HIGHER SECONDARY SCHOOL SYLLABUS

w.e.f

2024 – 2025

ARTS, SCIENCE, COMMERCE

MIZORAM BOARD OF SCHOOL EDUCATION
AIZAWL : 796 012

MIZORAM BOARD OF SCHOOL EDUCATION
AIZAWL – 796 012

Dated Aizawl, the 8th April, 2024

NOTICE

No.J.11012/1/2018–MBSE (Acad)/91: In modification of the Notification issued vide No. MBSE/Acad(S)2(Part)/2011 – 2012/21 dt. 22.05.2013, it is hereby notified for the information of all concerned that the Syllabi for the following subjects of Higher Secondary Stage is enclosed herewith and shall be effective from 2024 – 2025 academic session.

1. English
2. Mizo
3. Hindi
4. Political Science
5. History
6. Sociology
7. Education
8. Psychology
9. Computer Science
10. Home Science
11. Geography
12. Economics
13. Public Administration
14. Mathematics
15. Physics
16. Chemistry
17. Biology
18. Geology
19. Business Studies
20. Accountancy
21. Business Mathematics

The Higher Secondary School Leaving Certificate (HSSLC) Examinations will be conducted in accordance with these syllabi with effect from the HSSLC Examinations, 2025 onwards and until further order(s).

This is issued in pursuance of the Resolution No. SC:89:2024:02 of the 89th Meeting of the Syllabus Committee of the Board held on 23.02.2024.

Sd/- SARAH LALENGZAMI PACHUAU
Secretary
Mizoram Board of School Education

Memo No. J.11012/1/2018–MBSE(Acad)/91 (A) : Dated Aizawl, the 8th April, 2024
Copy to:-

1. The Commissioner & Secretary to the Govt. of Mizoram, School Education Department and Controlling Authority, MBSE, Aizawl.
2. The Director, School Education Department, Govt. of Mizoram, for information.
3. The Principal, Institute of Advanced Study in Education, Aizawl, for information.
4. The Controller of Examinations, MBSE.
5. Regional Officer, MBSE Regional Office, Lunglei.
6. All District Education Officers, for information with a request to inform all Principals of Higher Secondary Schools under their jurisdiction.
7. Guard files Nos.-1&10

08/04/24
(DAVID LALLAWMKIMA FANAI)
Director (Academic)
Mizoram Board of School Education

Introduction

The Mizoram Board of School Education (MBSE) has long been committed to providing a comprehensive education system that caters to the evolving needs of students. It has continuously strived to align its syllabus with national educational standards, following the National Council of Educational Research and Training (NCERT) guidelines. In line with this objective, the MBSE has undertaken a thorough revision of its Higher Secondary School syllabus, with a focus on rationalization and optimization.

Rationalization of Syllabus

The process of rationalizing the syllabus requires a meticulous evaluation of the existing content to enhance learning experience. Recognizing the dynamic nature of education, MBSE has adopted a forward-looking approach in this regard. One significant aspect of the rationalization process is the identification and removal of certain topics and chapters that are considered redundant. However, it is imperative to note that these removed contents remain relevant for broader understanding and are recommended for study.

The need for syllabus rationalization was initially caused by the unprecedented challenges posed by the global Covid-19 pandemic. In response to the disruptions caused by the pandemic, educational institutions worldwide have been compelled to reevaluate their pedagogical strategies and curriculum frameworks. The initial rationalization of syllabi was necessitated by the Covid-19 situation. The National Education Policy (NEP) 2020 also advocates for a shift towards experiential learning and competency-based education, thereby necessitating syllabus reduction.

In the process of rationalizing the syllabus, the MBSE has closely adhered to the learning outcomes outlined by the NCERT. These learning outcomes serve as guiding principles, delineating the knowledge, skills, and competencies, that students are expected to acquire at each educational stage and prepare them for the challenges and opportunities of the 21st century. By aligning its syllabus with these predefined learning outcomes, MBSE ensures coherence and consistency with different educational boards and institutions.

It is noteworthy that while MBSE remains committed to aligning with NCERT standards, the Board also acknowledges the importance of catering to the future needs of learners, particularly in the context of entrance examinations such as those conducted by the National Testing Agency (NTA), including NEET, JEE, and CUET. Consequently, the revised

syllabus integrates contents from CBSE and NTA syllabi to ensure that students are well-prepared for higher education and career aspirations. As a result of these considerations, it is possible that the syllabi of few subjects may be increased, rather than being reduced.

Methodology of Rationalization

The rationalization process undertaken by MBSE is characterized by the following key considerations:

Overlapping Content: Identification and integration of content that overlaps with similar topics covered in other subject areas within the same class.

Vertical and Horizontal Alignment: Inclusion or exclusion of content based on its coverage in lower or higher classes within the same subject domain.

Difficulty Level: Assessment of the difficulty level of topics to ensure appropriateness for the targeted grade level.

Accessibility and Self-learning: Prioritization of content that can be comprehended and assimilated by students with minimal intervention from teachers, facilitating self-learning and peer-learning opportunities.

Relevance to Present Context: Evaluation of the contextual relevance of content to ensure its alignment with contemporary issues and societal needs.

J.H. ZOREMTHANGA
Chairman

ENGLISH

Objectives:

The general objectives at this stage are to enable the learners 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.
- write text-based (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.
- be able to fill up of forms, prepare CV, e-mail messages, make notes from reference materials, recorded talks etc.

CLASS XI

Section A **Reading Skills**

Reading unseen prose passages and note making

Section B **Writing**

Section C **Grammar**

Section D **Literature Text Book and Supplementary Reading Text**

SECTION – A: READING UNSEEN PASSAGES FOR COMPREHENSION AND NOTE-MAKING

The total length of the two passages will be between 800-1000 words. The passages could be any of the following two types:

(a) **Factual Passages** e.g. instructions, descriptions, reports.
(b) **Discursive passage** involving opinion e.g. argumentative, persuasive or interpretative text.

SUMMARY

Unseen Passages	**No. of words**	**Testing Areas**
l.	500-600	Short answer type questions to test local, global and inferential comprehension including multiple choice Questions. Vocabulary
2.	300-400	Note-making in an appropriate format Summary

SECTION – B: WRITING

3. One out of two writing tasks such as advertisements and posters based on verbal input provided. (up to 50 words)

4. One out of two compositions based on a visual and/ or verbal input (120 words). The output may be descriptive or argumentative in nature such as an article for publication in a newspaper or a school magazine or a report.

5. Writing one out of two letters based on given input. Letter types include-
   (a) business or official letters (for making enquiries, registering complaints, asking for and giving information: placing orders and sending replies)
   (b) letters to the editor (giving suggestions, opinions on an issue of public interest)
   (c) application for a job.

SECTION – C: GRAMMAR

Different grammatical structures in meaningful contexts will be tested. Item types will include gap-filling, sentence-reordering, dialogue-completion and sentence transformation. The grammar syllabus will include the following areas:

6. Tenses, Clauses.

7. Re-ordering/transformation of sentences.

SECTION – D: LITERATURE TEXT BOOK AND SUPPLEMENTARY READING TEXT

Questions should assess local and global comprehension, interpretation, analysis, evaluation, inference, appreciation and extrapolation beyond the text, and should elicit inferential responses through critical thinking.

