ENGLISH CORE

Subject Code-301

Classes-XI- XII (2025-26)

Background

Students are expected to have acquired a reasonable degree of language proficiency in English Language by the time they come to class XI, and the course aims, essentially, at promoting the higher-order language skills.

For a large number of students, the higher secondary stage will be a preparation for the university, where a fairly high degree of proficiency in English may be required. Additionally, for another large group, the higher secondary stage may be a preparation for entry into the professional domain. The Core Course caters to both groups by promoting the language skills required for academic study as well as the language skills required for the workplace.

Competencies to be focused on:

The general objectives at this stage are to:

- listen and comprehend live as well as recorded oral presentations on a variety of topics
- develop greater confidence and proficiency in the use of language skills necessary for social and academic purpose to participate in group discussions and interviews, by making short oral presentation on given topics
- perceive the overall meaning and organisation of the text (i.e., correlation of the vital portions of the text)
- identify the central/main point and supporting details, etc., to build communicative competence in various lexicons of English
- promote advanced language skills with an aim to develop the skills of reasoning, drawing inferences, etc. through meaningful activities
- translate texts from mother tongue(s) into English and vice versa
- develop ability and acquire knowledge required in order to engage in independent reflection and enquiry
- read and comprehend extended texts (prescribed and non-prescribed) in the following genres: science fiction, drama, poetry, biography, autobiography, travel and sports literature, etc.
- text-based writing (i.e., writing in response to questions or tasks based on prescribed or unseen texts), understand and respond to lectures, speeches, etc.
- write expository / argumentative essays, explaining or developing a topic, arguing a case, etc, write formal/informal letters and applications for different purposes

- make use of contextual clues to infer meanings of unfamiliar vocabulary
- select, compile and collate information for an oral presentation
- produce unified paragraphs with adequate details and support
- use grammatical structures accurately and appropriately
- write items related to the workplace (minutes, memoranda, notices, summaries, reports etc.
- filling up of forms, preparing CV, e-mail messages., making notes from reference materials, recorded talks etc.

The core course should draw upon the language items suggested for class IX-X and delve deeper into their usage and functions. Particular attention may, however, be given to the following areas of grammar:

- The use of passive forms in scientific and innovative writings.
- Convert one kind of sentence/clause into a different kind of structure as well as other items to exemplify stylistic variations in different discourses modal auxiliaries- uses based on semantic considerations.

A. Specific Objectives of Reading

Students are expected to develop the following study skills:

- skim for main ideas and scan for details
- refer to dictionaries, encyclopedia, thesaurus and academic reference material in any format
- select and extract relevant information, using reading skills of skimming and scanning
- understand the writer's purpose and tone
- comprehend the difference between the literal and the figurative
- differentiate between claims and realities, facts and opinions, form business opinions on the basis of latest trends available
- comprehend technical language as required in computer related fields, arrive at personal conclusion and logically comment on a given text.
- Specifically develop the ability to be original and creative in interpreting opinion, develop the ability to be logically persuasive in defending one's opinion and making notes based on a text.
- recognize multilingual nature of Indian society by reading different genres.

Develop literary skills as enumerated below:

- respond to literary texts
- appreciate and analyse special features of languages that differentiate literary texts from non-literary ones, explore and evaluate features of character, plot, setting, etc.
- understand and appreciate the oral, mobile and visual elements of drama. Identify the elements of style such as humour, pathos, satire and irony, etc.
- make notes from various resources for the purpose of developing the extracted ideas into sustained pieces of writing

B. Listening and Speaking

Speaking needs a very strong emphasis and is an important objective leading to professional competence. Hence, testing of oral skills must be made an important component of the overall testing pattern. To this end, speaking and listening skills are overtly built into the material to guide the teachers in actualization of the skills.

Specific Objectives of Listening & Speaking

Students are expected to develop the ability to:

- take organized notes on lectures, talks and listening passages
- listen to news bulletins and to develop the ability to discuss informally a wide ranging issues like current national and international affairs, sports, business, etc.
- respond in interviews and to participate in formal group discussions.
- make enquiries meaningfully and adequately and to respond to enquiries for the purpose of travelling within the country and abroad.
- listen to business news and to be able to extract relevant important information.
- to develop public speaking skills.

C. Specific Objectives of Writing

The students will be able to:

- write letters to friends, relatives, etc. to write business and official letters.
- open accounts in post offices and banks. To fill in railway/airline reservation forms both online and offline.
- draft notices, advertisements and design posters effectively and appropriately
- write on various issues to institutions seeking relevant information, lodge complaints, express gratitude or render apology.
- write applications, fill in application forms, prepare a personal bio-data for admission into colleges, universities, entrance tests and jobs.
- write informal reports as part of personal letters on functions, programmes and activities held in school (morning assembly, annual day, sports day, etc.)
- write formal reports for school magazines/events/processes/ or in local newspapers about events or occasions.
- express opinions, facts, arguments in the form of speech or debates, using a variety of accurate sentence structures
- draft papers to be presented in symposia.
- take down notes from talks and lectures.
- write examination answers according to the requirement of various subjects.
- summarise a text.

Note: The creative writing section shall assess the prescribed competencies for writing skills, irrespective of any word limit.

D. More About Reading

Inculcating good reading habits in children has always been a concern for all stakeholders in education. The purpose is to create independent thinking individuals with the ability to not only create their own knowledge but also critically interpret, analyse and evaluate it with objectivity and fairness. This will also help students in learning and acquiring better language skills.

Creating learners for the 21st century involves making them independent learners who can learn, unlearn and relearn. If our children are in the habit of reading, they will learn to reinvent themselves and deal with the many challenges that lie ahead of them.

Reading is not merely decoding information or pronouncing words correctly. It is an interactive dialogue between the author and the reader in which the reader and the author share their experiences and knowledge with each other. Good readers are critical readers with an ability to arrive at a deeper understanding of not only the world presented in the book but also of the real world around them.

Consequently, they become independent thinkers capable of taking their own decisions in life rationally. Hence, a few activities are suggested below which teachers may use as a part of the reading project.

- Short review / dramatization of the story
- Commentary on the characters
- Critical evaluation of the plot, storyline and characters
- Comparing and contrasting the characters within the story, with other characters in stories by the same author or by different authors
- Extrapolating about the story read or life of characters after the story ends defending characters' actions in the story
- Making an audio story out of the novel/text to be read aloud.
- Interacting with the author
- Holding a literature fest where students role-play as various characters to interact with each other
- Role playing as authors/poets/dramatists, to defend their works and characters
- Symposiums and seminars for introducing a book, an author, or a theme
- Creating graphic novels out of novel or short stories they read
- Dramatizing incidents from a novel or a story
- Creating their own stories
- Books of one genre to be read by the whole class.

Teachers may select books and e-books suitable to the age and level of the learners. Care ought to be taken to choose books that are appropriate in terms of language, theme and content and which do not hurt the sensibilities of a child.

Teachers may later suggest books from other languages by dealing with the same themes as an extended activity. The Project should lead to independent learning/reading skills and hence the chosen book should not be taught in class, but may be introduced through activities and be left for the students to read at their own pace. Teachers may, however, choose to assess a student's progress or success in reading the book by asking for verbal or written progress reports, looking at their diary entries, engaging in a discussion about the book, giving a short quiz or a work sheet about the book/short story. A befitting mode of assessment may be chosen by the teacher.

Methods and Techniques

The techniques used for teaching should promote habits of self-learning and reduce dependence on the teacher. In general, we recommend a multi-skill, learner-centred, activity based approach, of which there can be many variations.

- The core classroom activity is likely to be that of silent reading of prescribed/selected texts for comprehension, which can lead to other forms of language learning activities such as role-play, dramatization, group discussion, writing, etc., although many such activities could be carried out without the preliminary use of textual material.
- It is important that students be trained to read independently and intelligently, interacting actively with texts, with the use of reference materials (dictionary, thesaurus, etc.) where necessary.
- Some pre-reading activity will generally be required, and the course books should suggest suitable activities, leaving teachers free to devise other activities when desired. So also, the reading of texts should be followed by post reading activities.
- It is important to remember that students should be encouraged to interpret texts in different ways.
- Group and pair activities can be resorted to, when desired, although many useful language activities can be carried out individually. In general, teachers should encourage students to interact actively with texts and with each other.
- Oral activity (group discussion, etc.) should be encouraged.

ENGLISH CORE

CLASS –XI (2025-26)

Section A
Reading Skills-- 26 Marks

I. Reading Comprehension through Unseen Passages **10+8=18 Marks**

1. One unseen passage to assess comprehension, interpretation, analysis, inference and vocabulary. The passage may be factual, descriptive or literary.
2. One unseen case-based factual passage with verbal/visual inputs like statistical data, charts etc.to assess comprehension, interpretation, analysis, inference and evaluation.

Note*: The combined word limit for both the passages will be 600-750*. Multiple Choice Questions / Objective Type Questions will be asked.

3. Note Making and Summarization based on a passage of approximately 200-250 words.

i.	Note Making:		5 Marks
	• Title:	1	
	• Numbering and indenting:	1	
	• Key/glossary:	1	
	• Notes:	2	
ii.	Summary (up to 50 words):		3 Marks
	• Content:	2	
	• Expression:	1	

Section B
Grammar and Creative Writing Skills– 23 Marks

II. Grammar **7 Marks**

4. Questions on Gap filling (Tenses, Clauses)
5. Questions on re-ordering/transformation of sentences

(Total seven questions to be done out of the eight given).

III. Creative Writing Skills **16 Marks**

6. Short writing task – Classified Advertisements, up to 50 words. One out of the two given questions to be answered (3 Marks: Format: 1 / Content: 1 / Expression: 1)

7. Short writing task –Poster up to 50 words. One out of the two given questions to be answered. (3 marks: Format: 1 / Content: 1 / Expression: 1)

8. Long Writing task: Speech in 120-150 words based on verbal / visual cues related to contemporary / age-appropriate topic. One out of the two given questions to be answered. (5 Marks: Format: 1 / Content: 2 / Expression: 2)

9. Long Writing Task: Debate based on visual/verbal inputs in 120-150 words, thematically related to contemporary, topical issues. One out of the two given questions to be answered. (5 Marks: Format: 1 / Content: 2 / Expression: 2)

Section C
Literature Text Book and Supplementary Reading Text-31 Marks

This section will have variety of assessment items including Multiple Choice Questions, Objective Type Questions, Short Answer Type Questions and Long Answer Type Questions to assess comprehension, interpretation, analysis, evaluation and extrapolation beyond the text.

10. One Poetry extract out of two, from the book Hornbill, to assess comprehension, interpretation, analysis, inference and appreciation. **3x1=3 Marks**

11. One Prose extract out of two, from the book Hornbill, to assess comprehension, interpretation, analysis, evaluation and appreciation. **3x1=3 Marks**

12. One prose extract out of two, from the book Snapshots, to assess comprehension, interpretation, analysis, inference and appreciation. **4x1=4 Marks**

13. Two Short answer type questions (one from Prose and one from Poetry, from the book Hornbill), outof four, to be answered in 40-50 words. Questions should elicit inferential responses through critical thinking. **3x2=6 Marks**

14. One Short answer type question, from the book Snapshots, to be answered in 40- 50 words. Questions should elicit inferential responses through critical thinking. One out of two questions to be done. **3x1=3 Marks**

15. One Long answer type question, from Prose/Poetry of Hornbill, to be answered in 120-150 words. Questions can be based on incident / theme / passage / extract / event, as reference points to assess extrapolation beyond and across the text. The question will elicit analytical and evaluative response from the student. Any one out of two questions to be done. **1x6=6 Marks**

16. One Long answer type question, based on the chapters from the book Snapshots, to be answered in 120-150 words, to assess global comprehension and extrapolation beyond the text. Questions to provide analytical and evaluative responses, using incidents, events, themes, as reference points. Any one out of two questions to be done. **1x6=6 Marks**

Prescribed Books

1. **Hornbill:** English Reader published by National Council of Education Research and Training, New Delhi

- The Portrait of a Lady (Prose)
- A Photograph (Poem)
- "We're Not Afraid to Die… if We Can Be Together
- Discovering Tut: The Saga Continues
- The Laburnum Top (Poem)
- The Voice of the Rain (Poem)
- Childhood (Poem)
- The Adventure
- Silk Road (Prose)
- Father to Son

2. **Snapshots:** Supplementary Reader published by National Council of Education Research and Training, New Delhi

- The Summer of the Beautiful White Horse (Prose)
- The Address (Prose)
- Mother's Day (Play)
- Birth (Prose)
- The Tale of Melon City

INTERNAL ASSESSMENT

Assessment of Listening Skills	- 05 marks.
Assessment of Speaking Skills	- 05 Marks
Project Work	- 10 Marks

ENGLISH CORE
QUESTION PAPER DESIGN
CLASS-XI (2025-26)

Section	Competencies	Total marks
Reading Skills	Conceptual understanding, decoding, Analyzing, inferring, interpreting, appreciating, literary, conventions and vocabulary, summarizing and using appropriate format/s.	26
Grammar and Creative Writing Skills	Conceptual Understanding, application of rules, Analysis, Reasoning, appropriate style and tone, using appropriate format and fluency, inference, analysis, evaluation and creativity.	23
Literature Text Book and Supplementary Reading Text	Recalling, reasoning, appreciating literary convention, inference, analysis, creativity with fluency, Critical Thinking.	31
	TOTAL	**80**
Internal Assessment	Assessment of Listening and Speaking Skills • Listening • Speaking	**10** 5+5
	• Project Work	**10**
	GRAND TOTAL	**100**

ENGLISH CORE
CLASS – XII (2025-26)

Section A
Reading Skills-22 Marks

I. Reading Comprehension through Unseen Passage **12+10 = 22 Marks**

1. One unseen passage to assess comprehension, interpretation, analysis and inference. Vocabulary assessment will also be assessed via inference. The passage may be factual, descriptive or literary.
2. One unseen **case-based factual** passage with verbal/visual inputs like statistical data, charts etc. to assess comprehension, interpretation, analysis, inference and evaluation.

Note: The combined word limit for both the passages will be 700-750 words.

Multiple Choice Questions / Objective Type Questions and Short Answer Type Questions (to be answered in 40-50 words) will be asked.

Section B

Creative Writing Skills-18 Marks

3. Notice, up to 50 words. One out of the two given questions to be answered. **(4 Marks**: Format :1 / Content: 2 / Accuracy of Spelling and Grammar: 1).

4. Formal/Informal Invitation and Reply, up to 50 words. One out of the two given questions to be answered. **(4 Marks**: Format: 1 / Content: 2 / Accuracy of Spelling and Grammar :1).

5. Letters based on verbal/visual input, to be answered in approximately 120-150 words. Letter types include application for a job with bio data or resume. Letters to the editor (giving suggestions or opinion on issues of public interest). One out of the two given questions to be answered. **(5 Marks**: Format: 1/Organisation of Ideas:1/Content:2/ Accuracy of Spelling and Grammar :1).

6. Article/ Report Writing, descriptive and analytical in nature, based on verbal inputs, to be answered in 120-150 words. One out of the two given questions to be answered. **(5 Marks**:Format:1/Organisation of Ideas:1/Content:2/Accuracy of Spelling and Grammar:1).

Section C

Literature Text Book and Supplementary Reading Text- 40 Marks

This section will have variety of assessment items including Multiple Choice Questions, Objective Type Questions, Short Answer Type Questions and Long Answer Type Questions to assess comprehension, interpretation, analysis, evaluation and extrapolation beyond the text.

7. One Poetry extract out of two, from the book **Flamingo,** to assess comprehension, interpretation, analysis, inference and appreciation. **(6x1=6 Marks)**

8. One Prose extract out of two, from the book **Vistas,** to assess comprehension, interpretation, analysis, evaluation and appreciation. **(4x1=4 Marks)**

9. One prose extract out of two from the book **Flamingo,** to assess comprehension, interpretation, analysis, inference and evaluation. **(6x1=6Marks)**

10. Short answer type questions **(from Prose and Poetry from the book Flamingo**), to be answered in 40-50 words each. Questions should elicit inferential responses through critical thinking. Five questions out of the six given, are to be answered. **(5x2=10 Marks)**

11. Short answer type questions, from **Prose (Vistas)**, to be answered in 40- 50 words each. Questions should elicit inferential responses through critical thinking. Any two out of three questions to be done. **(2x2=4 Marks)**

12. One Long answer type question, from **Prose/Poetry (Flamingo)**, to be answered in 120-150 words. Questions can be based on incident / theme / passage / extract / event as reference points to assess extrapolation beyond and across the text. The question will elicit analytical and evaluative response from the student. Any one out of two questions to be done. **(1x5=5 Marks)**

13. One Long answer type question, based on the chapters from the book **Vistas**, to be answered in 120-150 words, to assess global comprehension and extrapolation beyond the text. Questions to provide analytical and evaluative responses using incidents, events, themes, as reference points. Any one out of two questions to be done. **(1x5=5 Marks)**

Prescribed Books

1. **Flamingo:** English Reader published by National Council of Education Research and Training, New Delhi

Prose

- The Last Lesson
- Lost Spring
- Deep Water
- The Rattrap
- Indigo
- Poets and Pancakes
- The Interview
- Going Places

Poetry

- My Mother at Sixty-Six
- Keeping Quiet
- A Thing of Beauty
- A Roadside Stand
- Aunt Jennifer's Tigers

2. **Vistas:** Supplementary Reader published by National Council of Education Research and Training, New Delhi
   - The Third Level
   - The Tiger King
   - Journey to the End of the Earth
   - The Enemy
   - On the Face of It
   - Memories of Childhood
     - The Cutting of My Long Hair
     - We Too are Human Beings

INTERNAL ASSESSMENT

Assessment of Listening Skills	- 05 marks.
Assessment of Speaking Skills	- 05 Marks
Project Work	- 10 Marks

ENGLISH CORE

QUESTION PAPER DESIGN
CLASS- XII (2025-26)

Section	Competencies	Total marks
Reading Skills	Conceptual understanding, decoding, Analyzing, inferring, interpreting, appreciating, literary, conventions and vocabulary, summarizing and using appropriate format/s.	22
Creative Writing Sills	Conceptual Understanding, application of rules, Analysis, Reasoning, appropriate style and tone, using appropriate format and fluency, inference, analysis, evaluation and creativity.	18
Literature Text Book and Supplementary Reading Text	Recalling, reasoning, critical thinking, appreciating literary convention, inference, analysis, creativity with fluency.	40
	TOTAL	**80**
Internal Assessment	Assessment of Listening and Speaking Skills • Listening • Speaking	**10** 5+5
	• Project Work	**10**
	GRAND TOTAL	**100**

Annexure I

GUIDELINES FOR INTERNAL ASSESSMENT

Classes XI-XII **Total Marks: 20**

ALS must be seen as an integrated component of all four language skills rather than a compartment of two. Suggested activities, therefore, take into consideration an integration of the four language skills but during assessment, emphasis will be given to speaking and listening, since reading and writing are already being assessed in the written exam.

Assessment of Listening and Speaking Skills: (5+5=10 Marks)

i. **Activities:**

- Subject teachers must refer to books prescribed in the syllabus.
- In addition to the above, teachers may plan their own activities and create their own material for assessing the listening and speaking skills.

ii. **Parameters for Assessment:** The listening and speaking skills are to be assessed on the following parameters:

a. Interactive competence (Initiation & turn taking, relevance to the topic)

b. Fluency (cohesion, coherence and speed of delivery)

c. Pronunciation

d. Language (grammar and vocabulary)

SUGGESTIVE RUBRICS

	1	2	3	4	5
Interaction	• Contributions are mainly unrelated to those of other speakers • Shows hardly any initiative in the development of conversation • Very limited interaction	• Contributions are often unrelated to those of the other speaker • Generally passive in the development of conversation	• Develops interaction adequately, makes however minimal effort to initiate conversation • Needs constant prompting to take turns	• Interaction is adequately initiated and developed • Takes turn but needs some prompting	• Initiates & logically develops simple conversation on familiar topics • Takes turns appropriately
Fluency & Coherence	• Noticeably/ long pauses; rate of speech is slow	• Usually fluent; produces simple speech	• Is willing to speak at length, however repetition is	• Speaks without noticeable effort, with a little repetition	• Speaks fluently almost with no repetition & minimal

	• Frequent repetition and/or self-correction this is all right in informal conversation • Links only basic sentences; breakdown of coherence evident	fluently, but loses coherence in complex communication • Often hesitates and/or resorts to slow speech • Topics partly developed; not always concluded logically	noticeable • Hesitates and/or self corrects; occasionally loses coherence • Topics developed, but usually not logically concluded	• Demonstrates hesitation to find words or use correct grammatical structures and/or self-correction • Topics not fully developed to merit.	hesitation Develops topic fully & coherently
Pronunciation	• Frequent inaccurate pronunciation • Communication is severely affected	• Frequently unintelligible articulation • Frequent phonological errors • Major communication problems	• Largely correct pronunciation &clear articulation except occasional errors	• Mostly correct pronunciation & clear articulation • Is clearly understood most of the time;very few phonological errors	• Pronounces correctly & articulates clearly • Is always comprehensible • uses appropriate intonation
Vocabulary & Grammar	• Demonstrates almost no flexibility, and mostly struggles for appropriate words • Many Grammatical errors impacting communication	• Is able to communicate on some of the topics, with limited vocabulary. • Frequent errors, but self- corrects	• Is able to communicate on most of the topics, with limited vocabulary. A few grammatical errors	• Is able to communicate on most of the topics with appropriate vocabulary • Minor errors that do not hamper communication	• Is able to communicate on most of the topics using a wide range of appropriate vocabulary, using new words and expression • No grammatical errors

iii. Schedule:

- The practice of listening and speaking skills should be done throughout the academic year.
- The final assessment of the skills is to be done as per the convenience and schedule of the school.

