation-guide)
6	Conceptual installations (https://bit.ly/AI-installation-guide)
7	Intel Open VINO 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 **OR** Bachelor's Degree in Computer Applications/ Science/ Information Technology (BCA, B. Sc. Computer Science/ Information Technology) **OR** Graduate with PGDCA **OR** DOEACC A Level Certificate. The suggested qualification is the minimum criteria. However higher qualifications will also be acceptable.	• 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.	• 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 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, teamwork, 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.