Course Book

8. One out of two extracts on poetry.

9. Three short questions from poetry section.

10. Three questions from prose section.
11. Three out of four short answer type questions based on the prose section.

12. One out of two long answer type questions from prose section.

Supplementary Reader

13. Three short answer type questions.

14. One out of two long answer type questions.

CLASS XII

Section A **Reading Skills**
Reading unseen prose passages and note making

Section B **Writing**

Section C **Literature Text Book and Supplementary Reading Text**

SECTION – A: READING SKILLS

The total length of the two passages will be between 800- 1000 words. The passages will include two of the following:

(a) **Factual Passages** e.g. instructions, descriptions, reports.
(b) **Discursive passage** involving opinion e.g. argumentative, persuasive or interpretative text.
(c) **Literary passage** e.g. extract from fiction, drama, poetry, essay or biography.

SUMMARY

Unseen Passages	No. of words	Testing Areas
l.	500-600	Short answer type questions to test local, global and inferential comprehension including Multiple choice Questions. Vocabulary
2.	300-400	Note-making in an appropriate format. Summary

SECTION – B: WRITING SKILLS

3. Two short compositions of not more than 50 words each. E.g. Notices *and* writing formal and informal invitations and replies.

4. Writing one out of two letters based on verbal input. Letter types include.
   (a) business or official letters (for making enquiries, registering complaints, asking for and giving information, placing orders and sending replies)
   (b) letters to the editor (giving suggestions on an issue)
   (c) application for a job.

5. One out of two compositions based on visual and/or verbal input (120 words). Output may be descriptive or argumentative in nature such as an article or a report.

SECTION – C: LITERATURE TEXT BOOK AND SUPPLEMENTARY READING TEXT

Questions should assess local and global comprehension, interpretation, analysis, evaluation, inference, appreciation and extrapolation beyond the text, and should elicit inferential responses through critical thinking.

Course Book

6. One out of two extracts on poetry.

7. Three short questions from poetry section.

8. Two multiple choice questions from prose section.

9. Four short answer type questions based on the prose section.

10. One out of two long answer type question from prose section.

Supplementary Reader

11. Three short answer type questions.

12. Four multiple choice questions.

13. One out of two long answer type questions.

MIZO
CLASS XI

ṬHEN KHATNA - HLA (Poetry)

FAKNA	1. Ka va ngai em Lal ram ropui	- Hleia
	2. Pathian ralthuam hmangtute chu	- Saihnuna
RAM HMANGAIHNA	3. Piallei hmun rem kan bel	- Dozinga
	4. Ram hmangaihna	- R.L.Kamlala
LENGZEM	5. Chhingkhual Thalengheri	- Laltanpuia
	6. Lenna khua hmun lo	- Lalzova
NUNKAWNG	7. Lei mite hunbi an chhiar e	- Rokunga
	8. Khawngai hnuchham	- Vankhama
KHUAREL	9. Ka lungkham	- Vanlalbeli
	10. Nungchate	- R.Rochungnunga
HLA LENGLAWNG	11. Thlawhhma hla	- Romani
HLA HLUI	12. German run zai	

ṬHEN HNIHNA - THU (Prose)

NUN KAWNG HRUAINA	1. Hmangaihna	- Lalhmingliana Saiawi
	2. Mi puitling	- Lalena
KHUAREL	3. Zoram par mawi	- C.Rokhuma
	4. Khawvel mawi hi	- R.Lalzarmawia
HNAM ZIARANG	5. Mizo ka ni ka zak dawn lo	- James Dokhuma
RAM LEH HNAM	6. Mizo tlangval rual leh Japan ral	- Zokima
	7. Mizo, Hnam leh Sakhua	- Lalrinawma
	8. Ram nghahfak chu keimahni	- Lalrintluanga
INPUMKHATNA LAM	9. Mizo ṭawng khawvel	- C.Sangzuala
THUPUI DANG	10. Anni leh keini	- Siamkima Khawlhring
	11. Chanchin Tha malsawmna	- Z.T.Sangkhuma
	12. Nunna tui	- C. Lalnunnema

ṬHEN THUMNA - LEMCHAN (Drama)

1. Hausakna Nun dik tak - Chawngzika

ṬHEN LINA - THAWNTHU TAWI (Fiction)
1. Lali (Lalawmpuii) - Biakliana

ṬHEN NGANA - GRAMMAR & COMPOSITION
1. Mood
2. Tawng Upa
3. Report ziah dan
4. Minute ziah dan
5. Thu lak tawi dan (Precis)

RAPID READER
1. C.C. Coy. No. 27 - Zikpuii Pa

MIZO
CLASS XII

THEN KHATNA - HLA (Poetry)

KHAWHAR	1. Phungrual an tin ang a	- Laithangpuia
	2. Enchimloh chawi lai	- Ralngama
RAMHMANGAIHNA	3. I tan ka ding zel ang	- T.Zorampela
	4. Zoram! Ka ram!	- Kaphleia
LENGZEM	5. Kar a hla	- Lalhmingthanga
	6. Tleitirah tleitiri	- Durra Chawngthu
NUNKAWNG	7. Kan dam chhung ni	- P.S.Chawngthu
	8. Phengphe nunnem	- Zirsangzela Hnamte
KHUAREL	9. Pi pu chhuahtlang hlui	- Liandala
HLA LENGLAWNG	10. Hmanah pi pu lenlai chul hnu	- Damhauhva
	11. Pan lai ka ram tuanna	- Lalsangzuali Sailo
HLA HLUI	12. Hausiampa Zai	

THEN HNIHNA - THU (Prose)

NUN KAWNG HRUAINA	1. Dawhtheihna	- R.L.Thanmawia
	2. Lung in malsawmna thuruk	- H.Lallungmuana
	3. Zirlaite hnena thuchah	- Zikpuii pa
	4. Ngaihtuahna	- C.H. Thangkhuma
	5. I Thinrim elo	- C. Lalhrekima
KHUAREL	6. Lungphang lo la	- L.Keivom
	7. Leilung hi Pathian siam a ni	- P.L.Liandinga
HNAM ZIA-RANG	8. Mizo thu leh hla tobul	- B.Lalthangliana
RAM LEH HNAM	9. Mizo hnam zai leh hla thlavang hauhna	- C. Lalsiamthanga
THUPUI DANG	10. Tawrhna	- Zairema
	11. Mi huaisen	- Thanpuii pa
	12. Kan nun khuarei an chang tur hi	- C. Ṭhuamluaia

THEN THUMNA - LEMCHAN (Drama)

1. Thangzawra - Lalsangzuala

THEN LINA - THAWNTHU TAWI (Fiction)

1. Lal hlau lo ṭhi - Lalzuia Colney

THEN NGANA - GRAMMAR & COMPOSITION

1. Adverb
2. Ṭawng upa
3. Lehkhathawn:
   (i) Sawiselna (complaint)
   (ii) Thu pawi thlen (FIR)
4. Essay ziah dan

RAPID READER:

1. Chawngmawii leh Hrangchhuana - R. Rozika

हिंदी

कक्षा–11

क) अपठित बोध :

1. काव्यांश – बोध (काव्यांश पर आधारित पाँच बहुउत्तरात्मक प्रश्न)
2. गद्यांश – बोध (गद्यांश पर आधारित बोध, प्रयोग, रचनांतरण, शीर्षक आदि पर बहुउत्तरात्मक प्रश्न

(ख) रचनात्मक लेखन : (कामकाजी हिंदी और रचनात्मक लेखन)