Project Work + Viva: 10 Marks

Out of ten marks, 5 marks will be allotted for the project report/script /essay etc. and 5 marks for the viva

I. Schedule:

- Schools may refer to the suggestive timeline given in these guidelines for the planning, preparation and viva-voce of ALS based projects.
- The final assessment of the skills may be done on the basis of parameters suggested by the Board. Language teachers, however, have the option to adopt/ modify these parameters according to their school specific requirements.

II. Suggestions for Project Work:

- The Project can be inter-disciplinary in theme. The ideas/issues highlighted in the chapters/ poems/ drama given the prescribed books can also be developed in the form of a project. Students can also take up any relevant and age-appropriate theme.
- Such topics may be taken up that provide students with opportunities for listening and speaking. Some suggestions are as follows:

a) Interview-Based research:

Example:

- Students can choose a topic on which to do their research/ interview, e.g. a student can choose the topic: “Evolving food tastes in my neighbourhood” or “Corona pandemic and the fallout on families.” Read the available literature.
- The student then conducts interviews with a few neighbours on the topic. For an interview, with the help of the teacher, student will frame questions based on the preliminary research/background.
- The student will then write an essay/ write up / report etc. up to 1000 words on his/her research and submit it. He/ She will then take a viva on the research project. The project can be done in individually or in pairs/ groups

b) Students listen to podcasts/ interviews/radio or TV documentary on a topic and prepare a report countering or agreeing with the speakers. Write an 800 - 1000 words report and submit. Take a viva on the report.

c) Students create their own video/ Audio, after writing a script. Before they decide a format, the following elements can be taken into consideration:

- Theme/topic of the audio / video. Would the child like to pick a current issue or something artistic like theatre?
- What are the elements that need to be part of the script?
- Will the video/audio have an interview with one or more guests?

- Would they prefer to improvise while chatting with guests, or work from a script?
- What would be the duration?
- How would they present the script/report to the teacher? Can it be in the form of a narrative?

d) Students write**, direct and present a theatrical production, /One act play**

This will be a project which will be done as a team. It will involve planning, preparation and presentation. In short, various language skills will be utilised. There will be researching, discussion, writing the script, auditioning and ultimately producing the play. The project will end with a presentation and subsequently a viva. Teachers will be able to assess the core language skills of the students and help them grow as 21st century critical thinkers.

II. Instructions for the Teachers: -

1. Properly orient students about the Project work, as per the present Guidelines.
2. Facilitate the students in the selection of theme and topic.
3. Create a rubric for assessment and share with the students before they start so that they know the parameters of assessment:

- Teachers need to familiarize themselves with the method of assessing students with the rubric-- a table with different criteria and a grading scale.
- Choose the criteria on which you will grade students and list them along the left side of the page.
- Create an even number of columns along the top of the page. These columns will represent potential skill levels of the students.
- Assessing students on four/five criteria is an easy way to begin. For each criterion, define the ability that student would exhibit at each of the levels.
- The more detailed you make your criteria, the easier it will be to evaluate each student and define the level at which the student is presenting**.**
  {Sample Rubric is attached at the end for reference}

III. Parameters for Overall Assessment: -

1. Pronunciation:

- When evaluating the pronunciation of the students, teachers must listen for clearly articulated words, pronunciation of unusual spellings and intonation.
- Assess the students for the pronunciation skills and determine at which level the student needs improvement.

2. Vocabulary:

After noting their pronunciation levels, evaluate the students on the use of extensive and appropriate **vocabulary** during the viva. Check if students are using vocabulary appropriate to the context about which they are speaking.

3. **Accuracy**:

   Grammar has always been an important component of language skills. As students speak/ answer the questions during the viva, listen to their **grammatical structures**. *Are they competent enough to use multiple tenses? Is their word order correct in a given sentence?* An effective speaker will automatically use the correct grammatical structures of his language.

4. **Communication**:

   Assessing the **communication skills** of the students means looking at more than language. Look at how creatively students use the language to make their points understood. Students with a low level of vocabulary and grammar may still have good communication skills if they are able to make the teacher understand their point of view.

5. **Interaction**:

   - During the viva teachers need to ask the students some questions. Questions need to be based on the projects that have been suggested or chosen by the students.
   - It is imperative for a teacher to read the essays/project reports before they can be ready to ask questions.
   - Teachers need to observe how students answer the questions that are posed to them: *Are they able to understand and answer questions independently or can they answer only when the questions are translated into simpler words or repeated? Are they able to give appropriate responses in a conversation*?
   - These elements of **interaction** are necessary for clear and effective communication. A student with effective interaction skills will be able to answer questions with relative ease and follow the flow of conversation.

6. **Fluency**:

   - Fluency may be the easiest quality to judge in the students' speech: *How comfortable are they as they speak and express themselves? How easily do the words come out? Are there inappropriate pauses and gaps in the way a student speaks?*
   - **Fluency** is a judgement of this communication and is an important criterion when evaluating speaking skills. These criteria: pronunciation, vocabulary, accuracy, interaction and fluency are all the hallmarks of a student's overall speaking abilities.
   - Teachers must also remember that some **students may excel in one area and struggle in another**. Helping the students understand these issues will enable them to become effective speakers in future. Let your students know that you will be assessing them in these various areas when you evaluate their progress and encourage them to work and improve in these areas.
   - **Finally,** teachers must remember that a proper evaluation of the students will take into consideration **more than just one oral interview on the final ASL** project. Teachers must take note of a student's progress throughout the academic year.

IV. Project-Portfolio/ Project Report

The **Project-Portfolio/Project Report** is a compilation of the work that the students produce during the process of working on their ALS Project.

The Project-Portfolio may include the following:

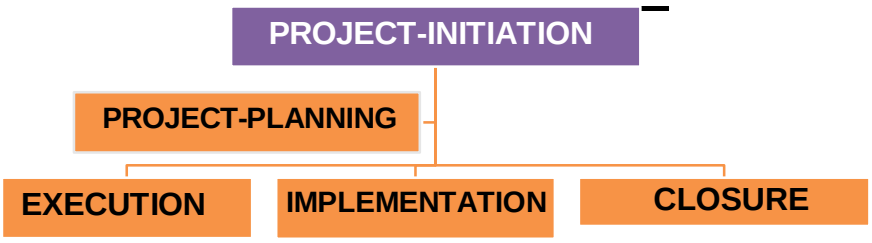
- Cover page, with title of project, school details/details of students.
- Statement of purpose/objectives/goals
- Certificate of completion under the guidance of the teacher.
- Students Action Plan for the completion of assigned tasks.
- Materials such as scripts for the theatre/role play, questionnaires for interview, written assignments, essays, survey-reports and other material evidence of learning progress and academic accomplishment.
- The 800-1000 words essay/Script/Report.
- Student/group reflections.
- If possible, Photographs that capture the positive learning experiences of the student(s).
- List of resources/bibliography

The following points must be kept for consideration while assessing the project portfolios:

- Quality of content of the project
- Accuracy of information
- Adherence to the specified timeline
- Content in respect of (spellings, grammar, punctuation)
- Clarity of thoughts and ideas
- Creativity
- Contributions by group members
- Knowledge and experience gained

V. Suggestive Timeline:

The FIVE Steps in Project Plan



Month	Objectives
Planning and Research for the Project Work **Preferably till November-December**	• Teachers plan a day to orient students about the ALS projects, details are shared with all stakeholders. • Students choose a project, select team members and develop project- plan. • Group meets (preferably online) and reports to the team leader about the progress: shortfalls and successes are detailed. • Team leader apprises teacher-mentor. • Students working individually or in pairs also update the teachers. • A logical, deliverable and practical plan is drafted by the team/ pair/individual. Goals/objectives are clearly defined for all. • Work is delegated to team members by the team leader. Students wishing to work alone develop their own plan of Action. • Detailed project schedules are shared with the teacher.
December- January	• Suggestions and improvements are shared by the teacher, wherever necessary. • Group members coordinate and keep communication channels open for interaction. • Gaps (if any) are filled with the right skill sets by the Team Leader/ individual student. • The final draft of the project portfolio/ report is prepared and submitted for evaluation.
January-February	• Students are assessed on their group/pair/individual presentations on allotted days. Final Viva is conducted by the External/Internal examiner.
February-March or as per the timelines given by the Board	• Marks are uploaded on the CBSE website.

SAMPLE RUBRIC FOR ALS Project Work (For Theatre/Role Play/Oral presentation/ Interview/ Podcast)

CATEGORY	1	2	3	4	5
TIME LIMIT	Presentation is less than or more than 5 minutes long	Presentation exceeded or less than specified time limit by 4 to 5 minutes	Presentation exceeded or less than specified time limit by 3 to 4 minutes	Presentation exceeded or less than specified time limit by 2 to 3 mins	Student/ group adhered to the given time limit
CONTENT/ SCRIPT/ QUESTIONNAIRE	Script is not related to topic or issue	Well written script/content shows little understanding of parts of topic	Well written script/content shows good understanding of parts of topic	Well written script/content shows a good understanding of subject topic	Well written script/content shows full understanding of subject topic
CREATIVITY	No props/ costumes/ stage presentation lack-lustre	Some work done, average stage set-up and costumes	Well organized presentation, could have improved	Logical use of props, reasonable work done, creative	Suitable props /effort seen/ considerable work done/ Creative and relevant costumes
PREPAREDNESS	Student/ group seems to be unprepared	Some visible preparedness but Rehearsal is lacking	Somewhat prepared, rehearsal is lacking	Good preparedness but need better rehearsal	Complete Preparedness /rehearsed presentation
CLARITY OF SPEECH	Lack of clarity in presentation many words mis-pronounced	Speaks clearly some words are mis-pronounced	Speaks clearly 90% of the time/ a few mis-pronounced words	Speaks clearly and distinctly 95% of time/ Few mis-pronounced words	Speaks clearly distinctly 95% of time/ fluency in pronunciation
USE OF PROPS (Theatre/Role Play)	Only 1/no relevant props used Very little use of facial expressions /body language, Does not generate much interest	1 to 2 relevant props used Little Use of facial expressions and body language	2 to 3 relevant props used Facial expressions and body language is used to try to generate some enthusiasm	3 to 4 relevant props used Facial expression and body language sometimes generate enthusiasm with the topic	4 to 5 relevant props used Facial expression and body language generate enthusiasm with the topic
PORTFOLIO-PRESENTATION	Inadequate & unimpressive	Somewhat suitable & convincing	Adequate & relevant	Interesting, enjoyable & relevant	Brilliant, creative& exceptional

PHYSICS

Subject Code – 042

Class XI-XII (2025-26)

Senior Secondary stage of school education is a stage of transition from general education to discipline-based focus on curriculum. The present updated syllabus keeps in view the rigor and depth of disciplinary approach as well as the comprehension level of learners. Due care has also been taken that the syllabus is comparable to the international standards. Salient features of the syllabus include:

- Emphasis on basic conceptual understanding of the content.
- Emphasis on use of SI units, symbols, nomenclature of physical quantities and formulations as per international standards.
- Providing logical sequencing of units of the subject matter and proper placement of concepts with their linkage for better learning.
- Reducing the curriculum load by eliminating overlapping of concepts/content within the discipline and other disciplines.
- Promotion of process-skills, problem-solving abilities and applications of Physics concepts.

Besides, the syllabus also attempts to

- Strengthen the concepts developed at the secondary stage to provide firm foundation for further learning in the subject.
- Expose the learners to different processes used in Physics-related industrial and technological applications.
- Develop process-skills and experimental, observational, manipulative, decision making and investigatory skills in the learners.
- Promote problem solving abilities and creative thinking in learners.
- Develop conceptual competence in the learners and make them realize and appreciate the interface of Physics with other disciplines.

PHYSICS (Code No. 042)

COURSE STRUCTURE

Class XI - 2025-26 (Theory)

Time: 3 hrs. **Max Marks: 70**

UNIT	CHAPTERS	MARKS
Unit–I	**Physical World and Measurement**	**23**
	Chapter–1: Units and Measurements	
Unit-II	**Kinematics**	
	Chapter–2: Motion in a Straight Line	
	Chapter–3: Motion in a Plane	
Unit–III	**Laws of Motion**	
	Chapter–4: Laws of Motion	
Unit–IV	**Work, Energy and Power**	**17**
	Chapter–5: Work, Energy and Power	
Unit–V	**Motion of System of Particles and Rigid Body**	
	Chapter–6: System of Particles and Rotational Motion	
Unit-VI	**Gravitation**	
	Chapter–7: Gravitation	
Unit–VII	**Properties of Bulk Matter**	**20**
	Chapter–8: Mechanical Properties of Solids	
	Chapter–9: Mechanical Properties of Fluids	
	Chapter–10: Thermal Properties of Matter	
Unit–VIII	**Thermodynamics**	
	Chapter–11: Thermodynamics	
Unit–IX	**Behaviour of Perfect Gases and Kinetic Theory of Gases**	
	Chapter–12: Kinetic Theory	
Unit–X	**Oscillations and Waves**	**10**
	Chapter–13: Oscillations	
	Chapter–14: Waves	
Total		**70**

Unit I: Physical World and Measurements

Chapter–1: Units and Measurements

Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. significant figures, Determining the uncertainty in result**.** Dimensions of physical quantities, dimensional analysis and its applications.

Unit II: Kinematics

Chapter–2: Motion in a Straight Line

Frame of reference, Motion in a straight line, Elementary concepts of differentiation and integration for describing motion, uniform and non- uniform motion, average speed and average velocity and instantaneous velocity, uniformly accelerated motion, velocity - time and position-time graphs. Relations for uniformly accelerated motion (graphical and calculus treatment).

Chapter–3: Motion in a Plane

Scalar and vector quantities; position and displacement vectors, general vectors and their notations; equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors, Unit vector; resolution of a vector in a plane, rectangular components, Scalar and Vector product of vectors.

Motion in a plane, cases of uniform velocity and uniform acceleration- projectile motion, uniform circular motion.

Unit III: Laws of Motion

Chapter–4: Laws of Motion

Intuitive concept of force, Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion.

Law of conservation of linear momentum and its applications.

Equilibrium of concurrent forces, Static and kinetic friction, laws of friction, rolling friction, lubrication.

Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on a level circular road, vehicle on a banked road).

Unit IV: Work, Energy and Power

Chapter– 5: Work, Energy and Power

Work done by a constant force and a variable force; kinetic energy, work- energy theorem, power.

Notion of potential energy, potential energy of a spring, conservative forces: non-conservative forces, motion in a vertical circle; elastic and inelastic collisions in one and two dimensions.

Unit V: Motion of System of Particles and Rigid Body

Chapter–6: System of Particles and Rotational Motion

Centre of mass of a two-particle system, momentum conservation and Centre of mass motion. Centre of mass of a rigid body; centre of mass of a uniform rod. Moment of a force, torque, angular momentum, law of conservation of angular momentum and its applications.

Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions.

Moment of inertia, radius of gyration, values of moments of inertia for simple geometrical objects (no derivation).

Unit VI: Gravitation

Chapter – 7: Gravitation

Kepler's laws of planetary motion, universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth.

Gravitational potential energy and gravitational potential, escape speed, orbital velocity of a satellite, energy of an orbiting satellite.

Unit VII: Properties of Bulk Matter

Chapter–8: Mechanical Properties of Solids

Elasticity, Stress-strain relationship, Hooke's law, Young’s modulus, bulk modulus, shear modulus of rigidity (qualitative idea only), Poisson's ratio; elastic energy. Application of elastic behavior of materials (qualitative idea only).

Chapter–9: Mechanical Properties of Fluids

Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift and hydraulic brakes), effect of gravity on fluid pressure.

Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, critical velocity, Bernoulli's theorem and its simple applications (Torricelli's law and Dynamic lift).

Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension ideas to drops, bubbles and capillary rise.

Chapter–10: Thermal Properties of Matter

Heat, temperature, thermal expansion; thermal expansion of solids, liquids and gases, anomalous expansion of water; specific heat capacity; Cp, Cv - calorimetry; change of state - latent heat capacity.

Heat transfer-conduction, convection and radiation, thermal conductivity, qualitative ideas of Blackbody radiation, Wein's displacement Law, Stefan's law.

Unit VIII: Thermodynamics

Chapter–11: Thermodynamics

Thermal equilibrium and definition of temperature, zeroth law of thermodynamics, heat, work and internal energy. First law of thermodynamics, Second law of thermodynamics: Thermodynamic state variable and equation of state. Change of condition of gaseous state - isothermal, adiabatic, reversible, irreversible, and cyclic processes.

Unit IX: Behavior of Perfect Gases and Kinetic Theory of Gases

Chapter–12: Kinetic Theory

Equation of state of a perfect gas, work done in compressing a gas.

Kinetic theory of gases - assumptions, concept of pressure. Kinetic interpretation of temperature; rms speed of gas molecules; degrees of freedom, law of equi-partition of energy (statement only) and application to specific heat capacities of gases; concept of mean free path, Avogadro's number.

Unit X: Oscillations and Waves

Chapter–13: Oscillations

Periodic motion - time period, frequency, displacement as a function of time, periodic functions and their applications.

Simple harmonic motion (S.H.M), uniform circular motion and its equations of motion; phase; oscillations of a loaded spring- restoring force and force constant; energy in S.H.M.
Kinetic and potential energies; simple pendulum derivation of expression for its time period.

Chapter–14: Waves

Wave motion: Transverse and longitudinal waves, speed of travelling wave, displacement relation for a progressive wave, principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats.

PRACTICALS

The record, to be submitted by the students, at the time of their annual examination, has to include:

- Record of at least 8 Experiments [with 4 from each section], to be performed by the students.
- Record of at least 6 Activities [with 3 each from section A and section B], to be performed by the students.
- Report of the project carried out by the students.

EVALUATION SCHEME

Time 3 hours **Max. Marks: 30**

Topic	Marks
Two experiments one from each section	7+7
Practical record (experiment and activities)	5
One activity from any section	3
Investigatory Project	3
Viva on experiments, activities and project	5
Total	**30**

SECTION–A

Experiments

1. To measure diameter of a small spherical/cylindrical body and to measure internal diameter and depth of a given beaker/calorimeter using Vernier Callipers and hence find its volume.
2. To measure diameter of a given wire and thickness of a given sheet using screw gauge.
3. To determine volume of an irregular lamina using screw gauge.
4. To determine radius of curvature of a given spherical surface by a spherometer.
5. To determine the mass of two different objects using a beam balance.
6. To find the weight of a given body using parallelogram law of vectors.

7. Using a simple pendulum, plot its graph and use it to find the effective length of second's pendulum.
8. To study variation of time period of a simple pendulum of a given length by taking bobs of same size but different masses and interpret the result.
9. To study the relationship between force of limiting friction and normal reaction and to find the co- efficient of friction between a block and a horizontal surface.
10. To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination θ by plotting graph between force and Sinθ.

Activities

1. To make a paper scale of given least count, e.g., 0.2cm, 0.5 cm.
2. To determine mass of a given body using a metre scale by principle of moments.
3. To plot a graph for a given set of data, with proper choice of scales and error bars.
4. To measure the force of limiting friction for rolling of a roller on a horizontal plane.
5. To study the variation in range of a projectile with angle of projection.
6. To study the conservation of energy of a ball rolling down on an inclined plane (using a double inclined plane).
7. To study dissipation of energy of a simple pendulum by plotting a graph between square of amplitude and time.

SECTION–B

Experiments

1. To determine Young's modulus of elasticity of the material of a given wire.
2. To find the force constant of a helical spring by plotting a graph between load and extension.
3. To study the variation in volume with pressure for a sample of air at constant temperature by plotting graphs between P and V, and between P and 1/V.
4. To determine the surface tension of water by capillary rise method.
5. To determine the coefficient of viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body.
6. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.
7. To determine specific heat capacity of a given solid by method of mixtures.
8. To study the relation between frequency and length of a given wire under constant tension using sonometer.
9. To study the relation between the length of a given wire and tension for constant frequency using sonometer.
10. To find the speed of sound in air at room temperature using a resonance tube by two resonance positions.

Activities

1. To observe change of state and plot a cooling curve for molten wax.
2. To observe and explain the effect of heating on a bi-metallic strip.
3. To note the change in level of liquid in a container on heating and interpret the observations.
4. To study the effect of detergent on surface tension of water by observing capillary rise.
5. To study the factors affecting the rate of loss of heat of a liquid.
6. To study the effect of load on depression of a suitably clamped metre scale loaded at (i) its end (ii) in the middle.
7. To observe the decrease in pressure with increase in velocity of a fluid.

