

**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 <i>(To be assessed in Practicals only)</i>		--
	Unit 4: Data Science (Introduction, Applications of Data Sciences, Data Science: Getting Started (up to Data Access), <i>remaining portion is to be assessed in practical</i>)		4
	Unit 5: Computer Vision (Introduction, Applications of Computer Vision, Computer Vision: Getting Started (up to RGB Images), <i>remaining portion is to be assessed in practical</i>)		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
	<ul style="list-style-type: none"> • Unit 3: Advance Python • Unit 4: Data Science • Unit 5: Computer Vision 		5
	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. <ul style="list-style-type: none">● 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. <ul style="list-style-type: none">● Introducing AI, ML & DL.● Introduction to AI Domains (Data Sciences, CV & NLP)● Gamified tools for each domain-<ul style="list-style-type: none">○ 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
		<ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ● 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 <ul style="list-style-type: none"> ● 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Computer Vision Tasks • Basics of Images-Pixel, Resolution, Pixel value • Grayscale and RGB images
		Activities: <ul style="list-style-type: none"> • 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)** <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Text Normalisation • Bag of Words Hands-on: Text processing <ul style="list-style-type: none"> • Data Processing • Bag of Words • <i>TFIDF (Optional)**</i> • <i>NLTK (Optional)**</i>

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 <ul style="list-style-type: none"> • What is Evaluation? • Different types of Evaluation techniques- Underfit, Perfect Fit, OverFit
Model Evaluation Terminology	Learn various Model Evaluation Terminologies	Session: Model Evaluation Terminologies <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Accuracy • Precision • Recall • Which Metric is Important? - Precision or Recall • F1 Score
		Activity: Practice Evaluation

PART-C: PRACTICAL WORK

Suggested Programs List	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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	<ol style="list-style-type: none">1. Student Marks Prediction Model2. CNN Model on Smoke and Fire Detection
Field Work	Students' participation in the following- <ul style="list-style-type: none">• 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)	<ul style="list-style-type: none">• Maintaining a record of all AI activities• Hackathons• Competitions (CBSE/Interschool) <p>Note: Portfolio should contain minimum 5 activities</p>

****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.	<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 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.