रचनात्मक लेखन पर दो प्रश्न

3. • निबंध
4. • कार्यालयी पत्र
5. निर्धारित पुस्तक 'अभिव्यक्ति और माध्यम' के आधार पर जनसंचार की विधाओं पर दो प्रश्न
   - प्रिंट माध्यम (समाचार और सम्पादकीय)
   - रिपोर्ट/आलेख
6. [illegible]

ग आरोह

(काव्य–भाग)

7. दो काव्यांशों मे से किसी एक पर अर्थग्रहण के चार प्रश्न
8. काव्यांश के सौंदर्यबोध पर दो प्रश्न
9. कविता की विषय–वस्तु पर आधारित तीन बहुउत्तरात्मक प्रश्न

(गद्य–भाग)

10. दो में से एक गद्यांश पर आधारित अर्थग्रहण संबंधित तीन प्रश्न
11. पाठों की विषयवस्तु पर आधारित चार में से तीन बोधात्मक प्रश्न

वितान – भाग : 1

12. पाठों की विषयवस्तु पर आधारित चार में से तीन लघूत्तरात्मक प्रश्न

13. विषयवस्तु पर आधारित दो में से एक निबंधात्मक प्रश्न

घ मौखिक परीक्षण

श्रवण (सुनना): वर्णित या पठित सामग्री को सुनकर अर्थग्रहण करना, वार्तालाप, वाद–विवाद, भाषण, कवितापाठ आदि को सुनकर समझना, मूल्यांकन करना और अभिव्यक्ति के ढंग को समझना।

बोलना: भाषण, सस्वर कविता–पाठ, वार्तालाप और उसकी औपचारिकता, कार्यक्रम–प्रस्तुति, कथा–कहानी अथवा घटना सूचना, परिचय देना, साक्षात्कार लेना–देना।

वार्तालाप की दक्षताएँ :

टिप्पणी: वार्तालाप की दक्षताओं का मूल्यांकन निरंतरता के आधार पर परीक्षा के समय होगा। निर्धारित 10 अंकों में से 5 श्रवण (सुनना) के मूल्यांकन के लिए और 5 (बोलना) के मूल्यांकन के लिए होंगे।

श्रवण (सुनना) टिप्पणी का मूल्यांकन:

परीक्षक किसी प्रासंगिक विषय पर एक अनुच्छेद का स्पष्ट वाचन करेगा। अनुच्छेद, तथ्यात्मक या सुझावात्मक हो सकता है। अनुच्छेद लगभग 250 शब्दों का होना चाहिए। परीक्षक/अध्यापक को सुनते–सुनते परीक्षार्थी अलग कागज़ पर दिए हुए श्रवण–बोध के अभ्यासों को हल कर सकेंगे।

अभ्यास रिक्तस्थान–पूर्ति, बहुविकल्पी अथवा सही–गलत का चुनाव आदि विधाओं में हो सकते हैं। आधे–आधे अंक के 10 परीक्षण–प्रश्न होंगे।

मौखिक अभिव्यक्ति (बोलना) का मूल्यांकन:

1. चित्रों के क्रम पर आधारित वर्णन: इस भाग में अपेक्षा की जाएगी कि विवरणात्मक भाषा का प्रयोग करें।
2. किसी चित्र का वर्णन: चित्र लोगों या स्थानों के हो सकते हैं।
3. किसी निर्धारित विषय पर बोलना, जिससे विद्यार्थी/परीक्षार्थी अपने व्यक्तिगत अनुभव का प्रत्यास्मरण कर सके।
4. कोई कहानी सुनाना या किसी घटना का वर्णन करना।

टिप्पणी :

परीक्षण से पूर्व परीक्षार्थी को कुछ तैयारी के लिए समय दिया जाए।

- विवरणात्मक भाषा में वर्तमान काल का प्रयोग अपेक्षित है।
- निर्धारित विषय परीक्षार्थी के अनुभव–जगत के हों जैसे

  कोई चुटकला या हास्य प्रसंग सुनाना।

  हाल में पढ़ी पुस्तक या देखे सिनेमा की कहानी सुनाना।

जब परीक्षार्थी बोलना आरंभ कर दे तो परीक्षक कम से कम हस्तक्षेप करें।

कौशलों के अंतरण का मूल्यांकन

(इस बात का निश्चय करना कि क्या विद्यार्थी में श्रवण और वाचन की निम्नलिखित योग्यताएँ हैं।)

श्रवण (सुनना)	वाचन (बोलना)
विद्यार्थी में–	विद्यार्थी –
1. परिचित संदर्भों में प्रयुक्त शब्दों और पदों को समझने की सामान्य योग्यता है किन्तु वह सुसंबद्ध आशय को नहीं समझ पाता।	1. केवल अलग–अलग शब्दों और पदों के प्रयोग की योग्यता प्रदर्शित करता है किन्तु एक सुसंबद्ध स्तर पर नहीं बोल सकता।
3. छोटे संबद्ध कथनों को परिचित संदर्भों में समझने की योग्यता है।	3. परिचित संदर्भों में केवल छोटे संबद्ध कथनों का सीमित शुद्धता से प्रयोग करता है।
5. परिचित या अपरिचित दोनों संदर्भों में कथित सूचना को स्पष्ट समझने की योग्यता है।	5. अपेक्षाकृत दीर्घ भाषण में अधिक जटिल कथनों के प्रयोग की योग्यता प्रदर्शित करता है, अभी भी कुछ अशुद्धियां करता है, जिससे प्रेषण में रुकावट आती है।
7. दीर्घ कथनों की शृंखला को पर्याप्त शुद्धता से समझने और निष्कर्ष निकाल सकने की योग्यता है।	7. अपरिचित स्थितियों में विचारों को तार्किक ढंग से संगठित कर धारा–प्रवाह रूप में प्रस्तुत करता है। ऐसी गलतियाँ करता है जिनसे प्रेषण में रुकावट नहीं आती।
9. जटिल कथनों के विचार–बिंदुओं को समझने की योग्यता प्रदर्शित करने की क्षमता है। वह उद्देश्य के अनुकूल सुनने की कुशलता प्रदर्शित करता है।	9. उद्देश्य और श्रोता के लिए उपयुक्त शैली को अपना सकता है, केवल मामूली गलतियाँ करता है।

हिंदी

कक्षा–12

क अपठित बोध :

1. काव्यांश–बोध पर आधारित पाँच लघूत्तरात्मक प्रश्न
2. गद्यांश–बोध पर आधारित बोध, प्रयोग, रचनांतरण, शीर्षक आदि पर लघूत्तरात्मक प्रश्न

ख रचनात्मक लेखन एवं जन–संचार माध्यम :

3. निबंध

   जन–संचार की निम्नलिखित विधाओं पर दो प्रश्न–

4. रिपोर्ट
5. आलेख
6. फीचर लेखन (जीवन–संदर्भों से जुड़ी घटनाओं और स्थितियों पर फीचर–लेखन)

ग आरोह भाग–2 (काव्य –भाग और गद्य–भाग)

7. दो काव्यांशों में से किसी एक पर अर्थग्रहण के चार/पाँच प्रश्न
8. काव्यांश के सौंदर्यबोध पर दो प्रश्न के स्थान पर विकल्प दिया जाएगा।
   किसी एक काव्यांश के तीनो प्रश्नों के उत्तर देने होंगे।
9. कविताओं की विषय–वस्तु से संबंधित तीन में से दो लघूत्तरात्मक प्रश्न
10. दो में से किसी एक गद्यांश पर आधारित अर्थ–ग्रहण के चार प्रश्न
11. पाठों की विषय वस्तु पर आधारित पांच में से चार बोधात्मक प्रश्न