Practical Examination for Visually Impaired Students Class XI

Note: Same Evaluation scheme and general guidelines for visually impaired students as given for Class XII may be followed.

A. Items for Identification/Familiarity of the apparatus for assessment in practical's (All experiments)

Spherical ball, Cylindrical objects, vernier calipers, beaker, calorimeter, Screw gauge, wire, Beam balance, spring balance, weight box, gram and milligram weights, forceps, Parallelogram law of vectors apparatus, pulleys and pans used in the same 'weights' used, Bob and string used in a simple pendulum, meter scale, split cork, suspension arrangement, stop clock/stop watch, Helical spring, suspension arrangement used, weights, arrangement used for measuring extension, Sonometer, Wedges, pan and pulley used in it, 'weights' Tuning Fork, Meter scale, Beam balance, Weight box, gram and milligram weights, forceps, Resonance Tube, Tuning Fork, Meter scale, Flask/Beaker used for adding water.

B. List of Practicals

1. To measure diameter of a small spherical/cylindrical body using vernier calipers.
2. To measure the internal diameter and depth of a given beaker/calorimeter using vernier calipers and hence find its volume.
3. To measure diameter of given wire using screw gauge.
4. To measure thickness of a given sheet using screw gauge.
5. To determine the mass of a given object using a beam balance.
6. To find the weight of given body using the parallelogram law of vectors.
7. Using a simple pendulum plot L-T and graphs. Hence find the effective length of second's pendulum using appropriate length values.
8. To find the force constant of given helical spring by plotting a graph between load and extension.
9. (i) To study the relation between frequency and length of a given wire under constant tension using a sonometer.

   (ii) To study the relation between the length of a given wire and tension, for constant frequency, using a sonometer.
10. To find the speed of sound in air, at room temperature, using a resonance tube, by observing the two resonance positions.

Note: The above practicals may be carried out in an experiential manner rather than recording observations.

Prescribed Books:

1. Physics Part-I, Textbook for Class XI, Published by NCERT
2. Physics Part-II, Textbook for Class XI, Published by NCERT
3. Laboratory Manual of Physics, Class XI Published by NCERT
4. The list of other related books and manuals brought out by NCERT (consider multimedia also).

Note:

The content indicated in NCERT textbooks as excluded for the year 2025-26 is not to be tested by schools.

CLASS XII (2025-26)

PHYSICS (THEORY)

Time: 3 hrs. **Max Marks: 70**

UNIT	CHAPTERS	MARKS
Unit–I	**Electrostatics**	
	Chapter–1: Electric Charges and Fields	
	Chapter–2: Electrostatic Potential and Capacitance	**16**
Unit-II	**Current Electricity**	
	Chapter–3: Current Electricity	
Unit-III	**Magnetic Effects of Current and Magnetism**	
	Chapter–4: Moving Charges and Magnetism	
	Chapter–5: Magnetism and Matter	**17**
Unit-IV	**Electromagnetic Induction and Alternating Currents**	
	Chapter–6: Electromagnetic Induction	
	Chapter–7: Alternating Current	
Unit–V	**Electromagnetic Waves**	
	Chapter–8: Electromagnetic Waves	
Unit–VI	**Optics**	**18**
	Chapter–9: Ray Optics and Optical Instruments	
	Chapter–10: Wave Optics	
Unit–VII	**Dual Nature of Radiation and Matter**	
	Chapter–11: Dual Nature of Radiation and Matter	
Unit–VIII	**Atoms and Nuclei**	**12**
	Chapter–12: Atoms	
	Chapter–13: Nuclei	
Unit–IX	**Electronic Devices**	
	Chapter–14: Semiconductor Electronics: Materials, Devices and Simple Circuits	**7**
Total		**70**

Unit I: Electrostatics

Chapter–1: Electric Charges and Fields

Electric charges, Conservation of charge, Coulomb's law-force between two- point charges, forces between multiple charges; superposition principle and continuous charge distribution.

Electric field, electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in uniform electric field.

Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside).

Chapter–2: Electrostatic Potential and Capacitance

Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two-point charges and of electric dipole in an electrostatic field.

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor (no derivation, formulae only).

Unit II: Current Electricity

Chapter–3: Current Electricity

Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity, temperature dependence of resistance, Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel, Kirchhoff's rules, Wheatstone bridge.

Unit III: Magnetic Effects of Current and Magnetism

Chapter–4: Moving Charges and Magnetism

Concept of magnetic field, Oersted's experiment.

Biot - Savart law and its application to current carrying circular loop.

Ampere's law and its applications to infinitely long straight wire. Straight solenoid (only qualitative treatment), force on a moving charge in uniform magnetic and electric fields.

Force on a current-carrying conductor in a uniform magnetic field, force between two parallel current-carrying conductors-definition of ampere, torque experienced by a current loop in uniform magnetic field; Current loop as a magnetic dipole and its magnetic dipole moment, moving coil galvanometer- its current sensitivity and conversion to ammeter and voltmeter.

Chapter–5: Magnetism and Matter

Bar magnet, bar magnet as an equivalent solenoid (qualitative treatment only), magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis (qualitative treatment only), torque on a magnetic dipole (bar magnet) in a uniform magnetic field (qualitative treatment only), magnetic field lines.

Magnetic properties of materials- Para-, dia- and ferro – magnetic substances with examples, Magnetization of materials, effect of temperature on magnetic properties.

Unit IV: Electromagnetic Induction and Alternating Currents

Chapter–6: Electromagnetic Induction

Electromagnetic induction; Faraday's laws, induced EMF and current; Lenz's Law, Self and mutual induction.

Chapter–7: Alternating Current

Alternating currents, peak and RMS value of alternating current/voltage; reactance and impedance; LCR series circuit (phasors only), resonance, power in AC circuits, power factor, wattless current. AC generator, Transformer.

Unit V: Electromagnetic waves

Chapter–8: Electromagnetic Waves

Basic idea of displacement current, Electromagnetic waves, their characteristics, their transverse nature (qualitative idea only).

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

Unit VI: Optics

Chapter–9: Ray Optics and Optical Instruments

Ray Optics: Reflection of light, spherical mirrors, mirror formula, refraction of light, total internal reflection and optical fibers, refraction at spherical surfaces, lenses, thin lens formula, lens maker's formula, magnification, power of a lens, combination of thin lenses in contact, refraction of light through a prism.

Optical instruments: Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

Chapter–10: Wave Optics

Wave optics: Wave front and Huygen's principle, reflection and refraction of plane wave at a plane surface using wave fronts. Proof of laws of reflection and refraction using Huygen's principle. Interference, Young's double slit experiment and expression for fringe width (No derivation final expression only), coherent sources and sustained interference of light, diffraction due to a single slit, width of central maxima (qualitative treatment only).

Unit VII: Dual Nature of Radiation and Matter

Chapter–11: Dual Nature of Radiation and Matter

Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation-particle nature of light.
Experimental study of photoelectric effect
Matter waves-wave nature of particles, de-Broglie relation.

Unit VIII: Atoms and Nuclei

Chapter–12: Atoms

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model of hydrogen atom, Expression for radius of nth possible orbit, velocity and energy of electron in nth orbit, hydrogen line spectra (qualitative treatment only).

Chapter–13: Nuclei

Composition and size of nucleus, nuclear force

Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission, nuclear fusion.

Unit IX: Electronic Devices

Chapter–14: Semiconductor Electronics: Materials, Devices and Simple Circuits

Energy bands in conductors, semiconductors and insulators (qualitative ideas only) Intrinsic and extrinsic semiconductors- p and n type, p-n junction

Semiconductor diode - I-V characteristics in forward and reverse bias, application of junction diode -diode as a rectifier.

PRACTICALS

The record to be submitted by the students at the time of their annual examination has to include:

- Record of at least 8 Experiments [with 4 from each section], to be performed by the students.
- Record of at least 6 Activities [with 3 each from section A and section B], to be performed by the students.
- The Report of the project carried out by the students.

Evaluation Scheme

Max. Marks: 30 **Time 3 hours**

Two experiments one from each section	7+7 Marks
Practical record [experiments and activities]	5 Marks
One activity from any section	3 Marks
Investigatory Project	3 Marks
Viva on experiments, activities and project	5 Marks
Total	**30 marks**

Experiments **SECTION–A**

1. To determine resistivity of two / three wires by plotting a graph for potential difference versus current.
2. To find resistance of a given wire / standard resistor using metre bridge.
3. To verify the laws of combination (series) of resistances using a metre bridge.

OR

To verify the laws of combination (parallel) of resistances using a metre bridge.

4. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
5. To convert the given galvanometer (of known resistance and figure of merit) into a voltmeter of desired range and to verify the same.

OR

To convert the given galvanometer (of known resistance and figure of merit) into an ammeter of desired range and to verify the same.

6. To find the frequency of AC mains with a sonometer.

Activities

1. To measure the resistance and impedance of an inductor with or without iron core.
2. To measure resistance, voltage (AC/DC), current (AC) and check continuity of a given circuit using multimeter.
3. To assemble a household circuit comprising three bulbs, three (on/off) switches, a fuse and a power source.
4. To assemble the components of a given electrical circuit.
5. To study the variation in potential drop with length of a wire for a steady current.
6. To draw the diagram of a given open circuit comprising at least a battery, resistor/rheostat, key, ammeter and voltmeter. Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram.

SECTION-B

Experiments

1. To find the value of *v* for different values of *u* in case of a concave mirror and to find the focal length.
2. To find the focal length of a convex mirror, using a convex lens.
3. To find the focal length of a convex lens by plotting graphs between *u* and *v* or between *1/u* and *1/v*.
4. To find the focal length of a concave lens, using a convex lens.
5. To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation.
6. To determine refractive index of a glass slab using a travelling microscope.
7. To find the refractive index of a liquid using convex lens and plane mirror.
8. To find the refractive index of a liquid using a concave mirror and a plane mirror.
9. To draw the I-V characteristic curve for a p-n junction diode in forward and reverse bias.

Activities

1. To identify a diode, an LED, a resistor and a capacitor from a mixed collection of such items.
2. Use of multimeter to see the unidirectional flow of current in case of a diode and an LED and check whether a given electronic component (e.g., diode) is in working order.

3. To study effect of intensity of light (by varying distance of the source) on an LDR.
4. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
5. To observe diffraction of light due to a thin slit.
6. To study the nature and size of the image formed by a (i) convex lens, or (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/mirror).
7. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.

Suggested Investigatory Projects

1. To study various factors on which the internal resistance/EMF of a cell depends.
2. To study the variations in current flowing in a circuit containing an LDR because of a variation in
   (a) the power of the incandescent lamp, used to 'illuminate' the LDR (keeping all the lamps at a fixed distance).
   (b) the distance of an incandescent lamp (of fixed power) used to 'illuminate' the LDR.
3. To find the refractive indices of (a) water (b) oil (transparent) using a plane mirror, an equiconvex lens (made from a glass of known refractive index) and an adjustable object needle.
4. To investigate the relation between the ratio of (i) output and input voltage and (ii) number of turns in the secondary coil and primary coil of a self-designed transformer.
5. To investigate the dependence of the angle of deviation on the angle of incidence using a hollow prism filled one by one, with different transparent fluids.
6. To estimate the charge induced on each one of the two identical Styrofoam (or pith) balls suspended in a vertical plane by making use of Coulomb's law.
7. To study the factor on which the self-inductance of a coil depends by observing the effect of this coil, when put in series with a resistor/(bulb) in a circuit fed up by an A.C. source of adjustable frequency.
8. To study the earth's magnetic field using a compass needle -bar magnet by plotting magnetic field lines and tangent galvanometer.

Practical Examination for Visually Impaired Students of

Classes XI and XII Evaluation Scheme

Time 2 hours **Max. Marks: 30**

Identification/Familiarity with the apparatus	5 marks
Written test (based on given/prescribed practicals)	10 marks
Practical Record	5 marks
Viva	10 marks
Total	**30 marks**

General Guidelines

- The practical examination will be of two-hour duration.
- A separate list of ten experiments is included here.
- The written examination in practicals for these students will be conducted at the time of practical examination of all other students.
- The written test will be of 30 minutes duration.
- The question paper given to the students should be legibly typed. It should contain a total of 15 practical skill based very short answer type questions. A student would be required to answer any 10 questions.
- A writer may be allowed to such students as per CBSE examination rules.
- All questions included in the question papers should be related to the listed practicals.
- Every question should require about two minutes to be answered.
- These students are also required to maintain a practical file. A student is expected to record at least five of the listed experiments as per the specific instructions for each subject. These practicals should be duly checked and signed by the internal examiner.
- The format of writing any experiment in the practical file should include aim, apparatus required, simple theory, procedure, related practical skills, precautions etc.
- Questions may be generated jointly by the external/internal examiners and used for assessment.
- The viva questions may include questions based on basic theory/principle/concept, apparatus/ materials/chemicals required, procedure, precautions, sources of error etc.

Class XII

A. Items for Identification/ familiarity with the apparatus for assessment in practicals (All experiments)

Meter scale, general shape of the voltmeter/ammeter, battery/power supply, connecting wires, standard resistances, connecting wires, voltmeter/ammeter, meter bridge, screw gauge, jockey Galvanometer, Resistance Box, standard Resistance, connecting wires, Potentiometer, jockey, Galvanometer, Lechlanche cell, Daniell cell [simple distinction between the two vis-à-vis their outer (glass and copper) containers], rheostat connecting wires, Galvanometer, resistance box, Plug-in and tapping keys, connecting wires battery/power supply, Diode, Resistor (Wire-wound or carbon ones with two wires connected to two ends), capacitors (one or two types), Inductors, Simple electric/electronic bell, battery/power supply, Plug- in and tapping keys, Convex lens, concave lens, convex mirror, concave mirror, Core/hollow wooden cylinder, insulated wire, ferromagnetic rod, Transformer core, insulated wire.

B. List of Practicals

1. To determine the resistance per cm of a given wire by plotting a graph between voltage and current.
2. To verify the laws of combination (series/parallel combination) of resistances by Ohm's law.
3. To find the resistance of a given wire / standard resistor using a meter bridge.
4. To determine the resistance of a galvanometer by half deflection method.
5. To identify a resistor, capacitor, inductor and diode from a mixed collection of such items.
6. To observe the difference between
   (i) a convex lens and a concave lens
   (ii) a convex mirror and a concave mirror and to estimate the likely difference between the power of two given convex /concave lenses.
7. To design an inductor coil and to know the effect of
   (i) change in the number of turns
   (ii) Introduction of ferromagnetic material as its core material on the inductance of the coil.
8. To design a (i) step up (ii) step down transformer on a given core and know the relation between its input and output voltages.

Note: The above practicals may be carried out in an experiential manner rather than recording observations.

Prescribed Books:

1. Physics, Class XI, Part -I and II, Published by NCERT.
2. Physics, Class XII, Part -I and II, Published by NCERT.
3. Laboratory Manual of Physics for class XII Published by NCERT.
4. The list of other related books and manuals brought out by NCERT (consider multimedia also).

Note:

The content indicated in NCERT textbooks as excluded for the year 2025-26 is not to be tested by schools and will not be assessed in the Board examinations 2025-26.

QUESTION PAPER DESIGN

Theory (Class: XI/XII)

Maximum Marks: 70 **Duration: 3 hrs.**

S No.	Typology of Questions	Total Marks	Approximate Percentage
1	**Remembering**: Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. **Understanding**: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	27	38 %
2	**Applying**: Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	22	32%
3	**Analysing :** Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations **Evaluating:** Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. **Creating**: Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.	21	30%
	Total Marks	**70**	**100**
	Practical	**30**	
	Gross Total	**100**	

Note:

*The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same**.***

For more details kindly refer to Sample Question Paper of class XII for the year 2025-26 to be published by CBSE at its website.

CHEMISTRY
Subject Code: 043
Classes XI-XII (2025-26)

Rationale

The second phase of Secondary stage is the most crucial stage of school education because at this juncture specialized discipline based, content - oriented courses are introduced. Students reach this stage after 10 years of general education and opt for Chemistry with a purpose of pursuing their career in basic sciences or professional courses like medicine, engineering, technology and study courses in applied areas of science and technology at tertiary level. Therefore, there is a need to provide the learners with a sufficient conceptual background of Chemistry, which will make them competent to meet the challenges of academic and professional courses after this stage.

The new and updated curriculum is based on a disciplinary approach with rigor and depth taking care that the syllabus is not heavy and at the same time it is comparable to that at the international level. The pedagogy of Chemistry has undergone tremendous changes in recent times. Many new areas like green chemistry, material science, biomolecules, and industrial chemistry deserve to be an integral part of the chemistry syllabus at this stage. Globally, nomenclature of elements and compounds, symbols and units of physical quantities recommended by scientific bodies like IUPAC and CGPM are of immense importance and also need to be incorporated in the updated syllabus. The proposed syllabus adequately addresses these issues.

Objectives

The curriculum of Chemistry at the second phase of Secondary stage has been designed to:

- equip the learners with tools to understand the working of Chemistry rather than mere facts of it;
- develop the necessary conceptual foundations of chemistry and ability to apply them to real life situations;
- enable the learners to represent chemical phenomena at macroscopic, molecular, and symbolic levels;
- make the learners identify patterns and form connections that underlie various chemical phenomena;
- prepare the learners to contribute to frontier research areas related to climate change, environmental issues, materials science, biology and medicine etc.:
- inculcate problem solving skills in the learners and integrate life skills and values in the context of chemistry; and
- apprise learners of the interface of chemistry with other disciplines of science such as physics, biology, geology, engineering etc.

COURSE STRUCTURE
CLASS XI
THEORY

Time: 3 Hours **Total Marks: 70**

S. No	UNIT	Marks
1	Some Basic Concepts of Chemistry	7
2	Structure of Atom	9
3	Classification of Elements and Periodicity in Properties	6
4	Chemical Bonding and Molecular Structure	7
5	Chemical Thermodynamics	9
6	Equilibrium	7
7	Redox Reactions	4
8	Organic Chemistry: Some basic Principles and Techniques	11
9	Hydrocarbons	10
	TOTAL	**70**

Unit 1: Some Basic Concepts of Chemistry

General Introduction: Importance and scope of Chemistry, Nature of matter, laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules, atomic and molecular masses, mole concept and molar mass, percentage composition, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry.

Unit 2: Structure of Atom

Discovery of Electron, Proton and Neutron, atomic number, isotopes and isobars. Thomson's model and its limitations. Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p and d orbitals, rules for filling electrons in orbitals - Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of atoms, stability of half-filled and completely filled orbitals.

Unit 3: Classification of Elements and Periodicity in Properties

Significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements -atomic radii, ionic radii, inert gas radii, Ionization enthalpy, electron gain enthalpy, electronegativity, valiancy, Nomenclature of elements with atomic number greater than 100.

Unit 4: Chemical Bonding and Molecular Structure

Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization, involving s, p and d orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), Hydrogen bond.

Unit 5: Chemical Thermodynamics

Concepts of System and types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions.

First law of thermodynamics -internal energy and enthalpy, heat capacity and specific heat, measurement of ΔU and ΔH, Hess's law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, solution and dilution. Second law of Thermodynamics (brief introduction), Introduction of entropy as a state function, Gibb's energy change for spontaneous and non- spontaneous processes, criteria for equilibrium, Third law of thermodynamics (brief introduction).

Unit 6: Equilibrium

Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium – Le Chatelier's principle, ionic equilibrium- ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of poly basic acids, acid strength, concept of pH, hydrolysis of salts (elementary idea), buffer solution, Henderson Equation, solubility product, common ion effect (with illustrative examples).

Unit 7: Redox Reactions

Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, in terms of loss and gain of electrons and change in oxidation number, applications of redox reactions.

Unit 8: Organic Chemistry – Some Basic Principles and Techniques

General introduction, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electrometric effect, resonance and hyper conjugation. Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions, electrophiles and nucleophiles, types of organic reactions.

Unit 9: Hydrocarbons

Aliphatic Hydrocarbons

Alkanes - Nomenclature, isomerism, conformation (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis.

Alkenes - Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation, chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

Alkynes - Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of - hydrogen, halogens, hydrogen halides and water.

Aromatic Hydrocarbons

Introduction, IUPAC nomenclature, benzene: resonance, aromaticity, chemical properties: mechanism of electrophilic substitution. Nitration, sulphonation, halogenation, Friedel Craft's alkylation and acylation, directive influence of functional group in mono substituted benzene, carcinogenicity and toxicity

Note: The following topics are included in the syllabus but will be assessed only formatively to reinforce understanding without adding to summative assessments. This reduces academic stress while ensuring meaningful learning. Schools can integrate these with existing chapters as they align well. Relevant NCERT textual material is enclosed for reference.

1. **s & p Block Elements**
   Electronic configuration, atomic & Ionic radii, Ionization Enthalpy, Hydration Enthalpy and general trends in physical and chemical properties of s and p block elements across the periods and down the groups; unique behavior of the first element in each group.
2. **The Gaseous State**
   Qualitative treatment of Gas laws, Ideal gas equation and deviations from it.