पूरक पुस्तक : वितान भाग 2

12. पाठों की विषयवस्तु पर आधारित तीन में से दो बोधात्मक प्रश्न
13. विचार/संदेश पर आधारित तीन में से दो लघूत्तरात्मक प्रश्न
14. विषयवस्तु पर आधारित दो में से एक निबंधात्मक प्रश्न

POLITICAL SCIENCE

Objectives:

- Enable the students to understand the key features of Indian Constitution, historical processes and circumstances in which the Constitution of India was made.
- Provide opportunity to the students to have an idea of diverse political concerns.
- Help the students to develop political arguments on various issues and familiar with the significant political events and figures in independent India, and to equip the students to think about India's place in the present world.
- Identify certain key features of the Constitution and analyse how the provisions have worked in real political life .
- Familiarize the students the need for political philosophy to the Constitution of India.
- Develop an interest in political theory, significant concepts and a capacity for logical reasoning and abstraction.
- Inculcate attention and respect for the viewpoints of others rather than one's own viewpoint.
- Introduce the students about the different political thinkers in relation to a concept and in everyday social life.
- Enable the students to meaningfully participate in current political life that surrounds them.
- Encourage the students to analyse any unexamined prejudice that one may have inherited.
- Enable the students to expand their horizon beyond India and make sense of the changing political map of the contemporary world.
- Familiarise the students with some of the key political events and processes in the social political life around them.
- Equip students to be conscious of the way in which global events and processes shape our everyday life.
- Strengthen their capacity for political analysis by thinking contemporary political development in a historical perspective
- Enable students to be familiar with some of the key political events and figures in the post-independence period.
- Equip the students to think about the functions of Indian democracy, and imbibe them to become active and responsible citizens of Indian democracy.
- Develop skill of political analysis through events and processes of recent political developments in the country.
- Increase their capacity to link macro processes with micro situations and their own life.
- Encourage the students to take a historical perspective of making sense of the contemporary India.

CLASS XI

Part A: INDIAN CONSTITUTION AT WORK

1. **The Constitution : Why and How?**
   Why do we need a Constitution?; The Authority of a Constitution.

2. **Rights in the Indian Constitution**
   The importance of Rights; Fundamental Rights enshrined in the Constitution; Directive Principles of State Policy; Relationship between Fundamental Rights and Directive Principles of State Policy

3. **Election and Representation**
   Elections and Democracy; Election system in India;
   Reservation of Constituencies; Free and Fair Elections; Electoral Reforms

4. **Executive**
   What is an Executive?; What are the different types of Executive?;
   Parliamentary Executive in India; Prime Minister and Council of Ministers;
   Permanent Executive: Bureaucracy

5. **Legislature**
   Why do we need a Parliament?; Why do we need two Houses of Parliament?
   What does the Parliament do?; How does the Parliament make Laws?;
   How does the Parliament control the Executive?; What do the Committees of Parliament do?; How does the Parliament regulate itself?

6. **Judiciary**
   Why do we need an independent Judiciary?; Structure of the Judiciary;
   Judicial Activism; Judiciary and Rights; Judiciary and Parliament.

7. **Federalism**
   What is Federalism?; Federalism in the Indian Constitution? Federalism with a strong Central Government; Conflicts in India's Federal system;
   Special Provisions.

8. **Local Governments**
   Why Local Governments?; Growth of Local Government in India;
   73^{rd} and 74^{th} Amendments; Implementation of 73^{rd} and 74^{th} Amendments.

9. **Constitution as a Living Document**
   Are Constitution static?; How to amend the Constitution?; Why have there been so many amendments?; Basic structure and evolution of the Constitution; Constitution as a living document.

10. **The Philosophy of the Constitution**
    What is meant by Philosophy of the Constitution?; What is the Political Philosophy of our Constitution?; Procedural Achievements; Criticisms.

Part B: POLITICAL THEORY

11. **Political Theory : An Introduction**
What is Politics?; What do we study in Political Theory?; Putting Political Theory to practice; Why should we study Political Theory?

12. **Freedom**
The ideal of Freedom; What is Freedom?; Why do we need constraints?; Harm principle; Negative and Positive Liberty.

13. **Equality**
Why does Equality matter?; What is Equality?; Three dimensions of Equality?; How can we promote Equality?

14. **Social Justice**
What is Justice?; Just Distribution; John Rawl's Theory of Justice; Pursuing Social Justice.

15. **Rights**
What are Rights?; Where do Rights come from?; Legal Rights and the State; Kinds of Rights; Rights and Responsibilities.

16. **Citizenship**
Introduction; Full and Equal membership; Equal Rights; Citizen and Nation; Universal Citizenship; Global Citizenship.

17. **Nationalism**
Introducing Nationalism; Nations and Nationalism; National self-determination; Nationalism and Pluralism.

18. **Secularism**
What is Secularism?; Secular State; The Western Model of Secularism; The Indian Model of Secularism; Criticisms and Rationale of Indian Secularism.

CLASS XII

Part A: CONTEMPORARY WORLD POLITICS

1. **The End of Bipolarity**
   Overview; The Soviet System; Gorbachev and the disintegration; Why did the Soviet Union disintegrate?; Consequences of disintegration; Shock Therapy and its Consequences; Tensions and Conflicts; India and Post-Communist countries.

2. **Alternative Centres of Power**
   Overview; European Union; Association of South East Asian Nations (ASEAN); Rise of the Chinese Economy; India – China relations; Japan.

3. **Contemporary South Asia**
   Overview; What is South Asia?; The Military and Democracy in Pakistan; Democracy in Bangladesh; Monarchy and Democracy in Nepal; Ethnic conflict and Democracy in Sri Lanka; India – Pakistan conflicts; India and its other neighbours; Peace and Cooperation.

4. **International Organisations**
   Overview; Meaning and importance of International Organisations; Evolution of the United Nations (UN); Reforms of the UN after the Cold War; Reform of Structures and Processes; Jurisdiction of the UN; India and the UN Reforms; The UN in the Unipolar World.

5. **Security in the Contemporary World**
   Overview; Meaning of Security; Traditional Notions : External and Internal; Traditional Security and Cooperation; Non-traditional Notions; New sources of Threats; India's Security strategy;

6. **Environment and Natural Resources**
   Overview; Environmental concerns in Global Politics; The protection of global commons; Common but differentiated responsibilities; Common property resources; India's stand on environmental issues; Environmental Movements : One or Many?; Resources Geopolitics; The Indigenous Peoples and their Rights.

7. **Globalisation**
   Overview; The concept of Globalisation; Causes of Globalisation; Political consequences; Economic consequences; Cultural consequences; India and Globalisation; Resistance to Globalisation; India and resistance to Globalisation.

Part B: POLITICS IN INDIA SINCE INDEPENDENCE

8. **Challenges of Nation Building**
   Challenges for the new nation; Three challenges; Partition: Displacement and Rehabilitation; Mahatma Gandhi's Sacrifice; Integration of Princely States; Reorganisation of States;

9. **Era of One-Party Dominance**
Challenges of building Democracy; Congress dominance in the first three general elections; Communist victory in Kerala; Socialist Party; Nature of Congress dominance; The Communist Party of India; Bharatiya Jana Sangh; Emergence of opposition parties; Party competition in a Bihar village.

10. **Politics of Planned Development**
Political contestation; Ideas of Development; Planning; Planning commission; The Early Initiatives; The first Five Year Plan; Rapid Industrialisation.

11. **India's External Relations**
International context; The policy of non-alignment; Peace and Conflict with China; The Chinese invasion, 1962; War and Peace with Pakistan; Bangladesh war, 1971; India's Nuclear Policy; Shifting alliances in world politics.

12. **Challenges to and Restoration of the Congress system**
Challenges of political succession; Fourth General Elections, 1967; Split in the Congress; The 1971 Election and Restoration of Congress.

13. **The Crisis of Democratic Order**
Background to Emergency (Economic context, Gujarat and Bihar movements, Railway Strike of 1974, Conflict with Judiciary); Declaration of Emergency (Crisis and response, Consequences); Politics after Emergency.

14. **Regional Aspirations**
Region and the Nation; Jammu and Kashmir; Punjab; The North-East; Accommodation and National Integration.

15. **Recent Development in Indian Politics**
Context of the 1990s;Era of Coalitions; Political Rise of Other Backward Classes; Communalism, Secularism, Democracy (Ayodhya dispute, Demolition and after); Emergence of a new consensus (Lok Sabha Elections 2004, Growing consensus).

HISTORY

Objectives:

- The effort in these senior secondary classes would be to emphasise to students that history is a critical discipline, a process of enquiry, a way of knowing about the past, rather than just a collection of facts. The syllabus would help them understand the process through which historians write history, by choosing and assembling different types of evidence, and by reading their sources critically. They will appreciate how historians follow the trails that lead to the past, and how historical knowledge develops.
- The syllabus would also enable students to relate/compare developments in different situations, analyse connection between similar processes located in different time periods, and discover the relationship between different methods of social enquiry within different social sciences.
- The syllabus in Class XI is organised around some major themes in world history. The themes have been selected so as to (i) focus on some important developments in different spheres — political, social, cultural and economic, (ii) study not only the grand narratives of development — urbanisation, industrialisation and modernisation — but also to know about the processes of displacements and marginalisation. Through the study of these themes students will acquire a sense of the wider historical processes as well as an idea of the specific debates around them.
- The treatment of each theme in Class XI would include (a) a broad picture of the theme under discussion, (b) a more detailed focus on one region of study, (c) an introduction to a critical debate associated with the issue.
- In Class XII the focus will shift to a detailed study of some themes in Ancient, Medieval and Modern Indian history. The objective would be to study a set of these themes in some detail and depth rather than survey the entire chronological span of Indian history. In this sense the course will build on the knowledge that the students have acquired in the earlier classes.
- Each theme in Class XII will also introduce the student to one type of source for the study of history. Through such a study students would begin to see what different types of sources can reveal and what they cannot tell. They would come to know how historians analyse these sources, the problems and difficulties of interpreting each type of source, and the way a larger picture of an event, a historical process, or a historical figure, is built by looking at different types of sources.
- Each theme for Class XII will be organised around four subheads:
  (a) a detailed overview of the events, issues and processes under discussion,
  (b) a summary of the present state of research on the theme,
  (c) an account of how knowledge about the theme has been acquired,
  (d) an excerpt from a primary source related to the theme, explaining how it has been used by historians.
- While the themes in both these classes (XI and XII) are arranged in a broad chronological sequence, there are overlaps between them. This is intended to convey a sense that chronological divides and periodisation do not always operate in a neat fashion.
- In the textbooks each theme would be located in a specific time and place, but these discussions would be situated within a wider context by (a) plotting the specific event within time-lines, (b) discussing the particular event or process in relation to developments in other places and other times.

CLASS XI: THEMES IN WORLD HISTORY

SECTION A: EARLY SOCIETIES

1. ***Early Cities***

Focus: Iraq, 3rd millennium BC
(a) Growth of towns,
(b) Nature of early urban societies.
Debate on uses of writing

SECTION B: EMPIRES

2. ***An Empire across Three Continents***

Focus: Roman Empire, 27 BC to AD 600
(a) Political evolution,
(b) Economic expansion,
(c) Religion,
(d) Late Antiquity.
Debate on the institution of slavery

3. ***Nomadic Empires***

Focus: the Mongol, 13th to 14th century
(a) The nature of nomadism.
(b) Formation of empires.
(c) Conquests and relations with other states.
Debate on nomadic societies and state formation

SECTION C: CHANGING TRADITIONS

4. ***Three Orders***

Focus: Western Europe, 9th-16th century
(a) Feudal society and economy.
(b) Formation of states.
(c) Church and society.
Debate on decline of feudalism

5. ***Changing Cultural Traditions***

Focus on Europe, 14th to 17th century
(a) New ideas and new trends in literature and arts.
(b) Relationship with earlier ideas
(c) The contribution of West Asia.
Debate: Is the notion 'European 'Renaissance' valid?

SECTION D: PATHS TO MODERNIZATION

6. ***Displacing Indigenous Peoples***

Focus on North America and Australia, 18th-20th century
(a) European colonists in North America and Australia.
(b) Formation of white settler societies.
(c) Displacement and repression of local people.
Debate on the impact of European settlement on indigenous populations

7. ***Paths to Modernization***

Focus on East Asia. Late 19th and 20th century
(a) Militarization and economic growth in Japan.
(b) China and the Communist alternative.
Debate on the meaning of Modernization
Map work (units 1-7)

CLASS XII: THEMES IN INDIAN HISTORY

SECTION A: ARCHAELOGY &ANCIENT INDIA

1. ***The Story of the First Cities: Harappan Archaeology***
   Broad overview: Early urban centres.
   Story of discovery: Harappan civilization.
   Excerpt: Archaeological report on a major site.
   Discussion: How it has been utilized by archaeologists/ historians.

2. ***Political and Economic History: How Inscriptions tell a story***
   Broad overview: Political and economic history from the Mauryan to the Gupta period.
   Story of discovery: Inscriptions and the decipherment of the script. Shifts in the understanding of political and economic history.
   Excerpt: Asokan inscription and Gupta period land grant.
   Discussion: Interpretation of inscriptions by historians

3. ***Social Histories: Using the Mahabharata***
   Broad overview: Issues in social history, including caste, class, kinship and gender.
   Story of discovery: Transmission and publications of the Mahabharata.
   Excerpt: From the Mahabharata, illustrating how it has been used by historians.
   Discussion: Other sources for reconstructing social History.

4. ***A History of Buddhism: Sanchi Stupa***
   Broad overview:
   (a) A brief review of religious histories of Vedic religion, Jainism, Vaisnavism, Saivism.
   (b) Focus on Buddhism.
   Story of discovery: Sanchi stupa.
   Excerpt: Reproduction of sculptures from Sanchi.
   Discussion: Ways in which sculpture has been interpreted by historians, other sources for reconstructing the history of Buddhism.

SECTION B: MEDIEVAL INDIA

5. ***Medieval Society through Travellers' Accounts***
   Broad Overview: Outline of social and cultural life as they appear in travellers' accounts.
   Story of their writings: A discussion of where they travelled, why they travelled, what they wrote, and for whom they wrote.
   Excerpts: from Alberuni, Ibn Batuta, Bernier.
   Discussion: What these travel accounts can tell us and how they have been interpreted by historians.