PRACTICAL

Evaluation Scheme for Examination	Marks
Volumetric Analysis	08
Salt Analysis	08
Content Based Experiment	06
Project Work	04
Class record and viva	04
Total	**30**

PRACTICAL SYLLABUS

Micro-chemical methods are available for several of the practical experiments, wherever possible such techniques should be used.

A.Basic Laboratory Techniques

1. Cutting glass tube and glass rod
2. Bending a glass tube
3. Drawing out a glass jet
4. Boring a cork

B.Characterization and Purification of Chemical Substances

1. Determination of melting point of an organic compound.
2. Determination of boiling point of an organic compound.
3. Crystallization of impure sample of any one of the following: Alum, Copper Sulphate, Benzoic Acid.

C.Experiments based on pH

1. Any one of the following experiments:
    - Determination of pH of some solutions obtained from fruit juices, solution of known and varied concentrations of acids, bases and salts using pH paper or universal indicator.
    - Comparing the pH of solutions of strong and weak acids of same concentration.
    - Study the pH change in the titration of a strong base using a universal indicator.
2. Study the pH change by common-ion in case of weak acids and weak bases.

D. Chemical Equilibrium

Any one of the following experiments:

- Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing/decreasing the concentration of either of the ions.
- Study the shift in equilibrium between $[Co(H_2O)_6]^{2+}$ and chloride ions by changing the concentration of either of the ions.

E. Quantitative Estimation

1. Using a mechanical balance/electronic balance.
2. Preparation of standard solution of Oxalic acid.
3. Determination of strength of a given solution of Sodium hydroxide by titrating it against standard solution of Oxalic acid.
4. Preparation of standard solution of Sodium carbonate.
5. Determination of strength of a given solution of hydrochloric acid by titrating it against standard Sodium Carbonate solution.

F. Qualitative Analysis

1. Determination of one anion and one cation in a given salt

Cations: Pb^{2+},Cu^{2+}, Al^{3+}, Fe^{3+},Mn^{2+}, Ni^{2+}, Zn^{2+}, Co^{2+}, Ca^{2+},Sr^{2+}, Ba^{2+}, Mg^{2+}, NH_4^+

Anions: CO_3^{2-},S^{2-} , SO_3^{2-},NO_3^-, NO_2^- , Cl^-, Br^-, I^- ,SO_4^{2-}, PO_4^{3-} , CH_3COO^-

(Note: Insoluble salts excluded)

2. Detection of -Nitrogen, Sulphur, Chlorine in organic compounds.

PROJECTS

Scientific investigations involving laboratory testing and collecting information from other sources.

A few suggested Projects

a) Checking the bacterial contamination in drinking water by testing sulphide ion

b) Study of the methods of purification of water

c) Testing the hardness, presence of Iron, Fluoride, Chloride, etc., depending upon the regional variation in drinking water and study of causes of presence of these ions above permissible limit (if any).

d) Investigation of the foaming capacity of different washing soaps and the effect of addition of Sodium carbonate on it

e) Study the acidity of different samples of tea leaves.

f) Determination of the rate of evaporation of different liquids

g) Study the effect of acids and bases on the tensile strength of fibers.

h) Study of acidity of fruit and vegetable juices.

Note: *Any other investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher.*

Practical Examination for Visually Challenged Students Class XI

Note: *Same Evaluation scheme and general guidelines for visually challenged students as given for Class XII may be followed.*

List of apparatus for identification for assessment in practicals (All experiments)

Beaker, tripod stand, wire gauze, glass rod, funnel, filter paper, Bunsen burner, test tube, test tube stands, dropper, test tube holder, ignition tube, china dish, tongs, standard flask, pipette, burette, conical flask, clamp stand, dropper, wash bottle

- Odor detection in qualitative analysis.
- Procedure/Setup of the apparatus.

List of Experiments

A. Characterization and Purification of Chemical Substances

Crystallization of an impure sample of any one of the following:
copper sulphate, benzoic acid.

B. Experiments based on pH

1. Determination of pH of some solutions obtained from fruit juices, solutions of known and varied concentrations of acids, bases and salts using pH paper.
2. Comparing the pH of solutions of strong and weak acids of same concentration.

C. Chemical Equilibrium

1. Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing/decreasing the concentration of either ions.
2. Study the shift in equilibrium between $[Co(H_2O)_6]^{2+}$ and chloride ions by changing the concentration of either of the ions.

D. Quantitative estimation

1. Preparation of standard solution of oxalic acid.

2. Determination of molarity of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid.

E. Qualitative Analysis

1. Determination of one anion and one cation in a given salt

   Cations - NH_4^+

   Anions: CO_3^{2-},S^{2-} , SO_3^{2-}, , Cl^-, CH_3COO^-

   (Note: insoluble salts excluded)

2. Detection of Nitrogen in the given organic compound.
3. Detection of Halogen in the given organic compound.

Note: *The above practical may be carried out in an experiential manner rather than recording observations.*

Prescribed Books:

1. Chemistry Part – I, Class-XI, Published by NCERT.
2. Chemistry Part – II, Class-XI, Published by NCERT.
3. Manual of Microscale Chemistry laboratory kit.

Links for NCERT textbooks:

1. **https://ncert.nic.in/textbook.php?kech1=0-6**
2. **https://ncert.nic.in/textbook.php?kech2=0-3**
3. **https://ncert.nic.in/division/dek/pdf/Manual_01.pdf**

COURSE STRUCTURE
CLASS XII
THEORY

Time: 3 Hours **Total Marks: 70**

S. No.	Title	Marks
1	Solutions	7
2	Electrochemistry	9
3	Chemical Kinetics	7
4	d -and f -Block Elements	7
5	Coordination Compounds	7
6	Haloalkanes and Haloarenes	6
7	Alcohols, Phenols and Ethers	6
8	Aldehydes, Ketones and Carboxylic Acids	8
9	Amines	6
10	Biomolecules	7
	Total	**70**

Unit 1: Solutions

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, Raoult's law, colligative properties - relative lowering of vapor pressure, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, Van't Hoff factor

Unit 2: Electrochemistry

Redox reactions, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, Relation between Gibbs energy change and EMF of a cell, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis and law of electrolysis (elementary idea), dry cell-electrolytic cells and Galvanic cells, lead accumulator, fuel cells, corrosion.

Unit 3: Chemical Kinetics

Rate of a reaction (Average and instantaneous), factors affecting rate of reaction: concentration, temperature, catalyst; order and molecularity of a reaction, rate law and specific rate constant, integrated rate equations and half-life (only for zero and first order

reactions), concept of collision theory (elementary idea, no mathematical treatment), activation energy, Arrhenius equation.

Unit 4: d and f Block Elements

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals – metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation, preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$.

Lanthanides - Electronic configuration, oxidation states, chemical reactivity and lanthanide contraction and its consequences.

Actinides - Electronic configuration, oxidation states and comparison with lanthanides

Unit 5: Coordination Compounds

Coordination compounds - Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding, Werner's theory, VBT, and CFT; structure and stereoisomerism, importance of coordination compounds (in qualitative analysis, extraction of metals and biological system).

Unit 6: Haloalkanes and Haloarenes

Haloalkanes: Nomenclature, nature of C–X bond, physical and chemical properties, optical rotation mechanism of substitution reactions.
Haloarenes: Nature of C–X bond, substitution reactions (Directive influence of halogen in monosubstituted compounds only).
Uses and environmental effects of - dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

Unit 7: Alcohols, Phenols and Ethers

Alcohols: Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only), identification of primary, secondary and tertiary alcohols, mechanism of dehydration, uses with special reference to methanol and ethanol.
Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.
Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses

Unit 8: Aldehydes, Ketones and Carboxylic Acids

Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes, uses.

Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

Unit 9: Amines

Amines: Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

Unit 10: Biomolecules

Carbohydrates - Classification (aldoses and ketoses), monosaccahrides (glucose and fructose), D-L configuration oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen); Importance of carbohydrates.

Proteins -Elementary idea of - amino acids, peptide bond, polypeptides, proteins, structure of proteins - primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation of proteins; enzymes. Hormones - Elementary idea excluding structure.

Vitamins - Classification and functions.

Nucleic Acids: DNA and RNA.

PRACTICAL

Evaluation Scheme for Examination	**Marks**
Volumetric Analysis	08
Salt Analysis	08
Content Based Experiment	06
Project Work	04
Class record and viva	04
Total	**30**

PRACTICAL SYLLABUS

Micro-chemical methods are available for several of the practical experiments, wherever possible such techniques should be used.

A. Surface Chemistry

1. Preparation of one lyophilic and one lyophobic sol

Lyophilic sol - starch, egg albumin and gum

Lyophobic sol – aluminum hydroxide, ferric hydroxide, arsenous sulphide.

2. Dialysis of sol-prepared in (a) above.
3. Study of the role of emulsifying agents in stabilizing the emulsion of different oils.

B. Chemical Kinetics

1. Effect of concentration and temperature on the rate of reaction between Sodium Thiosulphate and Hydrochloric acid.
2. Study of reaction rates of any one of the following:
   - Reaction of Iodide ion with Hydrogen Peroxide at room temperature using different concentration of Iodide ions.
   - Reaction between Potassium Iodate, (KIO_3) and Sodium Sulphate: (Na_2SO_3) using starch solution as indicator (clock reaction).

C. Thermochemistry

Any one of the following experiments

- Enthalpy of dissolution of Copper Sulphate or Potassium Nitrate.
- Enthalpy of neutralization of strong acid (HCl) and strong base (NaOH).
- Determination of enthalpy change during interaction (Hydrogen bond formation) between Acetone and Chloroform.

D. Electrochemistry

Variation of cell potential in $Zn/Zn^{2+}||\ Cu^{2+}/Cu$ with change in concentration of electrolytes ($CuSO_4$ or $ZnSO_4$) at room temperature.

E. Chromatography

1. Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of Rf values.
2. Separation of constituents present in an inorganic mixture containing two cations only (constituents having large difference in Rf values to be provided).

F. Preparation of Inorganic Compounds

1. Preparation of double salt of Ferrous Ammonium Sulphate or Potash Alum.
2. Preparation of Potassium Ferric Oxalate.

G. Preparation of Organic Compounds

Preparation of any one of the following compounds

1. Acetanilide

2. Di -benzalAcetone
3. p-Nitroacetanilide
4. Aniline yellow or 2 - Naphthol Aniline dye.

H. Tests for the functional groups present in organic compounds

Unsaturation, alcoholic, phenolic, aldehydic, ketonic, carboxylic and amino (Primary) groups.

I. Characteristic tests of carbohydrates, fats and proteins in pure samples and their detection in given foodstuffs.

J. Determination of concentration/ molarity of KMnO4 solution by titrating it against a standard solution of:

1. Oxalic acid,
2. Ferrous Ammonium Sulphate

(Students will be required to prepare standard solutions by weighing themselves).

K. Qualitative analysis

Determination of one anion and one cation in a given salt

Cations: Pb^{2+},Cu^{2+}, Al^{3+}, Fe^{3+},Mn^{2+}, Ni^{2+} Zn^{2+} Co^{2+} $Ca^{2+}$$Sr^{2+}$ Ba^{2+} Mg^{2+}, NH_4^+

Anions: CO_3^{2-},S^{2-} , SO_3^{2-}, NO_3^-, NO_2^- , Cl^-, Br^-, I^- ,SO_4^{2-}, PO_4^{3-} , CH_3COO^-, $C_2O_4^{2-}$

(Note: Insoluble salts excluded)

PROJECTS

Scientific investigations involving laboratory testing and collecting information from other sources.

A few suggested Projects

a) Study of the presence of oxalate ions in guava fruit at different stages of ripening.

b) Study of quantity of casein present in different samples of milk.

c) Preparation of soybean milk and its comparison with the natural milk with respect to curd formation, effect of temperature, etc.

d) Study of the effect of Potassium Bisulphate as food preservative under various conditions (temperature, concentration, time, etc.)

e) Study of digestion of starch by salivary amylase and effect of pH and temperature on it.

f) Comparative study of the rate of fermentation of following materials: wheat flour, gram flour, potato juice, carrot juice, etc.

g) Extraction of essential oils present in Saunf (aniseed), Ajwain (carom), Illaichi (cardamom).

h) Study of common food adulterants in fat, oil, butter, sugar, turmeric power, chili powder and pepper.

Note: *Any other investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher.*

Practical Examination for Visually Challenged Learners Classes XI and XII

Evaluation Scheme	**Marks**
Identification/Familiarity with the apparatus	5
Written test (based on given/prescribed practical's)	10
Practical Record	5
Viva	10
Total	**30**

General Guidelines

- The practical examination will be of two-hour duration.
- A separate list of ten experiments is included here.
- The written examination in practicals for these students will be conducted at the time of practical examination of all other students.
- The written test will be of 30 minutes' duration.
- The question paper given to the students should be legibly typed. It should contain a total of 15 practical skill based very short answer type questions. A student would be required to answer any 10 questions.
- A writer may be allowed to such students as per CBSE examination rules.
- All questions included in the question papers should be related to the listed practicals
- Every question should require about two minutes to be answered.
- These students are also required to maintain a practical file. A student is expected to record at least five of the listed experiments as per the specific instructions for each subject. These practicals should be duly checked and signed by the internal examiner.
- The format of writing any experiment in the practical file should include aim, apparatus required, simple theory, procedure, related practical skills, precautions etc.
- Questions may be generated jointly by the external/internal examiners and used

for assessment.

- The viva questions may include questions based on basic theory/principle/concept, apparatus/materials/ chemicals required, procedure, precautions, sources of error etc.

List of apparatus for identification/familiarity for assessment in practical (All experiments)

Beaker, glass rod, tripod stand, wire gauze, Bunsen burner, Whatman filter paper, gas jar, capillary tube, pestle and mortar, test tubes, tongs, test tube holder, test tube stand, burette, pipette, conical flask, standard flask, clamp stand, funnel, filter paper

Hands-on Assessment

- Identification/familiarity with the apparatus
- Odour detection in qualitative analysis

List of Experiments

The experiments have been divided into two sections: Section A and Section B. The experiments mentioned in Section B are mandatory.

SECTION A

A. Surface Chemistry

1. Preparation of one lyophilic and one lyophobic sol

   i. Lyophilic sol - starch, egg albumin and gum

   ii. Lyophobic sol – Ferric hydroxide

B. Chromatography

Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of Rf values (distance values may be provided).

C. Tests for the functional groups present in organic compounds

1. Alcoholic and Carboxylic groups
2. Aldehyde and Kenotic groups

D. Characteristic tests of carbohydrates and proteins in the given foodstuffs.

E. Preparation of Inorganic Compounds- Potash Alum

SECTION B (Mandatory)

F. Quantitative analysis

1. (a) Preparation of a given volume of the standard solution of Oxalic acid.

   (b) Determination of molarity of $KMnO_4$ solution by titrating it against a standard solution of Oxalic acid.

2. The above exercise [F 1 (a) and (b)] to be conducted using Ferrous ammonium sulphate (Mohr's salt)

G. Qualitative Analysis

Determination of one anion and one cation in a given salt

Cation - $\boldsymbol{NH_4^+}$

Anions: $\boldsymbol{CO_3^{2-}}$**,**$\boldsymbol{S^{2-}}$ **,** $\boldsymbol{SO_3^{2-}}$**, ,** $\boldsymbol{Cl^-}$**,** $\boldsymbol{CH_3COO^-}$

(Note: insoluble salts excluded)

Note: *The above practical may be carried out in an experiential manner rather than recording observations.*

Prescribed Books:

1. Chemistry Part – I, Class-XII, Published by NCERT.
2. Chemistry Part – II, Class-XII, Published by NCERT.
3. Manual of Microscale Chemistry laboratory kit.

Links for NCERT textbooks:

1. **https://ncert.nic.in/textbook.php?lech1=0-5**
2. **https://ncert.nic.in/textbook.php?lech2=0-5**
3. **https://ncert.nic.in/division/dek/pdf/Manual_01.pdf**

QUESTION PAPER DESIGN CLASSES XI & XII

S.No	Domains	Total Marks	%
1	**Remembering and Understanding:** Exhibit memory of previously learned material by recalling facts, terms, basic concepts and answers. Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions and stating main ideas.	28	40
2	**Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	21	30
3	**Analysing, Evaluating and Creating:** Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations. Present and defend opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria. Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.	21	30

1. No chapter wise weightage is provided, however, care to be taken to cover all the chapters.
2. Suitable internal variations may be made for generating various templates.
3. There will be no overall choice in the question paper.
4. However, 33% internal choices will be given in all the sections.

Mathematics

Subject Code – 041

Classes XI-XII (2025 – 26)

The Syllabus in the subject of Mathematics has undergone changes from time to time in accordance with growth of the subject and emerging needs of the society. Senior Secondary stage is a launching stage from where the students go either for higher academic education in Mathematics or for professional courses like Engineering, Physical and Biological science, Commerce or Computer Applications. The present revised syllabus has been designed in accordance with National Curriculum Framework 2005 and as per guidelines given in Focus Group on Teaching of Mathematics 2005 which is to meet the emerging needs of all categories of students. Motivating the topics from real life situations and other subject areas, greater emphasis has been laid on application of various concepts.

Objectives

The broad objectives of teaching Mathematics at senior school stage intend to help the students:

- to acquire knowledge and critical understanding, particularly by way of motivation and visualization, of basic concepts, terms, principles, symbols and mastery of underlying processes and skills.
- to feel the flow of reasons while proving a result or solving a problem.
- to apply the knowledge and skills acquired to solve problems and wherever possible, by more than one method.
- to develop positive attitude to think, analyze and articulate logically.
- to develop interest in the subject by participating in related competitions.
- to acquaint students with different aspects of Mathematics used in daily life.
- to develop an interest in students to study Mathematics as a discipline.
- to develop awareness of the need for national integration, protection of environment, observance of small family norms, removal of social barriers, elimination of gender biases.
- to develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics.

COURSE STRUCTURE

CLASS XI (2025-26)

Three Hours **Max Marks: 80**

No.	Units	Marks
I.	Sets and Functions	23
II.	Algebra	25
III.	Coordinate Geometry	12
IV.	Calculus	08
V.	Statistics and Probability	12
	Total	**80**
	Internal Assessment	**20**

*No chapter/unit-wise weightage. Care to be taken to cover all the chapters.

Unit-I: Sets and Functions

1. Sets

Sets and their representations, Empty set, Finite and Infinite sets, Equal sets, Subsets, Subsets of a set of real numbers especially intervals (with notations). Universal set. Venn diagrams. Union and Intersection of sets. Difference of sets. Complement of a set. Properties of Complement.

2. Relations & Functions

Ordered pairs. Cartesian product of sets. Number of elements in the Cartesian product of two finite sets. Cartesian product of the set of reals with itself (up to R x R x R). Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special type of relation. Pictorial representation of a function, domain, co-domain and range of a function. Real valued functions, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum, exponential, logarithmic and greatest integer functions, with their graphs. Sum, difference, product and quotients of functions.

3. Trigonometric Functions

Positive and negative angles. Measuring angles in radians and in degrees and conversion from one measure to another. Definition of trigonometric functions with the help of unit circle. Truth of the identity $sin^2x + cos^2x = 1$, for all x. Signs of trigonometric functions. Domain and range of trigonometric functions and their graphs. Expressing $sin\,(x \pm y)$ and $cos\,(x \pm y)$ in terms of $sinx,\ siny, cosx$ & $cosy$ and their simple applications. Deducing identities like the following:

$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}, \cot(x \pm y) = \frac{\cot x \mp \cot y}{\cot y \pm \cot x}$

$\sin \alpha \pm \sin \beta = 2 \sin \frac{1}{2}(\alpha \pm \beta) \cos \frac{1}{2}(\alpha \mp \beta)$

$\cos \alpha + \cos \beta = 2 \cos \frac{1}{2}(\alpha + \beta) \cos \frac{1}{2}(\alpha - \beta)$

$\cos \alpha - \cos \beta = -2 \sin \frac{1}{2}(\alpha + \beta) \sin \frac{1}{2}(\alpha - \beta)$

Identities related to $\sin 2x$, $\cos 2x$, $\tan 2x$, $\sin 3x$, $\cos 3x$ and $\tan 3x$.

Unit-II: Algebra

1. Complex Numbers and Quadratic Equations

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve some of the quadratic equations. Algebraic properties of complex numbers. Argand plane.

2. Linear Inequalities

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line.

3. Permutations and Combinations

Fundamental principle of counting. Factorial *n.* (n!) Permutations and combinations, derivation of Formulae for ${}^{n}P_{r}$, ${}^{n}C_{r}$ and their connections, simple applications.

4. Binomial Theorem

Historical perspective, statement and proof of the binomial theorem for positive integral indices. Pascal's triangle, simple applications.

5. Sequence and Series

Sequence and Series. Arithmetic Mean (A.M.) Geometric Progression (G.P.), general term of a G.P., sum of *n* terms of a G.P., infinite G.P. and its sum, geometric mean (G.M.), relation between A.M. and G.M

Unit-III: Coordinate Geometry

1. Straight Lines

Brief recall of two-dimensional geometry from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axis, point -slope form, slope-intercept form, two-point form, intercept form. Distance of a point from a line.