6. ***Religious Histories: The Bhakti-Sufi Tradition***
   Broad Overview:
   (a) Outline of religious developments during this period.
   (b) Ideas and practices of the Bhakti-Sufi saints.
   Story of Transmission: How Bhakti-Sufi compositions have been preserved.
   Excerpt: Extracts from selected Bhakti Sufi works.
   Discussion: Ways in which these have been interpreted by historians.

7. ***New Architecture: Hampi***

Broad Overview:

(a) Outline of new buildings during Vijayanagar period — temples, forts, irrigation facilities.

(b) Relationship between architecture and the political system.

Story of Discovery: Account of how Hampi was found.

Excerpt: Visuals of buildings at Hampi.

Discussion: Ways in which historians have analysed and interpreted these structures.

8. ***Agrarian Relations: The Ain-i- Akbari***

Broad overview:

(a) Structure of agrarian relations in the 16th and 17th centuries.

(b) Patterns of change over the period.

Story of Discovery: Account of the compilation and translation of Ain-i-Akbari.

Excerpt: From the Ain-i-Akbari.

Discussion: Ways in which historians have used the text to reconstruct history.

SECTION C: MODERN INDIA

9. ***Colonialism and Rural Society: Evidence from Official Reports***

Broad overview:

(a) Life of zamindars, peasants and artisans in the late 18th century.

(b) East India Company, revenue settlements and surveys.

(c) Changes over the nineteenth century.

Story of official records: An account of why official investigations into rural societies were undertaken and the types of records and reports produced.

Excerpts: From Firminger's *Fifth Report*, Accounts of Francis Buchanan-Hamilton, and Deccan Riots Report.

Discussion: What the official records tell and do not tell, and how they have been used by historians.

10. ***Representations of 1857***

Broad Overview:

(a) The events of 1857-58.

(b) How these events were recorded and narrated.

Focus: Lucknow.

Excerpts: Pictures of 1857. Extracts from contemporary accounts.

Discussion: How the pictures of 1857 shaped British opinion of what had happened.

11. ***Mahatma Gandhi through Contemporary Eyes***

Broad Overview:

(a) The nationalist movement 1918-48,

(b) The nature of Gandhian politics and leadership.

Focus: Mahatma Gandhi in 1931.

Excerpts: Reports from English and Indian language newspapers and other contemporary writings.

Discussion: How newspapers can be a source of history

12. ***The Making of the Constitution***

Broad Overview:

(a) Independence and the new nation state.

(b) The making of the Constitution.

Focus: The Constitutional Assembly debates.

Excerpts: From the debates.

Discussion: What such debates reveal and how they can be analyzed.

Map work (units 1-12)

SOCIOLOGY

Objectives:

- To enable learners to relate classroom teaching to their outside environment.
- To introduce them to the basic concepts of sociology that would enable them to observe and interpret social life.
- To be aware of the complexity of social processes.
- To appreciate diversity in society in India and the world at large.
- To build the capacity of students to understand and analyze the changes in contemporary Indian society.

CLASS XI

PART-A INTRODUCING SOCIOLOGY

Unit 1*: Society & Sociology*

- Introducing Society: Individuals and collectivities. Plural Perspectives
- Introducing Sociology: Emergence. Nature & Scope, Relationship to other disciplines

Unit 2: *Basic Concepts*

- Social Groups
- Status and Role
- Social Stratification
- Social Control

Unit 3: *Social Institutions*

- Family and Kinship
- Political and Economic Institutions
- Religion as a Social Institution
- Education as a Social Institution

Unit 4: *Culture And Society*

- Culture, Values and Norms: Shared, Plural, Contested
- Socialization: Conformity, Conflict and the Shaping of Personality

Unit 5: *Doing Sociology: Methods & Techniques*

- Tools and Techniques: Observation, Survey, Interview
- The Significance of Field Work in Sociology

PART-B UNDERSTANDING SOCIETY

Unit 1: *Structure, Process and Stratification*

- Social Structure
- Social Processes: Cooperation, Competition, Conflict
- Social Stratification: Class, Caste, Race, Gender.

Unit 2: *Social Change*

- Social Change: Types and Dimensions; Causes and Consequences.
- Social Order: Domination, Authority & Law; Contestation, Crime and Violence
- Village, Town & City: Changes in Rural & Urban Society

Unit 3: ***Environment And Society***

- Ecology and Society
- Environmental Crises and Social Responses

Unit 4: ***Western Social Thinkers***

- Karl Marx on Class Conflict
- Emile Durkheim on Division of Labour
- Max Weber on Bureaucracy

Unit 5: ***Indian Sociologists***

- G.S. Ghurye on Race and Caste
- D.P. Mukherji on Tradition and Change
- A.R. Desal on the State
- M.N. Srinivas on the Village

CLASS XII

PART-A INDIAN SOCIETY

Unit 1: ***Introducing Indian Society***

- Colonialism, Nationalism, Class and Community

Unit 2: ***The Demographic Structure of the Indian Society***

- Rural-Urban Linkages and Divisions

Unit 3: ***Social Institutions: Continuity & Change***

- Family and Kinship
- The Caste System
- Tribal Society

Unit 4: ***The Market As a Social Institution***

- Market as a Social Institution

Unit 5: ***Patterns of Social Inequality & Exclusion***

- Caste Prejudice, Scheduled Castes and Other Backward Classes
- Marginalization of Tribal Communities
- The Struggle for Women's Equality
- The Protection of Religious Minorities
- Caring for the Differently Abled

Unit 6: ***The Challenges of Cultural Diversity***

- Problems of Communalism, Regionalism, Casteism & Patriarchy
- Role of the State in a Plural and Unequal Society
- What We Share

Unit 7: ***Project Work***

PART-B SOCIAL CHANGE AND DEVELOPMENT IN INDIA

Unit 1: ***Structural Change***

- Colonialism, Industrialization, Urbanization.

Unit 2: ***Cultural Change***

- Modernization, Westernization, Sanskritisation, Secularization.
- Social Reform Movements

Unit 3: ***The Constitution and Social Change***

- The Constitution as an instrument of Social Change
- Panchayati Raj and the Challenges of Social Transformation

Unit 4: ***Change and Development in Rural Society***

- Land Reforms, Green Revolution and Agrarian Society

Unit 5: ***Change and Development in Industrial Society***

- From Planned Industrialization to Liberalization
- Changes in the Class Structure

Unit 6: ***Globalization and Social Change***

Unit 7: ***Mass Media and Communications***

Unit 8: ***Social Movements***

- Class-Based Movements: Workers, Peasants.
- Caste-Based Movements: Dalit Movement, Backward Castes, Trends in Upper Caste Responses.
- Women's Movements in Independent India.
- Tribal Movements.
- Environmental Movement

EDUCATION

Objectives:

The general objectives at this stage are to enable the learners to:

- understand the multifaceted nature of education, distinguishing between its narrower and wider meanings, and recognize the significance of formal, informal, and non-formal types of education.
- analyze the constitutional provisions related to education in India, including free and compulsory education, language safeguards, equality of opportunity, and provisions for the education of minorities and weaker sections, fostering a deeper understanding of the legal framework of education in the country.
- evaluate contemporary issues in Indian education and other educational initiatives, enabling students to critically assess ongoing educational programs and policies.
- identify and articulate the aims of education, both individual and social, as outlined in national policies and reflected in the educational philosophies of great educators, fostering an appreciation for the diverse objectives of education.
- demonstrate comprehension of fundamental concepts in educational psychology including growth and development, learning theories, habits, attention, memory, personality, intelligence, mental health, and adjustment, as well as the significance of guidance and counseling in facilitating holistic development and well-being.