2. Conic Sections

Sections of a cone: circles, ellipse, parabola, hyperbola, a point, a straight line and a pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

3. Introduction to Three-dimensional Geometry

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points.

Unit-IV: Calculus

1. Limits and Derivatives

Derivative introduced as rate of change both as that of distance function and geometrically. Intuitive idea of limit. Limits of polynomials and rational functions trigonometric, exponential and logarithmic functions. Definition of derivative relate it to scope of tangent of the curve, derivative of sum, difference, product and quotient of functions of polynomial and trigonometric functions.

Unit-V Statistics and Probability

1. Statistics

Measures of Dispersion: Range, Mean deviation, variance and standard deviation of ungrouped/grouped data.

2. Probability

Events; occurrence of events, ‘not’, ‘and’ and ‘or’ events, exhaustive events, mutually exclusive events, Axiomatic (set theoretic) probability, connections with other theories of earlier classes. Probability of an event, probability of ‘not’, ‘and’ and ‘or’ events.

MATHEMATICS QUESTION PAPER DESIGN

CLASS – XI (2025-26)

Time: 3 hours **Max. Marks: 80**

S. No.	Typology of Questions	Total Marks	% Weightage
1	**Remembering:** Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. **Understanding:** Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	44	55
2	**Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	20	25
3	**Analysing:** Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations **Evaluating:** Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. **Creating:** Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions	16	20
	Total	**80**	**100**

1. *No chapter wise weightage. Care to be taken to cover all the chapters*
2. *Suitable internal variations may be made for generating various templates keeping the overall weightage to different form of questions and typology of questions same.*

Choice(s):

There will be no overall choice in the question paper. However, 33% internal choices will be given in all the sections

INTERNAL ASSESSMENT	**20 MARKS**
Periodic Tests (Best 2 out of 3 tests conducted)	10 Marks
Mathematics Activities	10 Marks

Note: Please refer the guidelines given under XII Mathematics Syllabus.

CLASS – XI (2025-26)

The following topics are included in the syllabus but will be assessed only formatively to reinforce understanding without adding to summative assessments. This reduces academic stress while ensuring meaningful learning. Schools can integrate these with existing chapters as they align well. Relevant NCERT textual material is enclosed for reference.

S.No.	Content
	Unit-I: Sets and Functions
1.	**Sets**
	Practical problems on Union and Intersection of two sets.
2.	**Relations and Functions**
	Composition of Functions
3.	**Trigonometric Functions**
	General solution of trigonometric equations of the type $\sin y = \sin a, \cos y = \cos a$ and $\tan y = \tan a$.
	Unit-II: Algebra
1.	**Principle of Mathematical Induction**
	Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers. The principle of mathematical induction and simple applications.
2.	**(Complex Numbers and) Quadratic Equations**
	Polar representation of complex numbers. Statement of Fundamental Theorem of Algebra, solution of quadratic equations (with real coefficients) in the complex number system.
3.	**Linear Inequalities**
	Graphical solution of linear inequalities in two variables. Graphical method of finding a solution of system of linear inequalities in two variables.
4.	**Binomial Theorem**
	General and middle term in binomial expansion.
5.	**Sequence and Series**
	Formulae for the following special sums $\sum_{k=1}^{n} k, \sum_{k=1}^{n} k^2, \sum_{k=1}^{n} k^3$
	Unit-III: Coordinate Geometry
1.	**Straight Lines**
	Normal form. General equation of a line.
2.	**Introduction to Three-dimensional Geometry**
	Section formula.
	Unit-IV: Calculus
1.	**Limits and Derivatives**
	Derivatives of composite functions (Chain rule).
	Unit-V Statistics and Probability
1.	**Probability**
	Random experiments; outcomes, sample space (set representation).

COURSE STRUCTURE

CLASS – XII

(2025-26)

One Paper **Max. Marks: 80**

No.	Units	Marks
I.	Relations and Functions	08
II.	Algebra	10
III.	Calculus	35
IV.	Vectors and Three - Dimensional Geometry	14
V.	Linear Programming	05
VI.	Probability	08
	Total	**80**
	Internal Assessment	**20**

Unit-I: Relations and Functions

1. Relations and Functions

Types of relations: reflexive, symmetric, transitive and equivalence relations. One to one and onto functions.

2. Inverse Trigonometric Functions

Definition, range, domain, principal value branch. Graphs of inverse trigonometric functions.

Unit-II: Algebra

1. Matrices

Concept, notation, order, equality, types of matrices, zero and identity matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operations on matrices: Addition and multiplication and multiplication with a scalar. Simple properties of addition, multiplication and scalar multiplication. Non- commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

2. Determinants

Determinant of a square matrix (up to 3 x 3 matrices), minors, co-factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

Unit-III: Calculus

1. Continuity and Differentiability

Continuity and differentiability, chain rule, derivative of composite functions, derivatives of inverse trigonometric functions like $\sin^{-1} x$, $\cos^{-1} x$ and $\tan^{-1} x$, derivative of implicit functions. Concept of exponential and logarithmic functions. Derivatives of logarithmic and exponential functions. Logarithmic differentiation, derivative of functions expressed in parametric forms. Second order derivatives.

2. Applications of Derivatives

Applications of derivatives: rate of change of quantities, increasing/decreasing functions, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real- life situations).

3. Integrals

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of the following types and problems based on them.

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2+bx+c}, \int \frac{dx}{\sqrt{ax^2+bx+c}}, \int \frac{px+q}{ax^2+bx+c} dx,$$

$$\int \frac{px+q}{\sqrt{ax^2+bx+c}} dx, \int \sqrt{a^2 \pm x^2}\, dx, \int \sqrt{x^2 - a^2}\, dx, \int \sqrt{ax^2 + bx + c}\, dx$$

Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

4. Application of the Integrals

Applications in finding the area under simple curves, especially lines, circles/ parabolas/ellipses (in standard form only)

5. Differential Equations

Definition, order and degree, general and particular solutions of a differential equation. Solution of differential equations by method of separation of variables, solutions of homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:

$\frac{dy}{dx} + py = q$, where p and q are functions of x or constants.

$\frac{dx}{dy} + px = q$, where p and q are functions of y or constants.

Unit-IV: Vectors and Three-dimensional Geometry

1. Vectors

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors.

2. Three-dimensional Geometry

Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, skew lines, shortest distance between two lines. Angle between two lines.

Unit-V: Linear Programming Problem

1. Linear Programming

Introduction, related terminology such as constraints, objective function, optimization, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

Unit-VI: Probability

1. Probability

Conditional probability, multiplication theorem on probability, independent events, total probability, Bayes' theorem.

MATHEMATICS (Code No. – 041)

QUESTION PAPER DESIGN

CLASS – XII (2025-26)

Time: 3 hours **Max. Marks: 80**

S. No.	Typology of Questions	Total Marks	% Weightage
1	**Remembering:** Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. **Understanding:** Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	44	55
2	**Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	20	25
3	**Analysing :** Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations **Evaluating:** Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. **Creating:** Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions	16	20
	Total	**80**	**100**

1. *No chapter wise weightage. Care to be taken to cover all the chapters*
2. *Suitable internal variations may be made for generating various templates keeping the overall weightage to different form of questions and typology of questions same.*

Choice(s):

There will be no overall choice in the question paper. However, 33% internal choices will be given in all the sections

INTERNAL ASSESSMENT	**20 MARKS**
Periodic Tests (Best 2 out of 3 tests conducted)	10 Marks
Mathematics Activities	10 Marks

Note: For activities NCERT Lab Manual may be referred.

Conduct of Periodic Tests:

Periodic Test is a Pen and Paper assessment which is to be conducted by the respective subject teacher. The format of periodic test must have questions items with a balance mix, such as, very short answer (VSA), short answer (SA) and long answer (LA) to effectively assess the knowledge, understanding, application, skills, analysis, evaluation and synthesis. Depending on the nature of subject, the subject teacher will have the liberty of incorporating any other types of questions too. The modalities of the PT are as follows:

a) **Mode:** The periodic test is to be taken in the form of pen-paper test.

b) **Schedule:** In the entire Academic Year, three Periodic Tests in each subject may be conducted as follows:

Test	Pre-Mid-term (PT-I)	Mid-Term (PT-II)	Post Mid-Term (PT-III)
Tentative Month	July-August	November	December-January

This is only a suggestive schedule and schools may conduct periodic tests as per their convenience. The winter bound schools would develop their own schedule with similar time gaps between two consecutive tests.

c) **Average of Marks**: Once schools complete the conduct of all the three periodic tests, they will convert the weightage of each of the three tests into ten marks each for identifying best two tests. The best two will be taken into consideration and the average of the two shall be taken as the final marks for PT.

d) The school will ensure simple documentation to keep a record of performance as suggested in detail circular no. Acad-05/2017.

e) **Sharing of Feedback/Performance**: The students' achievement in each test must be shared with the students and their parents to give them an overview of the level of learning that has taken place during different periods. Feedback will help parents formulate interventions (conducive ambience, support materials, motivation and morale-boosting) to further enhance learning. A teacher, while sharing the feedback with student or parent, should be empathetic, non- judgmental and motivating. It is recommended that the teacher share best examples/performances of IA with the class to motivate all learners

Assessment of Activity Work:

Throughout the year any 10 activities shall be performed by the student from the activities given in the NCERT Laboratory Manual for the respective class (XI or XII) which is available on the link: http://www.ncert.nic.in/exemplar/labmanuals.html a record of the same may be kept by the student. An year end test on the activity may be conducted

The weightage are as under:

- The activities performed by the student throughout the year and record keeping: 5 marks
- Assessment of the activity performed during the year end test: 3 marks
- Viva-voce: 2 marks

Prescribed Books:

1) Mathematics Textbook for Class XI, NCERT Publications
2) Mathematics Part I - Textbook for Class XII, NCERT Publication
3) Mathematics Part II - Textbook for Class XII, NCERT Publication
4) Mathematics Exemplar Problem for Class XI, Published by NCERT
5) Mathematics Exemplar Problem for Class XII, Published by NCERT
6) Mathematics Lab Manual class XI, published by NCERT
7) Mathematics Lab Manual class XII, published by NCERT

BIOLOGY

Subject Code – 044

Classes XI - XII (2025-26)

The present curriculum provides the students with updated concepts along with an extended exposure to contemporary areas of the subject. The curriculum also aims at emphasizing the underlying principles that are common to animals, plants and microorganisms as well as highlighting the relationship of Biology with other areas of knowledge. The format allows a simple, clear, sequential flow of concepts. It links the discoveries and innovations in biology to everyday life such as environment, industry, health and agriculture. The Biology curriculum is expected to enable the students to:

- develop capacities for observation, experimentation, documentation, and familiarity with quantitative reasoning and multi-disciplinary approaches.
- engender sensitivity towards biological issues (environment, health) in their surroundings and be aware of how citizens can contribute to their local communities and to science.
- be aware of bioethical concerns that arise in biology today.
- understand the integration of different fields of biology and highlight the interconnections between these fields.
- be exposed to diverse careers in the life sciences.

This curriculum of Biology will help in achieving the following curricular goals and competencies delineated in the National Curriculum Framework for School Education 2023:

CG-3 Explores the structure and function of the living world at the cellular level	C-3.1 Explains the role of cellular components (nucleus, mitochondria, endoplasmic reticulum, vacuoles, chloroplast, cell wall), including the semi permeability of cell membrane in making cell the structural basis of living organisms and functional basis of life processes C-3.2 Analyses similarities and differences in the life processes involved in nutrition (photosynthesis in plants; absorption of nutrients in fungi; digestion in animals), transport (transport of water in plants; circulation in animals), exchange of materials (respiration and excretion), and reproduction C-3.3 Describes mechanisms of heredity (in terms of DNA, genes, chromosomes) and variation (as changes in the sequence of DNA)
CG-4 Explores interconnectedness between organisms and their	C-4.1 Applies the knowledge of cellular diversity in organisms along with the ecological role organisms play (autotrophic/ heterotrophic nutrition) to classify them into five-kingdoms

environment	C-4.2 Illustrates different levels of organisations of living organisms (from molecules to organisms) C-4.3 Analyses different levels of biological organisation from organisms to ecosystems and biomes along with interactions that take place at each level C-4.4 Analyses patterns of inheritance of traits in terms of Mendel's laws and its consequences at a population level (using models and/or simulations) C-4.5 Analyses evidences of biological evolution demonstrating the consequences of the process of natural selection in terms of changes — in allele frequency in population, structure, and function of organisms
CG-5 Draws linkages between scientific knowledge and knowledge across other curricular areas	C-5.3 Applies scientific principles to explain phenomena in other subjects (sound pitch, octave, and amplitude in music; use of muscles in dance form and sports)
CG-6 Understands and appreciates the contribution of India through history and the present times to the overall field of Science, including the disciplines that constitute it	C-6.1 Knows and explains the significant contributions of India to all matters (concepts, explanations, methods) that are studied within the curriculum in an integrated manner
CG-7 Develops awareness of the most current discoveries, ideas, and frontiers in all areas of scientific knowledge in order to appreciate that Science is ever evolving, and that there are still many unanswered questions	C-7.1 States concepts that represent the most current understanding of the matter being studied — ranging from mere familiarity to conceptual understanding of the matter as appropriate to the developmental stage of the students C-7.2 States questions related to matters in the curriculum for which current scientific understanding is well-recognised to be inadequate
CG-8 Explores the nature of Science by doing Science	C-8.1 Develops accurate and appropriate models (including geometric, mathematical, graphical) to represent real-life events and phenomena using scientific principles and use these models to manipulate variables and predict results C-8.2 Designs and implements a plan for scientific inquiry (formulates hypotheses, makes predictions, identifies variables, accurately uses scientific instruments, represents data — primary and secondary — in multiple modes, draws inferences based on data and understanding of scientific concepts, theories, laws, and principles, communicates findings using scientific terminology)

It is expected that the students would get an exposure to various branches of Biology in the curriculum in a more contextual and systematic manner as they study its various units.

(NCFSE-2023)

Attainment of the competencies shall be done through transaction of the curriculum using appropriate pedagogy; these shall be assessed through an integrated evaluation scheme.

COURSE STRUCTURE
CLASS XI (2025-26)
(THEORY)

Time: 03 Hours **Max. Marks: 70**

Unit	Title	Marks
I	Diversity of Living Organisms	15
II	Structural Organization in Plants and Animals	10
III	Cell: Structure and Function	15
IV	Plant Physiology	12
V	Human Physiology	18
	Total	**70**

Unit-I Diversity of Living Organisms

Chapter-1: The Living World

Biodiversity; Need for classification; three domains of life; taxonomy and systematics; concept of species and taxonomical hierarchy; binomial nomenclature

Chapter-2: Biological Classification

Five kingdom classification; Salient features and classification of Monera, Protista and Fungi into major groups; Lichens, Viruses and Viroids.

Chapter-3: Plant Kingdom

Classification of plants into major groups; Salient and distinguishing features and a few examples of Algae, Bryophyta, Pteridophyta, Gymnospermae and Angiosperms.

Chapter-4: Animal Kingdom

Salient features and classification of animals, non-chordates up to phyla level and chordates upto class level (salient features and at a few examples of each category).

(No live animals or specimen should be displayed.)

Unit-II Structural Organization in Plants and Animals

Chapter-5: Morphology of Flowering Plants

Morphology of different parts of flowering plants: root, stem, leaf, inflorescence, flower, fruit and seed. Description of family Solanaceae

Chapter-6: Anatomy of Flowering Plants

Anatomy and functions of tissue systems in dicots and monocots.

Chapter-7: Structural Organisation in Animals

Morphology, Anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of frog.

Unit-III Cell: Structure and Function

Chapter-8: Cell-The Unit of Life

Cell theory and cell as the basic unit of life, structure of prokaryotic and eukaryotic cells; Plant cell and animal cell; cell envelope; cell membrane, cell wall; cell organelles - structure and function; endomembrane system, endoplasmic reticulum, golgi bodies, lysosomes, vacuoles, mitochondria, ribosomes, plastids, microbodies; cytoskeleton, cilia, flagella, centrioles (ultrastructure and function); nucleus.

Chapter-9: Biomolecules

Chemical constituents of living cells: biomolecules, structure and function of proteins, carbohydrates, lipids, and nucleic acids; Enzyme - types, properties, enzyme action. (Topics excluded: Nature of Bond Linking Monomers in a Polymer, Dynamic State of Body Constituents Concept of Metabolism, Metabolic Basis of Living, The Living State)

Chapter-10: Cell Cycle and Cell Division

Cell cycle, mitosis, meiosis and their significance

Unit-IV Plant Physiology

Chapter-11: Photosynthesis in Higher Plants

Photosynthesis as a means of autotrophic nutrition; site of photosynthesis, pigments involved in photosynthesis (elementary idea); photochemical and biosynthetic phases of photosynthesis; cyclic and non-cyclic photophosphorylation; chemiosmotic hypothesis; photorespiration; C3 and C4 pathways; factors affecting photosynthesis.

Chapter-12: Respiration in Plants

Exchange of gases; cellular respiration - glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); energy relations - number of ATP molecules generated; amphibolic pathways; respiratory quotient.

Chapter-13: Plant - Growth and Development

Seed germination; phases of plant growth and plant growth rate; conditions of growth; differentiation, dedifferentiation and redifferentiation; sequence of developmental processes

in a plant cell; plant growth regulators - auxin, gibberellin, cytokinin, ethylene, ABA.

Unit-V Human Physiology

Chapter-14: Breathing and Exchange of Gases

Respiratory organs in animals (recall only); Respiratory system in humans; mechanism of breathing and its regulation in humans - exchange of gases, transport of gases and regulation of respiration, respiratory volume; disorders related to respiration - asthma, emphysema, occupational respiratory disorders.

Chapter-15: Body Fluids and Circulation

Composition of blood, blood groups, coagulation of blood; composition of lymph and its function; human circulatory system - Structure of human heart and blood vessels; cardiac cycle, cardiac output, ECG; double circulation; regulation of cardiac activity; disorders of circulatory system - hypertension, coronary artery disease, angina pectoris, heart failure.

Chapter-16: Excretory Products and their Elimination

Modes of excretion - ammonotelism, ureotelism, uricotelism; human excretory system – structure and function; urine formation, osmoregulation; regulation of kidney function - renin - angiotensin, atrial natriuretic factor, ADH and diabetes insipidus; role of other organs in excretion; disorders - uremia, renal failure, renal calculi, nephritis; dialysis and artificial kidney, kidney transplant.

Chapter-17: Locomotion and Movement

Types of movement - ciliary, flagellar, muscular; skeletal muscle, contractile proteins and muscle contraction; skeletal system and its functions; joints; disorders of muscular and skeletal systems - myasthenia gravis, tetany, muscular dystrophy, arthritis, osteoporosis, gout.

Chapter-18: Neural Control and Coordination

Neuron and nerves; Nervous system in humans - central nervous system; peripheral nervous system and visceral nervous system; generation and conduction of nerve impulse

Chapter- 19: Chemical Coordination and Integration

Endocrine glands and hormones; human endocrine system - hypothalamus, pituitary, pineal, thyroid, parathyroid, adrenal, pancreas, gonads; mechanism of hormone action (elementary idea); role of hormones as messengers and regulators, hypo - and hyperactivity and related disorders; dwarfism, acromegaly, cretinism, goiter, exophthalmic goitre, diabetes, Addison's disease.

The following topics are included in the syllabus but will be assessed only formatively to reinforce understanding without adding to summative assessments. The reduces academic stress while ensuring meaningful learning. Schools can integrate these with existing chapters as they align well. Relevant NCERT textual material is enclosed for reference.

Digestion and Absorption (Please Refer to CBSE Reading Material)

Alimentary canal and digestive glands, role of digestive enzymes and gastrointestinal hormones; Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats; calorific values of proteins, carbohydrates and fats; egestion; nutritional and digestive disorders - PEM, indigestion, constipation, vomiting, jaundice, diarrhoea.

PRACTICALS

Time: 03 Hours **Max. Marks: 30**

Evaluation Scheme		Marks
One Major Experiment Part A (Experiment No- 1,3,7,8)		5 Marks
One Minor Experiment Part A (Experiment No- 6,9,10,11,12,13)		4 Marks
Slide Preparation Part A (Experiment No- 2,4,5)		5 Marks
Spotting Part B		7 Marks
Practical Record + Viva Voce	(Credit to the student's work over the academic session may be given)	4 Marks
Project Record + Viva Voce		5 Marks
Total		30 Marks

A: List of Experiments

1. Study and describe locally available common flowering plants, from family Solanaceae (Poaceae, Asteraceae or Brassicaceae can be substituted in case of particular geographical location) including dissection and display of floral whorls, anther and ovary to show number of chambers (floral formulae and floral diagrams), type of root (tap and adventitious); type of stem (herbaceous and woody); leaf (arrangement, shape, venation, simple and compound).
2. Preparation and study of T.S. of dicot and monocot roots and stems (primary).
3. Study of osmosis by potato osmometer.
4. Study of plasmolysis in epidermal peels (e.g. Rhoeo/lily leaves or flashy scale leaves of onion bulb).
5. Study of distribution of stomata on the upper and lower surfaces of leaves.