CLASS XI

Unit I: Concept of Education and Curriculum

- Meaning of Education, Narrower and Wider meaning of Education
- Types of Education: Formal, Informal and Non-formal
- Meaning of Literacy
- Distinction between Education and Literacy
- Meaning and Importance of curriculum

Unit II: Constitutional Provision Relating to Education

- Free and Compulsory Education (Article 21A)
- Religious Instruction
- Language Safeguards
- Equality of Opportunity
- Education of Minorities
- Education of weaker sections
- Women Education
- Instruction in Mother Tongue
- Promotion of Hindi
- Early Childhood Care and Education

Unit III: Contemporary Issues in Indian Education

- Sarva Shiksha Abhiyan
- Rastriya Madhyamik Shiksha Abhiyan
- Rashtriya Uchchatar Shiksha Abhiyan

Unit IV: Aims of Education

- Education for Individual Development
- Education for Social Development
- Synthesis Between Individual and Social Aims of Education
- Aims of Education as reflected in national Policy on Education, 1986

Unit V: Educational Ideas of Some Great Educators

- Pestalozzi, Montessori, Gandhiji and Tagore. Their brief life sketch, Educational ldeas and Relevance of their ldeas in the Present Education.

Unit VI: Environmental Education

- Meaning and Importance of Environmental Education
- Causes and Effects of Pollution:
  1. Noise Pollution
  2. Air Pollution
  3. Water Pollution

Unit VII: Value Education

- Concept of values and Value-Oriented Education
- Classification of Values
- Need and Importance for Value Education
- Role of a teacher in inculcating Values among students.

Unit VIII: Measurement and Evaluation

- Concept of Measurement and Evaluation
- Differences between Measurement and Evaluation
- Types of Examination: Objective and Descriptive Type: Meaning, merits and Demerits
- Formative and Summative Evaluation

Unit IX: Fundamental Statistics

- Meaning and uses of statistical measurement
- Frequency of Distribution
- Graphical Representation of Data: Polygon, Histogram, Pie-Diagram
- Measures of Central Tendency: Mean, Median and Mode

CLASS XII

Unit I: Psychology as a behavioural Science

- Meaning of Psychology, Relationship between Psychology and Education
- Meaning of Educational Psychology: Nature and scope of Educational Psychology

Unit II: Growth and Development

- Meaning of Growth and Development
- Difference between Growth and Development
- Principles of Growth and Development and their educational implications
- Social development up to adolescence
- Intellectual development up to adolescence
- Special characteristics of adolescence period

Unit III: Heredity and Environment

- Meaning of Heredity and Environment
- Laws of Heredity
- Types of Environment
- Relative importance of heredity and environment

Unit IV: Learning

- Concepts of Learning
- Laws of Learning
- Theories of Learning: Trial and Error, Conditioning, Insight and their Educational Implications

Unit V: Habits

- Meaning, Characteristics
- Formulation and Dissolution of bad habits
- Role of teachers and parents in forming good habits
- Importance of habits in life

Unit VI: Attention and Interests

- Meaning of attention and interest
- Characteristics of attention
- Factors affecting attention
- Educational Implications of interest
- Relationship between attention and interest

Unit VII: Memory and Forgetting

- Meaning of memory
- Factors affecting memory
- Aids for facilitating memory
- Meaning of forgetting, causes of forgetting, remedies for forgetting

Unit VIII: Personality and Intelligence

- Meaning of Personality
- Classification of Personality: Extrovert, Introvert, Ambivert
- Methods of assessing personality: Autobiography, Interview, Observation, Rating Seales, Rorschach Inkblot Test, Thematic Apperception test
- Meaning of Intelligence
- Intelligence Quotient
- Theories of Intelligence: Spearman's Two Factor Theory and Multifactor Theory
- Emotional Intelligence

Unit IX: Mental Health and Adjustment

- Concept of Mental Health and Hygiene
- Characteristics of a mentally healthy individual
- Meaning of Adjustment
- Adjustment Mechanisms

Unit X: Guidance and Counselling

- Meaning and importance of Guidance
- Types of guidance Personal, Educational and Vocational
- Meaning and importance of Counselling
- Types of Counselling: Directive, Non-Directive and Eclectic

PSYCHOLOGY

Objectives:

- To develop appreciation about human mind and behaviour in the context of learners' immediate society and environment.
- To develop in learners an appreciation of the nature of psychological knowledge and its application to various aspects of life.
- To enable learners to become perceptive, socially aware and self-reflective.
- To facilitate students' quest for personal growth and effectiveness, and to enable them to become responsive and responsible citizens.

CLASS XI

THEORY

Unit I: What is Psychology

1. Introduction
2. What is Psychology?
    - Psychology as a Discipline
    - Psychology as a Natural Science
    - Psychology as a Social Science
3. Understanding Mind and Behaviour
4. Popular Notions about the Discipline of Psychology
5. Evolution of Psychology
6. Development of Psychology in India
7. Branches of Psychology
8. Psychology and Other Disciplines
9. Psychology in Everyday Life

Unit II: Methods of Enquiry in Psychology

1. Introduction
2. Goals of Psychological Enquiry
    - Steps in Conducting Scientific Research
    - Alternative Paradigms of Research
3. Nature of Psychological Data
4. Some Important Methods in Psychology
    - Observational Method
    - Experimental Method
    - Correlational Research
    - Survey Research
    - Psychological Testing
    - Case Study
5. Analysis of Data
    - Quantitative Method
    - Qualitative Method
6. Limitations of Psychological Enquiry
7. Ethical Issues

Unit III: Human Development

1. Introduction
2. Meaning of Development
    - Life-Span Perspective on Development
3. Factors Influencing Development
4. Context of Development
5. Overview of Developmental Stages
    - Prenatal Stage
    - Infancy
    - Childhood
    - Challenges of Adolescence
    - Adulthood and Old Age

Unit IV: Sensory, Attentional and Perceptual Process

1. Introduction
2. Knowing the world
3. Nature and varieties of Stimulus
4. Sense Modalities
    - Functional limitation of sense organs
5. Attentional Processes
    - Selective Attention
    - Sustained Attention
6. Perceptual Processes
    - Processing Approaches in Perception
7. The Perceiver
8. Principles of Perceptual Organisation
9. Perception of Space, Depth and Distance
    - Monocular Cues and Binocular Cues
10. Perceptual Constancies
11. Illusions
12. Socio-Cultural Influences on Perception

Unit V: Learning

1. Introduction
2. Nature of Learning
3. Paradigms of Learning
4. Classical Conditioning
    - Determinants of Classical Conditioning
5. Operant/Instrumental Conditioning
    - Determinants of Operant Conditioning
    - Key Learning Processes
6. Observational Learning
7. Cognitive Learning
8. Verbal Learning
9. Skill Learning
10. Factors Facilitating Learning
11. Learning Disabilities