6. Comparative study of the rates of transpiration in the upper and lower surfaces of leaves.
7. Test for the presence of sugar, starch, proteins and fats in suitable plant and animal materials.
8. Separation of plant pigments through paper chromatography.
9. Study of the rate of respiration in flower buds/leaf tissue and germinating seeds.
10. Test for presence of urea in urine.
11. Test for presence of sugar in urine.
12. Test for presence of albumin in urine.
13. Test for presence of bile salts in urine.

B. Study and Observe the following (spotting):

1. Parts of a compound microscope.
2. Specimens/slides/models and identification with reasons - Bacteria, *Oscillatoria, Spirogyra, Rhizopus*, mushroom, yeast, liverwort, moss, fern, pine, one monocotyledonous plant, one dicotyledonous plant and one lichen.
3. Virtual specimens/slides/models and identifying features of - *Amoeba, Hydra,* liver fluke, *Ascaris*, leech, earthworm, prawn, silkworm, honey bee, snail, starfish, shark, rohu, frog, lizard, pigeon and rabbit.
4. Mitosis in onion root tip cells and animal's cells (grasshopper) from permanent slides.
5. Types of inflorescence (cymose and racemose).
6. Human skeleton and different types of joints with the help of virtual images/models only.

Practical Examination for Visually Impaired Students Class XI

Note: The 'Evaluation schemes' and 'General Guidelines' for visually impaired students as given for Class XII may be followed.

A. Items for Identification/Familiarity with the apparatus /equipment /animal and plant material / chemicals for assessment in practicals (All experiments)

B. Equipment - compound microscope, test tube, petri dish, chromatography paper, chromatography chamber, beaker, scalpel

Chemical – alcohol

Models – Model of Human skeleton to show – Ball and socket joints of girdles and limbs, Rib cage, Honeycomb, Mollusc shell, Pigeon and Star fish, cockroach

Specimen/Fresh Material – mushroom, succulents such as *Aloe vera*/ kalenchoe, raisins, potatoes, seeds of monocot and dicot- maize and gram or any other plant, plants of Solanaceae - Brinjal, Petunia, any other

C. List of Practicals

1. Study locally available common flowering plants of the family – Solanaceae and identify type of stem (Herbaceous or Woody), type of leaves (Compound or Simple).
2. Study the parts of a compound microscope- eye piece and objective lens, mirror, stage, coarse and fine adjustment knobs.
3. Differentiate between monocot and dicot plants on the basis of venation patterns.
4. Study the following parts of human skeleton (Model): Ball and socket joints of thigh and shoulder
5. Rib cage
6. Study honeybee/butterfly, snail/sheik snail through shell, Starfish, Pigeon (through models).
7. Identify the given specimen of a fungus – mushroom, gymnosperm-pine cone.
8. Identify and relate the experimental set up with the aim of experiment: For Potato Osmometer/endosmosis in raisins.

Note: The above practicals may be carried out in an experiential manner rather than only recording observations.

Prescribed Books:

1. Biology Class-XI, Published by NCERT
2. Other related books and manuals brought out by NCERT (including multimedia).
3. Biology supplementary Material (Revised). Available on CBSE Website.
4. Reading Material Biology Class XI.

COURSE STRUCTURE

CLASS XII (2025 - 26)

(THEORY)

Time: 03 Hours **Max. Marks: 70**

Unit	Title	Marks
VI	Reproduction	**16**
VII	Genetics and Evolution	**20**
VIII	Biology and Human Welfare	**12**
IX	Biotechnology and its Applications	**12**
X	Ecology and Environment	**10**
	Total	**70**

Unit-VI Reproduction

Chapter-1: Sexual Reproduction in Flowering Plants

Flower structure; development of male and female gametophytes; pollination - types, agencies and examples; out breeding devices; pollen-pistil interaction; double fertilization; post fertilization events - development of endosperm and embryo, development of seed and formation of fruit; special modes- apomixis, parthenocarpy, polyembryony; Significance of seed dispersal and fruit formation.

Chapter-2: Human Reproduction

Male and female reproductive systems; microscopic anatomy of testis and ovary; gametogenesis -spermatogenesis and oogenesis; menstrual cycle; fertilisation, embryo development upto blastocyst formation, implantation; pregnancy and placenta formation (elementary idea); parturition (elementary idea); lactation (elementary idea).

Chapter-3: Reproductive Health

Need for reproductive health and prevention of Sexually Transmitted Diseases (STDs); birth control - need and methods, contraception and medical termination of pregnancy (MTP); amniocentesis; infertility and assisted reproductive technologies - IVF, ZIFT, GIFT (elementary idea for general awareness).

Unit-VII Genetics and Evolution

Chapter-4: Principles of Inheritance and Variation

Heredity and variation: Mendelian inheritance; deviations from Mendelism – incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups, pleiotropy; elementary idea of polygenic inheritance; chromosome theory of inheritance; chromosomes and genes; Sex determination - in humans, birds and honey bee; linkage and crossing over; sex linked inheritance - haemophilia, colour blindness; Mendelian disorders in humans - thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

Chapter-5: Molecular Basis of Inheritance

Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central Dogma; transcription, genetic code, translation; gene expression and regulation - lac operon; Genome, Human and rice genome projects; DNA fingerprinting.

Chapter-6: Evolution

Origin of life; biological evolution and evidences for biological evolution (paleontology, comparative anatomy, embryology and molecular evidences); Darwin's contribution, modern synthetic theory of evolution; mechanism of evolution - variation (mutation and recombination) and natural selection with examples, types of natural selection; Gene flow and genetic drift; Hardy- Weinberg's principle; adaptive radiation; human evolution.

Unit-VIII: Biology and Human Welfare

Chapter-7: Human Health and Diseases

Pathogens; parasites causing human diseases (malaria, dengue, chikungunya, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control; Basic concepts of immunology - vaccines; cancer, HIV and AIDS; Adolescence - drug and alcohol abuse.

Chapter-8: Microbes in Human Welfare

Microbes in food processing, industrial production, sewage treatment, energy generation and microbes as bio-control agents and bio-fertilizers. Antibiotics; production and judicious use.

Unit-IX Biotechnology and its Applications

Chapter-9: Biotechnology - Principles and Processes

Genetic Engineering (Recombinant DNA Technology).

Chapter-10: Biotechnology and its Applications

Application of biotechnology in health and agriculture: Human insulin and vaccine production, stem cell technology, gene therapy; genetically modified organisms - Bt crops; transgenic animals; biosafety issues, biopiracy and patents.

Unit-X Ecology and Environment

Chapter-11: Organisms and Populations

Population interactions - mutualism, competition, predation, parasitism; population attributes - growth, birth rate and death rate, age distribution.

Chapter-12: Ecosystem

Ecosystems: Patterns, components; productivity and decomposition; energy flow; pyramids of number, biomass, energy.

Chapter-13: Biodiversity and its Conservation

Biodiversity-Concept, patterns, importance; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, Sacred Groves, biosphere reserves, national parks, wildlife, sanctuaries and Ramsar sites.

PRACTICALS

Time allowed: 3 Hours **Max. Marks: 30**

<table>
<tr><th colspan="2">Evaluation Scheme</th><th>Marks</th></tr>
<tr><td colspan="2">One Major Experiment 5</td><td>5</td></tr>
<tr><td colspan="2">One Minor Experiment 2 & 3</td><td>4</td></tr>
<tr><td colspan="2">Slide Preparation 1 & 4</td><td>5</td></tr>
<tr><td colspan="2">Spotting</td><td>7</td></tr>
<tr><td>Practical Record + Viva Voce</td><td rowspan="2">(Credit to the student's work over the academic session may be given)</td><td>4</td></tr>
<tr><td>Investigatory Project and its Project Record + Viva Voce</td><td>5</td></tr>
<tr><td colspan="2">Total</td><td>30</td></tr>
</table>

A. List of Experiments

1. Prepare a temporary mount to observe pollen germination.
2. Study the plant population density by quadrat method.
3. Study the plant population frequency by quadrat method.
4. Prepare a temporary mount of onion root tip to study mitosis.
5. Isolate DNA from available plant material such as spinach, green pea seeds, papaya, banana etc.

B. Study and observe the following (Spotting):

1. Flowers adapted to pollination by different agencies (wind, insects, birds).
2. Pollen germination on stigma through a permanent slide or scanning electron micrograph.
3. Identification of stages of gamete development, i.e., T.S. of testis and T.S. of ovary through permanent slides (from grasshopper/mice).
4. Meiosis in onion bud cell or grasshopper testis through permanent slides.
5. T.S. of blastula through permanent slides (Mammalian).
6. Mendelian inheritance using seeds of different colour/sizes of any plant.
7. Prepared pedigree charts of any one of the genetic traits such as rolling of tongue, blood groups, ear lobes, widow's peak and colour blindness.
8. Controlled pollination - emasculation, tagging and bagging.
9. Common disease causing organisms like *Ascaris, Entamoeba, Plasmodium*, any fungus causing ringworm through permanent slides, models or virtual images or specimens. Comment on symptoms of diseases that they cause.
10. Models specimens showing symbiotic association in lichens, root nodules of leguminous plants, and parasitic mode of nutrition shown by Cuscuta on host.
11. Flash cards / models showing examples of homologous and analogous organs.

Practical Examination for Visually Impaired Students of Classes XI and XII

Evaluation Scheme

Time: 02 Hours **Max. Marks: 30**

Topic	Marks
Identification/Familiarity with the apparatus	5
Written test (Based on given / prescribed practicals)	10
Practical Records	5
Viva	10
Total	**30**

General Guidelines

- The practical examination will be of two-hour duration. A separate list of ten experiments is included here.
- The written examination in practicals for these students will be conducted at the time of practical examination of all other students.

- The written test will be of 30 minutes duration.
- The question paper given to the students should be legibly typed. It should contain a total of 15 practical skill based very short answer type questions. A student would be required to answer any 10 questions.
- A writer may be allowed to such students as per CBSE examination rules.
- All questions included in the question paper should be related to the listed practicals. Every question should require about two minutes to be answered.
- These students are also required to maintain a practical file. A student is expected to record at least five of the listed experiments as per the specific instructions for each subject. These practicals should be duly checked and signed by the internal examiner.
- The format of writing any experiment in the practical file should include aim, apparatus required, simple theory, procedure, related practical skills, precautions etc.
- Questions may be generated jointly by the external/internal examiners and used for assessment.
- The viva questions may include questions based on basic theory / principle / concept, apparatus / materials / chemicals required, procedure, precautions, sources of error etc.

Class XII

A. Items for Identification/ familiarity with the apparatus for assessment in practicals (All experiments) Beaker, flask, petriplates, soil from different sites - sandy, clayey, loamy, small potted plants, aluminium foil, paint brush, test tubes, starch solution, iodine, ice cubes, Bunsen burner/spirit lamp/water bath, large flowers, Maize inflorescence, model of developmental stages highlighting morula and blastula of frog, beads/seeds of different shapes/size/texture *Ascaris*, Cactus/*Opuntia* (model).

B. List of Practicals

1. Study of flowers adapted to pollination by different agencies (wind, insects).
2. Identification of T.S of morula or blastula of frog (Model).
3. Study of Mendelian inheritance pattern using beads/seeds of different sizes/texture.
4. Preparation of pedigree charts of genetic traits such as rolling of tongue, colour blindness.
5. Study of emasculation, tagging and bagging by trying out an exercise on controlled pollination.

6. Identify common disease causing organisms like *Ascaris* (model) and learn some common symptoms of the disease that they cause.
7. Comment upon the morphological adaptations of plants found in xerophytic conditions.

Note: The above practicals may be carried out in an experiential manner rather than recording observations.

Prescribed Books:

1. Biology, Class-XII, Published by NCERT.
2. Other related books and manuals brought out by NCERT (consider multimedia also).
3. Biology Supplementary Material (Revised). Available on CBSE website.

Question Paper Design (Theory)

Class XII (2025 -26)

Biology (044)

Competencies	Total
Demonstrate Knowledge and Understanding	50 %
Application of Knowledge / Concepts	30 %
Analyse, Evaluate and Create	20 %

Note:

- Typology of questions: VSA including MCQs, Assertion – Reasoning type questions; SA; LA-I; LA-II; Source-based/ Case-based/ Passage-based/ Integrated assessment questions.
- An internal choice of approximately 33% would be provided.

Suggestive verbs for various competencies

- **Demonstrate, Knowledge and Understanding**
  State, name, list, identify, define, suggest, describe, outline, summarize, etc.
- **Application of Knowledge/Concepts**
  Calculate, illustrate, show, adapt, explain, distinguish, etc.
- **Analyze, Evaluate and Create**
  Interpret, analyse, compare, contrast, examine, evaluate, discuss, construct, etc.

COMPUTER SCIENCE
Subject Code - 083
Class XI (2025-26)

1. Learning Outcomes

Students should be able to:

a) develop basic computational thinking
b) explain and use data types
c) appreciate the notion of algorithms
d) develop a basic understanding of computer systems- architecture and operating system
e) explain cyber ethics, cyber safety, and cybercrime
f) understand the value of technology in societies along with consideration of gender and disability issues.

2. Distribution of Marks

Unit No.	Unit Name	Marks
1	Computer Systems and Organisation	10
2	Computational Thinking and Programming -1	45
3	Society, Law, and Ethics	15
	Total	**70**

3. Unit wise Syllabus

Unit 1: Computer Systems and Organisation

- Basic computer organisation: Introduction to Computer System, hardware, software, input device, output device, CPU, memory (primary, cache and secondary), units of memory (bit, byte, KB, MB, GB, TB, PB)
- Types of software: System software (Operating systems, system utilities, device drivers), programming tools and language translators (assembler, compiler, and interpreter), application software
- Operating System(OS): functions of the operating system, OS user interface
- Boolean logic: NOT, AND, OR, NAND, NOR, XOR, truth tables and De Morgan's laws, Logic circuits
- Number System: Binary, Octal, Decimal and Hexadecimal number system;

conversion between number systems
- Encoding Schemes: ASCII, ISCII, and Unicode (UTF8, UTF32)

Unit 2: Computational Thinking and Programming - I

- Introduction to Problem-solving: Steps for Problem-solving (Analyzing the problem, developing an algorithm, coding, testing, and debugging), representation of algorithms using flowchart and pseudocode, decomposition
- Familiarization with the basics of Python programming: Introduction to Python, Features of Python, executing a simple “hello world" program, execution modes: interactive mode and script mode, Python character set, Python tokens(keyword, identifier, literal, operator, punctuator), variables, concept of l-value and r-value, use of comments
- Knowledge of data types: Number(integer, floating point,complex), boolean, sequence(string, list, tuple), None, Mapping(dictionary), mutable and immutable data types.
- Operators: arithmetic operators, relational operators, logical operators, assignment operators, augmented assignment operators, identity operators (is, is not), membership operators (in not in)
- Expressions, statement, type conversion, and input/output: precedence of operators, expression, evaluation of an expression, type-conversion (explicit and implicit conversion), accepting data as input from the console and displaying output.
- Errors- syntax errors, logical errors, and run-time errors
- Flow of Control: introduction, use of indentation, sequential flow, conditional and iterative flow
- Conditional statements: if, if-else, if-elif-else, flowcharts, simple programs: e.g.: absolute value, sort 3 numbers and divisibility of a number.
- Iterative Statement: for loop, range(), while loop, flowcharts, break and continue statements, nested loops, suggested programs: generating pattern, summation of series, finding the factorial of a positive number, etc.
- Strings: introduction, string operations (concatenation, repetition, membership and slicing), traversing a string using loops, built-in functions/methods–len(), capitalize(), title(), lower(), upper(), count(), find(), index(), endswith(), startswith(), isalnum(), isalpha(), isdigit(), islower(), isupper(), isspace(),lstrip(), rstrip(), strip(), replace(), join(), partition(), split()
- Lists: introduction, indexing, list operations (concatenation, repetition, membership and slicing), traversing a list using loops, built-in functions/methods–len(), list(), append(), extend(), insert(), count(), index(), remove(), pop(), reverse(), sort(), sorted(), min(), max(), sum(); nested lists, suggested programs: finding the maximum, minimum, mean of numeric values stored in a list; linear search on list of numbers and counting the frequency of elements in a list.
- Tuples: introduction, indexing, tuple operations (concatenation, repetition, membership and slicing); built-in functions/methods — len(), tuple(), count(), index(), sorted(), min(), max(), sum(); tuple assignment, nested tuple; suggested programs: finding the minimum, maximum, mean of values stored in a tuple; linear

search on a tuple of numbers, counting the frequency of elements in a tuple.

- Dictionary: introduction, accessing items in a dictionary using keys, mutability of a dictionary (adding a new term, modifying an existing item), traversing a dictionary, built-in functions/methods — len(), dict(), keys(), values(), items(), get(), update(), del, clear(), fromkeys(), copy(), pop(), popitem(), setdefault(), max(), min(), sorted(); Suggested programs: count the number of times a character appears in a given string using a dictionary, create a dictionary with names of employees, their salary and access them.
- Introduction to Python modules: Importing module using 'import <module>' and using from statement, importing math module (pi, e, sqrt(), ceil(), floor(), pow(), fabs(), sin(), cos(), tan()); random module (random(), randint(), randrange()), statistics module (mean(), median(), mode()).

Unit 3: Society, Law and Ethics

- Digital Footprints
- Digital Society and Netizen: net etiquettes, communication etiquettes, social media etiquettes
- Data Protection: Intellectual property rights (copyright, patent, trademark), violation of IPR (plagiarism, copyright infringement, trademark infringement), open source software and licensing (Creative Commons, GPL and Apache)
- Cyber Crime: definition, hacking, eavesdropping, phishing and fraud emails, ransomware, cyber trolls, cyber bullying
- Cyber safety: safely browsing the web, identity protection, confidentiality
- Malware: viruses, trojans, adware
- E-waste management: proper disposal of used electronic gadgets.
- Information Technology Act (IT Act)
- Technology and society: Gender and disability issues while teaching and using computers

4. Practical

S.No.	Unit Name	Marks (Total=30)
1.	**Lab Test (12 marks)**	
	Python program (60% logic + 20% documentation + 20% code quality)	**12**
2.	**Report File + Viva (10 marks)**	
	Report file: Minimum 20 Python programs	**7**
	Viva voce	**3**
3.	Project (that uses most of the concepts that have been learnt)	**8**

5. Suggested Practical List

Python Programming

- Input a welcome message and display it.
- Input two numbers and display the larger / smaller number.
- Input three numbers and display the largest / smallest number.
- Generate the following patterns using nested loops:

Pattern-1	Pattern-2	Pattern-3
* ** *** **** *****	12345 1234 123 12 1	A AB ABC ABCD ABCDE

- Write a program to input the value of x and n and print the sum of the following series:
  - $1 + x + x^2 + x^3 + x^4 + \cdots x^n$
  - $1 - x + x^2 - x^3 + x^4 - \cdots x^n$
  - $x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \cdots \frac{x^n}{n}$
  - $x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \cdots \frac{x^n}{n!}$
- Determine whether a number is a perfect number, an Armstrong number or a palindrome.
- Input a number and check if the number is a prime or composite number.
- Display the terms of a Fibonacci series.
- Compute the greatest common divisor and least common multiple of two integers.
- Count and display the number of vowels, consonants, uppercase, lowercase characters in string.
- Input a string and determine whether it is a palindrome or not; convert the case of characters in a string.
- Find the largest/smallest number in a list/tuple
- Input a list of numbers and swap elements at the even location with the elements at the odd location.
- Input a list/tuple of elements, search for a given element in the list/tuple.
- Create a dictionary with the roll number, name and marks of n students in a class and display the names of students who have marks above 75.

6. Suggested Reading Material

- NCERT Textbook for Computer Science (Class XI)
- Support Material on CBSE website

COMPUTER SCIENCE
Subject Code – 083
Class XII (2025-26)

1. Prerequisites

Computer Science- Class XI

2. Learning Outcomes

Student should be able to

a) apply the concept of function.

b) explain and use the concept of file handling.

c) use basic data structure: Stacks

d) explain basics of computer networks.

e) use Database concepts, SQL along with connectivity between Python and SQL.

3. Distribution of Marks:

Unit No.	Unit Name	Marks
1	Computational Thinking and Programming — 2	40
2	Computer Networks	10
3	Database Management	20
	Total	**70**

4. Unit wise Syllabus

Unit 1: Computational Thinking and Programming – 2

- Revision of Python topics covered in Class XI.
- Functions: types of function (built-in functions, functions defined in module, user defined functions), creating user defined function, arguments and parameters, default parameters, positional parameters, function returning value(s), flow of execution, scope of a variable (global scope, local scope)
- Exception Handling: Introduction, handling exceptions using try-except-finally blocks
- Introduction to files, types of files (Text file, Binary file, CSV file), relative and absolute paths

- Text file: opening a text file, text file open modes (r, r+, w, w+, a, a+), closing a text file, opening a file using with clause, writing/appending data to a text file using write() and writelines(), reading from a text file using read(), readline() and readlines(), seek and tell methods, manipulation of data in a text file
- Binary file: basic operations on a binary file: open using file open modes (rb, rb+, wb, wb+, ab, ab+), close a binary file, import pickle module, dump() and load() method, read, write/create, search, append and update operations in a binary file
- CSV file: import csv module, open / close csv file, write into a csv file using writer(),writerow(),writerows() and read from a csv file using reader()
- Data Structure: Stack, operations on stack (push & pop), implementation of stack using list.

Unit 2: Computer Networks

- Evolution of networking: introduction to computer networks, evolution of networking (ARPANET, NSFNET, INTERNET)
- Data communication terminologies: concept of communication, components of data communication (sender,receiver, message, communication media, protocols), measuring capacity of communication media (bandwidth, data transfer rate), IP address, switching techniques (Circuit switching, Packet switching)
- Transmission media: Wired communication media (Twisted pair cable, Co-axial cable, Fiber-optic cable), Wireless media (Radio waves, Micro waves, Infrared waves)
- Network devices (Modem, Ethernet card, RJ45, Repeater, Hub, Switch, Router, Gateway, WIFI card)
- Network topologies and Network types: types of networks (PAN, LAN, MAN, WAN), networking topologies (Bus, Star, Tree)
- Network protocol: HTTP, FTP, PPP, SMTP, TCP/IP, POP3, HTTPS, TELNET, VoIP
- Introduction to web services: WWW, Hyper Text Markup Language (HTML), Extensible Markup Language (XML), domain names, URL, website, web browser, web servers, web hosting

Unit 3: Database Management

- Database concepts: introduction to database concepts and its need
- Relational data model: relation, attribute, tuple, domain, degree, cardinality, keys (candidate key, primary key, alternate key, foreign key)
- Structured Query Language: introduction, Data Definition Language and Data Manipulation Language, data type (char(n), varchar(n), int, float, date), constraints (not null, unique, primary key), create database, use database, show databases, drop database, show tables, create table, describe table, alter table (add and remove an attribute, add and remove primary key), drop table, insert, delete, select, operators (mathematical, relational and logical), aliasing, distinct clause, where clause, in, between, order by, meaning of null, is null, is not null, like, update command, delete command, aggregate functions (max, min, avg, sum, count), group by, having clause, joins: cartesian product on two tables, equi-join and natural join
- Interface of python with an SQL database: connecting SQL with Python, performing

insert, update, delete queries using cursor, display data by using connect(), cursor(), execute(), commit(), fetchone(), fetchall(), rowcount, creating database connectivity applications, use of %s format specifier or format() to perform queries

5. Practical

S.No	Unit Name	Marks (Total=30)
1	Lab Test: 1. Python program (60% logic + 20% documentation + 20% code quality)	8
	2. SQL queries (4 queries based on one or two tables)	4
2	Report file: • Minimum 15 Python programs. • SQL Queries – Minimum 5 sets using one table / two tables. • Minimum 4 programs based on Python — SQL connectivity	7
3	Project (using concepts learnt in Classes 11 and 12)	8
4	Viva voce	3

6. Suggested Practical List:

Python Programming

- Read a text file line by line and display each word separated by a #.
- Read a text file and display the number of vowels/consonants/uppercase/lowercase characters in the file.
- Remove all the lines that contain the character 'a' in a file and write it to another file.
- Create a binary file with name and roll number. Search for a given roll number and display the name, if not found display appropriate message.
- Create a binary file with roll number, name and marks. Input a roll number and update the marks.
- Write a random number generator that generates random numbers between 1 and 6 (simulates a dice).
- Write a Python program to implement a stack using list.
- Create a CSV file by entering user-id and password, read and search the password for given userid.

Database Management

- Create a student table and insert data. Implement the following SQL commands on the student table:
    - ALTER table to add new attributes / modify data type / drop attribute
    - UPDATE table to modify data
    - ORDER By to display data in ascending / descending order
    - DELETE to remove tuple(s)
    - GROUP BY and find the min, max, sum, count and average
- Similar exercise may be framed for other cases.
- Integrate SQL with Python by importing suitable module.

7. Suggested Reading Material

- NCERT Textbook for COMPUTER SCIENCE (Class XII)
- Support Materials on the CBSE website.

8. Project

The aim of the class project is to create something that is tangible and useful using Python file handling/ Python-SQL connectivity. This should be done in groups of two to three students and should be started by students at least 6 months before the submission deadline. The aim here is to find a real world problem that is worthwhile to solve.

Students are encouraged to visit local businesses and ask them about the problems that they are facing. For example, if a business is finding it hard to create invoices for filing GST claims, then students can do a project that takes the raw data (list of transactions), groups the transactions by category, accounts for the GST tax rates, and creates invoices in the appropriate format. Students can be extremely creative here. They can use a wide variety of Python libraries to create user friendly applications such as games, software for their school, software for their disabled fellow students, and mobile applications, of course to do some of these projects, some additional learning is required; this should be encouraged. Students should know how to teach themselves.

The students should be sensitized to avoid plagiarism and violations of copyright issues while working on projects. Teachers should take necessary measures for this.

CBSE | DEPARTMENT OF SKILL EDUCATION

CURRICULUM FOR SESSION 2025-2026

ARTIFICIAL INTELLIGENCE (SUB. CODE - 843)

JOB ROLE: AI Assistant

CLASS – XI

OBJECTIVES OF THE COURSE

AI is a discipline in computer science that focuses on developing intelligent machines, machines that can learn and then teach themselves. These machines, then, can process vast amounts of data than humans can, and several times faster. However, AI can go across all disciplines to change the world for the better– from creating new healthcare solutions, to designing hospitals of the future, improving farming and our food supply, helping refugees acclimatize to the new environments, improving educational resources and access, and even cleaning our oceans, air, and water supply. The potential for humans to improve the world through AI is endless, as long as we know how to use it.

LEARNING OUTCOMES

In this course, the students will develop knowledge, skills and values to understand AI and its implications for our society and the world and to use AI to solve authentic problems, now and in the future. The students will engage with a host of multi-media online resources, as well as hands-on activities and sequence of learning experiences.

The following are the main objectives of the course:

1. Develop informed citizens with an understanding of AI and the skills to think critically and knowledgeably about the implications of AI for society and the world.
2. Develop engaged citizens with a rigorous understanding of how AI can be harnessed to improve life and the world we live in.
3. Stimulate interest and prepare students for further study to take up careers as AI scientists and developers to solve complex real-world problems.

SCHEME OF UNITS

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

CBSE | DEPARTMENT OF SKILL EDUCATION

ARTIFICIAL INTELLIGENCE (SUBJECT CODE - 843)

CLASS – XI (SESSION 2025-2026)

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

	UNITS	NO. OF HOURS		MAX MARKS
PART A	**Employability skills**			
	Unit 1: Communication Skills – III	15		2
	Unit 2: Self-Management Skills – III	10		2
	Unit 3: ICT Skills – III	15		2
	Unit 4: Entrepreneurial Skills – III	10		2
	Unit 5: Green Skills – III	10		2
	TOTAL	**60**		**10**
PART B	**Subject specific skills**	**Theory**	**Practical**	
	Unit 1: Introduction: Artificial Intelligence for Everyone	4	10	4
	Unit 2: Unlocking your Future in AI	6	10	5
	Unit 3: Python Programming	10	20	5
	Unit 4: Introduction to Capstone Project	6	15	5
	Unit 5: Data Literacy – Data Collection to Data Analysis	6	15	6
	Unit 6: Machine Learning Algorithms	9	15	6
	Unit 7: Leveraging Linguistics and Computer Science	5	10	5
	Unit 8: AI Ethics and Values	4	5	4
	TOTAL	**50**	**100**	**40**
PART C	**PRACTICAL WORK / PROJECT WORK**			
	IBM Skills Build Certification/any other industry certification			5
	Capstone Project			12
	Bootcamps/ Internship/other startups			7
	Practical File			10
	Lab Test/ Written Exam (based on practical file)			10
	Viva Voce (based on practical file and project)			6
	TOTAL			**50**
	GRAND TOTAL			**100**

DETAILED CURRICULUM/TOPICS:

Part-A: EMPLOYABILITY SKILLS

S. No.	Units	Duration in Hours
1.	Unit 1: Communication Skills – III	15
2.	Unit 2: Self-Management Skills – III	10
3.	Unit 3: Basic Information and Communication Technology Skills – III	15
4.	Unit 4: Entrepreneurial Skills – III	10
5.	Unit 5: Green Skills – III	10
	TOTAL	**60**

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: Artificial Intelligence for Everyone
- Unit 2 – Unlocking your Future in AI
- Unit 3 – Python Programming
- Unit 4 – Introduction to Capstone Project
- Unit 5 – Data Literacy – Data Collection to Data Analysis
- Unit 6 – Machine Learning Algorithms
- Unit 7 – Leveraging Linguistics and Computer Science
- Unit 8 – AI Ethics and Values

UNIT 1 - INTRODUCTION: ARTIFICIAL INTELLIGENCE FOR EVERYONE

S. No	LEARNING OUTCOMES	THEORY	PRACTICAL
1	Students will be able to – • Communicate effectively about AI concepts and applications in written and oral formats. • Describe the historical development of AI. • Differentiate between various types and domains of AI, including their applications. • Recognize the key terminologies and concepts related to machine learning and deep learning. • Formulate informed opinions on the potential benefits and limitations of AI in various contexts.	• What is Artificial Intelligence? • Evolution of AI • Types of AI • Domains of AI • AI Terminologies • Benefits and limitations of AI	• Categorize the given applications into the three domains. Examples of Machine Learning & Reinforcement Learning given in the course below: IBM Skills Build – Introduction to AI

UNIT 2 - UNLOCKING YOUR FUTURE IN AI

S. No	LEARNING OUTCOMES	THEORY	PRACTICAL
1	Students will be able to – • Articulate the demand for AI professionals and the diverse career opportunities available in the field. • Identify the requisite skills and tools needed to pursue a career in artificial intelligence. • Understand the potential roles and responsibilities of AI professionals across different industries. • Explore resources for further learning and skill development in the field of AI. • Evaluate their own interests and skills to determine potential pathways for a career in AI.	• The Global Demand • Some Common Job Roles In AI • Essential Skills and Tools for Prospective AI Careers • Opportunities in AI across Various Industries	• Identify ten companies currently hiring employees for in specific AI positions. • Note down the technical skills and soft skills listed by any two companies for the specific AI position. IBM Skills Build: Your Future in AI: The Job Landscape

UNIT 3 - PYTHON PROGRAMMING

S. No	LEARNING OUTCOMES	THEORY	PRACTICAL
1	Students will be able to – • Explain the basics of python programming language and write programs with basic concepts of tokens. • Use selective and iterative statements effectively. • Gains practical knowledge on how to use the libraries efficiently.	**Level 1:** Basics of python programming, character sets, tokens, modes, operators, datatypes, Control Statements **Level 2:** CSV Files, Libraries – NumPy, Pandas, Scikit-learn	• Minimum five programs to be taught using operators, data types, control statements (**Level 1**) • Minimum 5 programs on NumPy, Pandas, Scikit-learn (**Level 2**) IBM SkillsBuild - Python for Data Science

UNIT 4 - INTRODUCTION TO CAPSTONE PROJECT

S. No	LEARNING OUTCOMES	THEORY	PRACTICAL
1	Students will be able to – • Decompose any problem using the 5W1H method. • Apply Design thinking methodology. • Create empathy maps. • Align problems to SDGs. • Apply all the learnings in solving real world problems. • Express their solution to a problem in non-technical words.	• Design Thinking • Empathy Map • Sustainable Development Goals • Capstone Project	• Create an empathy map for a given scenario. • Project Abstract Creation Using Design Thinking Framework. IBM SkillsBuild - What is Design thinking?

UNIT 5 - DATA LITERACY – DATA COLLECTION TO DATA ANALYSIS

S. No	LEARNING OUTCOMES	THEORY	PRACTICAL
1	Students will be able to – • Explain the importance of data literacy in AI. • Identify different data collection methods and their applications. • Comprehend mathematical concepts related to matrices, its operations, and applications. • Apply basic data analysis techniques to analyse data. • Visualize the data using different techniques.	• What is Data Literacy? • Data Collection • Exploring Data • Statistical Analysis of data • Representation of data, Python Programs for Statistical Analysis and Data Visualization • Introduction to Matrices • Data Pre-processing • Data in Modelling and Evaluation	• Identification of the level of measurement. • Python programs to demonstrate the use of mean, median, mode, standard deviation and variance. • Python programs to visualise the line graph, bar graph, histogram, scatter graph and pie chart using matplotlib. rainfall.csv IBM SkillsBuild - Data Visualisation with Python (Modules 1,2,3)

UNIT 6 – MACHINE LEARNING ALGORITHMS

S. No	LEARNING OUTCOMES	THEORY	PRACTICAL
1	Students will be able to – • Differentiate the different types of machine learning methods. • They will be able to understand the concept behind each machine learning methods. • Apply these methods to develop simple solutions for some day-to-day situations. • Build up this knowledge to the next level to apply during Capstone Project development.	• Machine Learning in a nutshell • Types of Machine Learning • Supervised Learning • Understanding Correlation, Regression, Finding the line, Linear Regression algorithm • Classification – How it works, Types, k – Nearest Neighbour algorithm • Unsupervised Learning • Clustering – How it works, Types, k -means Clustering algorithm	• Calculation of Pearson correlation coefficient in MS – Excel. • Demonstration of Linear regression in MS – Excel. • Demonstration of Linear regression using python program. (**For Advanced Learners) • Demonstration of k – Nearest Neighbour using python program. (**For Advanced Learners) • Demonstration of k – means clustering using python program. (**For Advanced Learners) IBM SkillsBuild - Machine learning with Python

UNIT 7 – LEVERAGING LINGUISTICS AND COMPUTER SCIENCE

S. No	LEARNING OUTCOMES	THEORY	PRACTICAL

1	Students will be able to –
	• Develop a better understanding of the complexities of language and the challenges involved in NLP tasks.
	• Learn new techniques and algorithms for NLP tasks.
		• Understanding Human Language Complexity
		• Introduction to Natural Language Processing (NLP) - Emotion Detection and Sentiment Analysis, Classification Problems, Chatbot
		• Phases of NLP
		• Applications of NLP
			• Write an article on "IBM Project Debater – Interesting facts".
			• Create a chatbot on ordering ice-creams using any of the following platforms:
			  • Google Dialogflow
			  • Botsify.com
			  • Botpress.com
			• Program to print the POS tags of a statement. (**For Advanced Learners)
			• Creating a simple rule based chatbot using Python. (**For Advanced Learners)
			
			IBM SKillsBuild - Natural Language Processing

UNIT 8 – AI ETHICS AND VALUES

S. No	LEARNING OUTCOMES	THEORY	PRACTICAL
1	Students will be able to – • Demonstrate an understanding of the fundamental principles of ethics and gain insight into ethical considerations related to AI technologies. • Develop an understanding of AI bias, its sources, and its real-world implications, as well as the ethical considerations. • Identify and apply strategies for mitigating bias in AI systems to promote fairness and transparency in technology. • Recognize the significance of AI policies in promoting responsible, safe, and ethical use of AI technologies.	• Ethics in Artificial Intelligence • The five pillars of AI Ethics • Bias, Bias Awareness, Sources of Bias • Mitigating Bias in AI Systems • Developing AI Policies • Moral Machine Game • Survival of the Best Fit Game	• Summarize your insights and interpretations from the video "Humans need not apply." • Activity: Role Play on biased AI systems • Comparative study of AI policies (that involve examining guidelines and principles) established by various organizations and regulatory bodies. • Understanding ethical dilemma using: Moral machine Survival of the best fit IBM SkillsBuild - AI Ethics

****Note- All portions under Advanced Learners are not to be evaluated in Theory or Practical Examinations.**

PART – C

1. Practical File

Note: The following to be included in the Practical File

- ***One certification (IBM SkillsBuild (any of the courses listed above) /any other industry certification)***
- ***At least one activity from each unit***
- ***One participation certificate of bootcamp/internship***

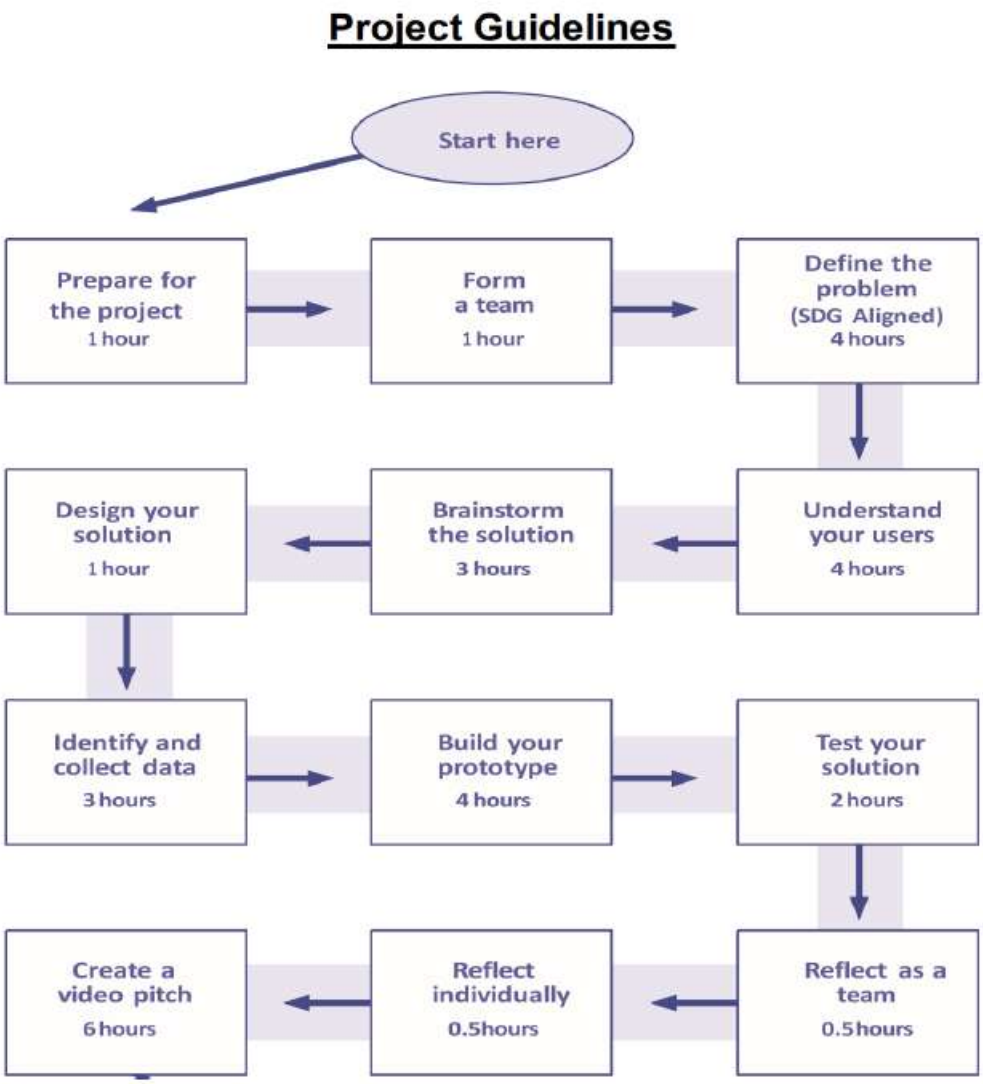
Unit-wise sample activities for Practical file given as below:

1. Categorize the given applications into the three domains as given on pg. 5 of the Students Handbook.
2. Identify ten companies currently hiring employees for in specific AI positions.
3. Note down the technical skills and soft skills listed by any two companies for the specific AI position.
4. Python programs using operators, data types, control statements (**Level 1**)
5. Python programs on NumPy, Pandas, Scikit-learn (**Level 2**)
6. Create an empathy map for a given scenario.
7. Project Abstract Creation Using Design Thinking Framework.
8. Python programs to demonstrate the use of mean, median, mode, standard deviation and variance.
9. Python programs to visualise the line graph, bar graph, histogram, scatter graph and pie chart using matplotlib.
10. Calculation of Pearson's correlation coefficient in MS – Excel.
11. Demonstration of Linear regression in MS – Excel.
12. Create a chatbot on ordering ice-creams using any of the following platforms:
    a. Google Dialogflow
    b. Botsify.com
    c. Botpress.com
    d. Any other online platform
13. Summarize your insights and interpretations from the video "Humans need not apply."
14. Comparative study of AI policies (that involve examining guidelines and principles) established by various organizations and regulatory bodies.
15. Understanding ethical dilemma using
    Moral machine
    Survival of the best fit

Additional programs for Practice (not to be evaluated)

Sample programs for regression, classification and clustering along with the dataset is in this link.

2. Capstone Project



Note: Prepare for the project; Form a team; Define the problem (SDG aligned); Understand your users; Brainstorm the solution; Design your solution; stages must be completed in the project documentation.
Project Documentation(As per the process given in "Project Guidelines", on page 2 of CBSE IBM Projects Cookbook)

LIST OF EQUIPMENTS/ MATERIALS:

The list given below is suggestive and an exhaustive list should be compiled by the teacher(s) teaching the subject. Only basic tools, equipment and accessories should be procured by the Institution so that the routine tasks can be performed by the students regularly for practice and acquiring adequate practical experience.

S. NO.	ITEM NAME, DESCRIPTION & SPECIFICATION
A	**HARDWARE**
1	Computer with latest configuration or minimum core I5 Processor or equivalent with minimum 8 GB RAM, 512 GB SSD, 17" LED Monitor, NIC Card, 3 button Mouse, Camera, 105 keys keyboard, speakers, mic, Wi-Fi / Internet connectivity, Webcam, UPS, Dual Band Wireless Connectivity Min 100 Mbps and integrated graphic cards
2	Fire extinguisher
B	**SOFTWARE SPECIFICATIONS**
1	Any Operating System with antivirus activated
2	Python IDLE
3	Anaconda Navigator Distribution – Python IDE installed with software: NumPy, Pandas, Matplotlib, Scikit Learn)
4	Productivity Suite: Any (Google+ Suite recommended)

Additional Recommendations:

- Ensure regular updates and maintenance for all installed software to benefit from bug fixes, security patches, and new features.
- Provide licenses for commercial software, such as MS Office, as per the school's requirements and budget.
- Encourage teachers and students to stay updated with the latest versions of the software and tools and provide resources for learning and support.
- Consider implementing version control systems (e.g., Git) to facilitate collaborative coding and project management.

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 Degree in Computer Application/ Science/ Information Technology (BCA, B.Sc. Computer Science/ Information Technology) **OR** Graduate with PGDCA OR DOEACCA Level Certificate. The suggested qualification is the minimum criteria. However higher qualifications will also be acceptable.	The candidate shouldhave a minimum of 1 year of work experiencein 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 Level2 or higher.

The National Quality Assurance Framework (NQAF) provides the benchmarks or quality criteriawhich 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 ofrelevant 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 beforebeing 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 thelatest 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;
- Organization of activities for promotion of vocational subjects;
- Involvement in placement of students/student support services.

CBSE | DEPARTMENT OF SKILL EDUCATION

CURRICULUM FOR SESSION 2025-2026

ARTIFICIAL INTELLIGENCE (SUB. CODE - 843)

JOB ROLE: AI Assistant

CLASS – XII

OBJECTIVES OF THE COURSE:

Artificial Intelligence (AI) is a transformative field in computer science that focuses on creating intelligent systems capable of learning, adapting, and self-improving. These systems can process vast amounts of data with remarkable speed and accuracy, surpassing human capabilities in many domains. AI's impact extends across disciplines, offering innovative solutions to some of the world's most pressing challenges. From revolutionizing healthcare with advanced diagnostics and personalized treatments to enhancing agricultural practices and ensuring food security, AI has the power to reshape industries. It can improve access to quality education, and play a pivotal role in protecting and restoring our planet's ecosystems by cleaning our oceans, air, and water. The possibilities for leveraging AI to create a better future are boundless, provided we harness its potential responsibly and ethically.

LEARNING OUTCOMES:

By the end of this course, students will:

1. Develop an informed perspective on Artificial Intelligence (AI), enabling them to think critically about its implications for society and the world.
2. Understand the role of Python in AI development and its practical applications.
3. Harness the power of AI using no-code tools like Orange Data Mining to solve complex problems efficiently.
4. Comprehend the significance of Data Science Methodology in a Capstone Project to address real-world challenges.
5. Explore the fundamentals of computer vision and its applications in processing and analyzing digital images and videos, as well as its role in intelligent machines.
6. Delve into the diverse possibilities of Generative AI, including image generation, text synthesis, audio production, and video creation.
7. Understand the structure and components of neural networks, building a foundational knowledge of deep learning.
8. Appreciate the value of storytelling as a powerful tool to communicate ideas, insights, and solutions effectively in the context of AI.

SCHEME OF UNITS:

This course follows a structured sequence of instructional units designed to develop employability and vocational skills among students. These units are carefully crafted to integrate seamlessly with other educational subjects, fostering a holistic learning experience.

CBSE | DEPARTMENT OF SKILL EDUCATION

ARTIFICIAL INTELLIGENCE (SUBJECT CODE - 843)

CLASS – XII (SESSION 2025-2026)

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

	UNITS	NO. OF HOURS		MAX MARKS
PART A	**EMPLOYABILITY SKILLS**			
	Unit 1: Communication Skills-IV	15		2
	Unit 2: Self-Management Skills-IV	10		2
	Unit 3: ICT Skills-IV	15		2
	Unit 4: Entrepreneurial Skills-IV	10		2
	Unit 5: Green Skills-IV	10		2
	TOTAL	**60**		**10**
PART B	**SUBJECT SPECIFIC SKILLS**	**Th.**	**Prac.**	
	Unit 1: Python Programming – II*	6	18	(*to be evaluated in practicals only)
	Unit 2: Data Science Methodology: An Analytic Approach to Capstone Project	8	12	8
	Unit 3: Making Machines See	6	12	6
	Unit 4: AI with Orange Data Mining Tool*	4	18	(*to be evaluated in practicals only)
	Unit 5: Introduction to Big Data and Data Analytics	7	12	6
	Unit 6: Understanding Neural Networks	8	12	8
	Unit 7: Generative AI	6	12	7
	Unit 8: Data Storytelling	5	4	5
	TOTAL	**50**	**100**	**40**
PART C	**PRACTICAL WORK / PROJECT WORK**			
	Capstone Project + Project Documentation (As per the process given in “Project Guidelines”, on page 2 of CBSE IBM Projects Cookbook) • Capstone Project =15 Marks • Project Documentation = 6 Marks • Video= 4 Marks			25
	Practical File			10
	Lab Test (Python and Orange Data Mining)			10
	Viva Voce (based on Capstone Project + Practical File)			5
	TOTAL			**50**
	GRAND TOTAL (THEORY + PRACTICAL)			**100**

(NOTE: *marked units/portion is to be evaluated in practicals only)

DETAILED CURRICULUM/TOPICS FOR CLASS XII

Part-A: EMPLOYABILITY SKILLS

S. No.	Units	Duration in Hours
1.	Unit 1: Communication Skills-IV	15
2.	Unit 2: Self-management Skills-IV	10
3.	Unit 3: Information and Communication Technology Skills-IV	15
4.	Unit 4: Entrepreneurial Skills-IV	10
5.	Unit 5: Green Skills-IV	10
	TOTAL	**60**

NOTE: The detailed curriculum/ topics to be covered under Part A: Employability Skills can be downloaded from the CBSE website.

Part-B - SUBJECT SPECIFIC SKILLS

- Unit 1: Python Programming – II*
- Unit 2: Data Science Methodology: An Analytic Approach to Capstone Project
- Unit 3: Making Machines See
- Unit 4: AI with Orange Data Mining Tool*
- Unit 5: Introduction to Big Data and Data Analytics
- Unit 6: Understanding Neural Networks
- Unit 7: Generative AI
- Unit 8: Data Storytelling

(NOTE: *marked units/portion is to be evaluated in practicals only)

UNIT 1: PYTHON PROGRAMMING - II *(to be evaluated in practicals only)

SUB-UNIT	LEARNING OUTCOMES	ACTIVITY/PRACTICALS
• Recap of NumPy library • Recap of Pandas Library • Importing and Exporting Data between CSV Files and DataFrames • Handling missing value • Linear Regression algorithm (**For Advanced Learners)	• Apply the fundamental concepts of the NumPy and Pandas libraries to perform data manipulation and analysis tasks • Import and export data between CSV files and Pandas Data Frames, ensuring data integrity and consistency.	• Import and Export Data between CSV Files and DataFrames • Implement Linear Regression algorithm on Google Colab or any Python IDE. (**For Advanced Learners)

UNIT 2: DATA SCIENCE METHODOLOGY: AN ANALYTIC APPROACH TO CAPSTONE PROJECT

SUB-UNIT	LEARNING OUTCOMES	ACTIVITY/PRACTICALS
• Introduction to Data Science Methodology • Steps for Data Science Methodology • Model Validation Techniques • Model Performance-Evaluation Metrics	• Integrate Data Science Methodology steps into the Capstone Project. • Identify the best way to represent a solution to a problem. • Understand the importance of validating machine learning models • Use key evaluation metrics for various machine learning tasks	• Calculate MSE and RMSE values for the data given using MS Excel • Calculate Precision, Recall, F1 score, and Accuracy from the given confusion matrix • Python Code to Evaluate a Model (*to be evaluated in practicals only)

UNIT 3: MAKING MACHINES SEE

SUB-UNIT	LEARNING OUTCOMES	ACTIVITY/PRACTICALS
• How Machines See • Working of Computer Vision • Computer Vision Process • Applications of Computer Vision • Challenges of Computer Vision • The Future of Computer Vision • Working with OpenCV (**For Advanced Learners)	• Explain computer vision and its significance in visual data analysis. • Understand key stages of computer vision, including acquisition, preprocessing, feature extraction, and analysis. • Identify real-world applications in fields like healthcare, surveillance, and autonomous vehicles. • Analyze challenges such as ethics, privacy, and technical limitations. • Explore future advancements and transformative potential of computer vision. • Develop basic skills in using OpenCV and deploying machine learning models online.	• Binary Art - Recreating Images with 0s and 1s • Creating a Website Containing an ML Model • Working with OpenCV to load, display and resize images (**For Advanced Learners)

UNIT 4: AI WITH ORANGE DATA MINING TOOL (*to be evaluated in practicals only)

SUB-UNIT	LEARNING OUTCOMES	ACTIVITY/PRACTICALS
• What is Data Mining? • Introduction to Orange Data Mining Tool • Beneficiaries of Orange data mining • Getting started with Orange tool • Components of Orange • Default Widget Catalogue • Key domains of AI with ORANGE DATA MINING TOOL	• Develop proficiency in utilizing the Orange Data Mining tool, enabling them to navigate its interface, employ its features, and execute data analysis tasks effectively. • Demonstrate the ability to apply Orange in real-world scenarios across diverse domains of artificial intelligence, including data science, computer vision, and natural language processing (NLP), through hands-on projects and case studies.	• Load and visualize the Iris dataset using Scatter Plot and other widgets. • Use classification widgets • Evaluating the Classification Model with Orange • Computer Vision with Orange • Natural Language Processing with Orange

UNIT 5: INTRODUCTION TO BIG DATA AND DATA ANALYTICS

SUB-UNIT	LEARNING OUTCOMES	ACTIVITY/PRACTICALS
• Introduction to Big Data • Types of Big Data • Advantages and Disadvantages of Big Data • Characteristics of Big Data • Big Data Analytics • Working on Big Data Analytics • Mining Data Streams • Future of Big Data Analytics	• Understanding Big Data, its types, advantages and disadvantages. • Recognize the characteristics of Big Data. • Explain the concept of Big Data Analytics and its significance. • Analyze the future trends in the field of Big Data Analytics. • Understanding the term Mining Data Streams.	*Performing Big Data analytics with Orange Data mining tool. (*to be evaluated in practicals only)

UNIT 6: UNDERSTANDING NEURAL NETWORKS

SUB-UNIT	LEARNING OUTCOMES	ACTIVITY/PRACTICALS
• Parts of a Neural Network • Components of a Neural Network • Working of a Neural Network • Types of Neural Networks • Future of Neural Networks and Societal Impact	• Explain the basic structure and components of a neural network. • Identify different types of neural networks and their respective applications. • Understand machine learning and neural networks through hands-on projects, interactive tools, and Python programming.	• Explore Machine Learning for Kids to create a neural network for identifying animals and birds. • Build a TensorFlow model to convert Celsius to Fahrenheit (*to be evaluated in practicals only) • Use Python Keras to create and train a neural network predicting Fahrenheit from Celsius. (**For Advanced Learners) • Classification problem using TensorFlow playground

UNIT 7: GENERATIVE AI

SUB-UNIT	LEARNING OUTCOMES	ACTIVITY/PRACTICALS
• Introduction to Generative AI • Working of Generative AI • Generative and Discriminative models • Applications of Generative AI • LLM- Large Language Model • Future of Generative AI • Ethical and Social Implications of Generative AI	• How Generative AI works. • Differentiate between Generative AI and Discriminative AI and identify their use cases. • Explore ethical, social, and legal concerns. • Gain hands-on experience using AI tools to generate creative and analytical outputs, such as images, texts, and videos. • Use the Gemini API to design and deploy a functional chatbot.	• Signing up for Canva Activity. • Animaker's AI Video Generation tool. • Use Google Gemini to craft prompts and generate text outputs. • Explore ChatGPT for conversational text generation and creative tasks. • Write Python code to initialize the Gemini API and create a chat bot. (**For Advanced Learners)

UNIT 8: DATA STORYTELLING

SUB-UNIT	LEARNING OUTCOMES	ACTIVITY/PRACTICALS
• Introduction to Storytelling • Elements of a Story • Introduction to Data Storytelling • Why is Data Storytelling Powerful? • Essential Elements of Data Storytelling • Narrative Structure of a Data Story (Freytag's Pyramid) • Types of Data and Visualizations for Different Data • Steps to Create a Story Through Data • Ethics in Data Storytelling	• Understand the benefits of storytelling. • Appreciate the role of data storytelling in data analysis, data science, and AI. • Learn to combine data, visuals, and narrative to present complex information effectively. • Gain skills to draw meaningful insights from data stories.	• Create an effective data story using given data.

****Note- All portions under Advanced Learners are not to be evaluated in Theory or Practical Examinations.**

(NOTE: *marked units/portion is to be evaluated in practicals only)

PART – C:

1. Practical File:

The following are to be included in the Practical File

1. Minimum 6 programs of Python.
2. Minimum 3 programs using Orange Data Mining tool.
3. Minimum 1 problem to create a Data Story using all steps of Data Storytelling.

Optional Programs- for practical File

- Demonstration of train-test split in Linear Regression using Python.
- Chatbot using Google Gemini API.
- Orange Data Mining for Data Analytics.
- Classification problem using TensorFlow playground.
- Regression problem using TensorFlow playground.

(snapshots to be attached)

Sample programs for reference

I. Python

1. Write Python code to create a Pandas DataFrame using any sequence data type.
a) Display the DataFrame.
b) Display first 5 records.
c) Display last 10 records.
d) Display the number of missing values in the dataset.

2. Download dataset in the form of CSV from any public open-source website.
   a) Read CSV File and convert it into Pandas DataFrame.
   b) Perform statistical functions on the dataset to check the data, checking missing values, filling missing data etc.
3. Python Code to Evaluate a Model.

II. Orange Data Mining

1. Perform step wise procedure of Data Visualization using the Orange Data Mining Tool.
2. Perform Classification with Orange Data Mining.
3. Evaluate the Classification Model with Orange.
4. Perform Image analytics using the Orange data mining tool.
5.Write down steps to visualize word frequencies with Word Cloud using the Orange Data Mining tool.

Note: Snapshots of all the steps and outputs to be taken and pasted in the practical file.

III. Data Storytelling (Sample)

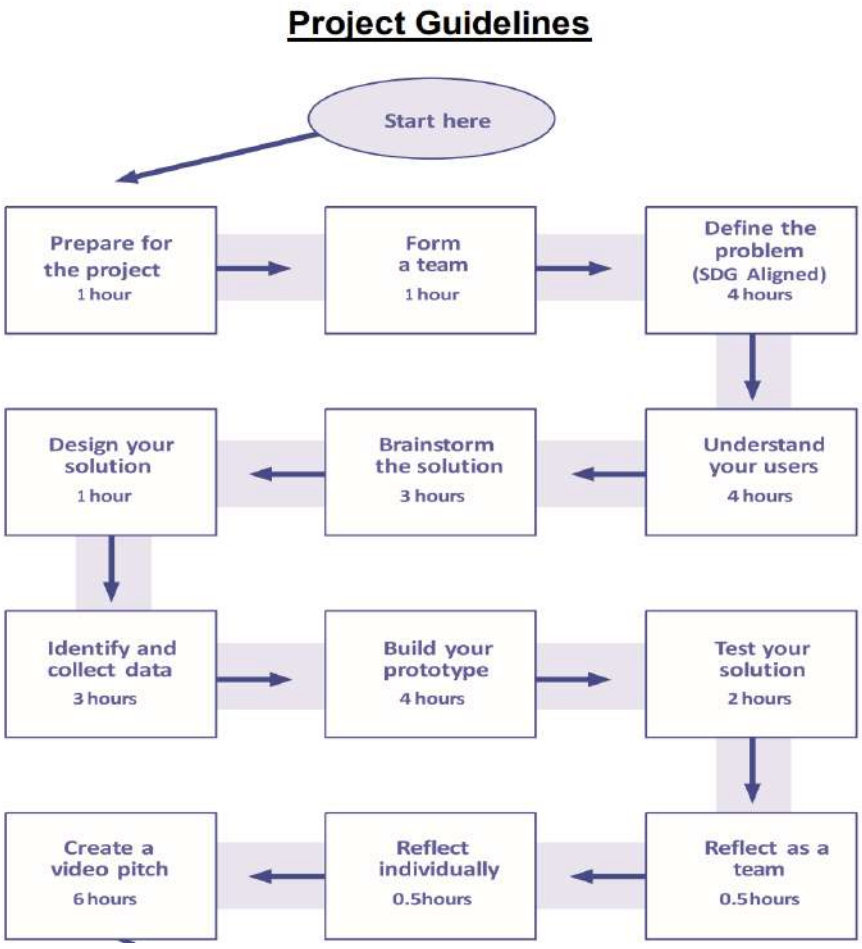
Using available data on student enrollment, attendance, and dropout rates, create a compelling data story that explores the impact of the Mid-Day Meal Scheme (MDMS) since its launch in 1995. Uncover trends, patterns, and correlations in the data to tell a story about how the implementation of the MDMS may have influenced dropout rates in the state over the years. Consider incorporating visualizations, charts, and graphs to effectively communicate your findings. Additionally, analyze any external factors or events that might have played a role in shaping these trends. Your goal is to provide a comprehensive narrative that highlights the relationship between the MDMS and student dropout rates in the state.

2. Capstone Project:

Capstone Project Guidelines:

- In a group, minimum 3 and maximum 5 students are allowed.
- Their projects should be aligned with any of the SDGs.
- Students will complete their Capstone Project in Class XII and complete the project documentation.
- Video of the Capstone Project should be exactly of 3 minutes duration.
- The video will have the following components:
    a. Problem statement
    b. To which SDG the project is aligned to
    c. AI concept/domains/algorithms used
    d. Working of the project
    e. Conclusion
    f. Acknowledgement to the teacher

Please refer to the Project guidelines of [CBSE-IBM AI PROJECT COOKBOOK (Page -2)]



Note for Educators: Python or No code/low code platforms like Orange Data Mining tool can be chosen by the students for developing their Capstone Projects.

LIST OF EQUIPMENTS/ MATERIALS:

The list given below is suggestive and an exhaustive list should be compiled by the teacher(s) teaching the subject. Only basic tools, equipment and accessories should be procured by the Institution so that the routine tasks can be performed by the students regularly for practice and acquiring adequate practical experience.

S. NO.	ITEM NAME, DESCRIPTION & SPECIFICATION
A	**HARDWARE**
1	Computer with latest configuration or minimum core I5 Processor or equivalent with minimum 8 GB RAM, 512 GB SSD, 17" LED Monitor, NIC Card, 3 button Mouse, Camera, 105 keys keyboard, speakers, mic, WiFi / Internet connectivity, Webcam, UPS, Dual Band Wireless Connectivity Min 100 Mbps and integrated graphic cards
2	Fire extinguisher
B	**SOFTWARE SPECIFICATIONS**
1	Any Operating System with antivirus activated
2	Python IDLE
3	Anaconda Navigator Distribution – Python IDE installed with software: NumPy, Pandas, Matplotlib, Scikit Learn)
4	Productivity Suite: Any (Google+ Suite recommended)
5	Orange Data Mining Tool

Additional Recommendations:

- Ensure regular updates and maintenance for all installed software to benefit from bug fixes, security patches, and new features.
- Provide licenses for commercial software, such as MS Office, as per the school's requirements and budget.
- Encourage teachers and students to stay updated with the latest versions of the software and tools and provide resources for learning and support.
- Consider implementing version control systems (e.g., Git) to facilitate collaborative coding and project management.

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 Degree in Computer Application/ Science/ Information Technology (BCA, B.Sc. Computer Science/ Information Technology) **OR** Graduate with PGDCA OR DOEACCA Level Certificate. The suggested qualification is the minimum criteria. However higher qualifications will also be acceptable.	The candidate shouldhave a minimum of 1 year of work experiencein 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 onJan. 01 (year)) • Age relaxation to be provided as perGovt. 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 Level2 or higher.

The National Quality Assurance Framework (NQAF) provides the benchmarks or quality criteriawhich 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 ofrelevant 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 procedurefor selection of (Vocational) Teachers/Trainers is followed. The selection procedure should consist ofthe 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 beforebeing deployed in the schools. The State should ensure that the existing trainers undergo in-service training of 5 days every year tomake them aware of the relevant and new techniques/approaches in their sector and understand thelatest 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;
- Organization of activities for promotion of vocational subjects;
- Involvement in placement of students/student support services.