Unit VI: Human Memory

1. Introduction
2. Nature of memory
3. Information Processing Approach: The Stage Model
4. Memory Systems: Sensory, Short-term and Long-term Memories
5. Levels of Processing
6. Types of Long-term Memory
    - Declarative and Procedural; Episodic and Semantic
7. Nature and Causes of Forgetting
    - Forgetting due to Trace Decay, Interference and Retrieval Failure
8. Enhancing Memory
    - Mnemonics using Images and Organisation

Unit VII: Thinking

1. Introduction
2. Nature of Thinking
    - Building Blocks of Thought
2. The Processes of Thinking
3. Problem Solving
4. Reasoning
5. Decision-making
6. Nature and Process of Creative Thinking
    - Nature of Creative Thinking
    - Process of Creative Thinking
    - Strategies for Creative Thinking
7. Thought and Language
8. Development of Language and Language Use

Unit VIII: Motivation and Emotion

1. Introduction
2. Nature of Motivation
3. Types of Motives
    - Biological Motives
    - Psychosocial Motives
4. Maslow's Hierarchy of Needs
5. Nature of Emotions
6. Expression of Emotions
    - Culture and Emotional Expression
    - Culture and Emotional Labelling
7. Managing Negative Emotions
8. Enhancing Positive Emotions

PRACTICAL

The students shall be required to undertake two practical works (experiments) which would involve conducting experiments and undertaking small studies, exercises, related to the topics covered in the course (e.g. Human development, Learning, Memory, Motivation, Perception, Attention and Thinking).

CLASS XII

THEORY

Unit I: Variations in Psychological Attributes

1. Introduction
2. Individual Differences in Human Functioning
3. Assessment of Psychological Attributes
4. Intelligence
5. Psychometric Theories of Intelligence, Information Processing Theory: Planning, Attention-arousal and Simultaneous successive Model of Intelligence, Triarchic Theory of Intelligence; Theory of Multiple Intelligences.
6. Individual Differences in Intelligence
7. Culture and Intelligence
8. Emotional Intelligence
9. Special Abilities: Aptitude: Nature and Measurement
10. Creativity

Unit II: Self and Personality

1. Introduction
2. Self and Personality
3. Concept of Self
4. Cognitive and Behavioural aspects of Self
5. Culture and Self
6. Concept of Personality
7. Major Approaches to the Study of Personality
   - Type Approaches
   - Trait Approaches
   - Psychodynamic Approach and Post Freudian Approaches
   - Behavioural Approach
   - Cultural Approach
   - Humanistic Approach
8. Assessment of Personality
   - Self-report Measures
   - Projective Techniques
   - Behavioural Analysis

Unit III: Meeting Life Challenges

1. Introduction
2. Nature, Types and Sources of Stress
3. Effects of Stress on Psychological Functioning and Health
   - Stress and Health
   - General Adaptation Syndrome
   - Stress and Immune System
   - Lifestyle
4. Coping with Stress
   - Stress Management Techniques
5. Promoting Positive Health and Well-being
   - Life Skills
   - Positive Health

Unit IV: Psychological Disorders

1. Introduction
2. Concepts of Abnormality and Psychological Disorders
    - Historical Background
3. Classification of Psychological Disorders
4. Factors Underlying Abnormal Behaviour
5. Major Psychological Disorders
    - Anxiety Disorders
    - Obsessive-Compulsive and Related Disorders
    - Trauma-and Stressor-Related Disorders
    - Somatic Symptom and Related Disorders
    - Dissociative Disorders
    - Depressive Disorder
    - Bipolar and Related Disorders
    - Schizophrenia Spectrum and Other Psychotic Disorders
    - Neurodevelopmental Disorders
    - Disruptive, Impulse-Control and Conduct Disorders
    - Feeding and Eating Disorders
    - Substance Related and Addictive Disorders

Unit V: Therapeutic Approaches

1. Nature and Process of psychotherapy
    - Therapeutic relationship
2. Types of Therapies
    - Behaviour Therapy
    - Cognitive Therapy
    - Humanistic-Existential Therapy
    - Alternative Therapies
    - Factors contributing to healing in Psychotherapy
    - Ethics in Psychotherapy
3. Rehabilitation of the Mentally Ill

Unit VI: Attitude and Social Cognition

1. Introduction
2. Explaining Social Behaviour
3. Nature and Components of Attitudes
4. Attitude Formation and Change
    - Attitude Formation
    - Attitude Change
    - Attitude-Behaviour Relationship
5. Prejudice and Discrimination
6. Strategies for Handling Prejudice

Unit VII: Social Influence and Group Pressure

1. Introduction
2. Nature and Formation of Groups
3. Type of Groups
4. Influence of Group on Individual Behaviour
    - Social Loafing
    - Group Polarisation

PRACTICAL

The students shall be required to undertake two practical works (experiments) which would involve conducting experiments and undertaking small studies, exercises, related to the topics covered in the course (e.g. Intelligence, Adjustment, Self-Concept, Personality, Aptitude, Attitude, Anxiety).

COMPUTER SCIENCE

Objectives:

The general objectives at this stage are to enable the learners to:

- understand and apply basic computational thinking.
- understand the notion of data types and data structures and apply in different situations.
- appreciate the notion of an algorithm and apply its structure including how algorithms handle corner cases.
- develop a basic understanding of computer systems - architecture, operating system, mobile and cloud computing.
- work in the cyber world with understanding of cyber ethics, cyber safety and cybercrime.
- make use the value of technology in societies, gender and disability issues and the technology behind biometric ids.

CLASS XI

THEORY

Unit I: Computer Systems and Organisation

- **Computer System Overview**: Introduction, Computer Organisation, Input Unit, Output Unit, The CPU, The Memory, Cache Memory, The Storage Unit, System Software, Application Software, Software Libraries.
- **Data Representation:** Introduction, Decimal Number System, Binary Number System, Octal Number System, Hexadecimal Number System, Number Conversions, ASCII, ISCII, and Unicode.
- **Boolean Logic:** Development of Boolean Logic, Binary Valued Quantities, Logical Operations.

Unit II: Computational Thinking and Programming – 1

- **Introduction to Problem-solving:** Introduction, Problem Solving Cycle, Designing Algorithms.
- **Getting Started with Python**: Introduction, Python – Pluses, Python - Some Minuses, Working in Python, Working in Default Python Distribution, Working in Jupyter Notebook and Spyder IDE, Understanding First Program/Script.
- **Python Fundamentals**: Introduction, Python Character Set, Tokens, Barebones of a Python Program, Variables and Assignments, Simple Input and Output.
- **Data Handling**: Introduction, Data Types, Mutable and Immutable Types, Operators, Expressions, Debugging.
- **Flow of Control**: Introduction, Types of Statements in Python, Statement Flow Control, The if Statements of Python, The if Statement, The if - else Statement, The if - elif Statement, The nested if Statement, The range( ) Function, Iteration/Looping Statements.
- **String Manipulation**: Introduction, Traversing a String, String Operators, String Slices, String Functions and Methods.
- **List Manipulation**: Introduction, Creating and Accessing Lists, Creating Lists, List Functions and Methods, Nested Lists, Working with Lists (List Manipulation).
- **Tuples**: Introduction, Creating and Accessing Tuples, Tuple Operations, Tuple Functions and Methods.

- **Dictionaries:** Introduction, Dictionary - Key: Value Pairs, Working with Dictionaries, Dictionary Functions and Methods.

Unit III: Cyber Safety, Society, Law and Ethics

- **Cyber Safety**: Introduction, What is Cyber Safety? Safely Browsing the Web, Identity Protection while using Internet, Confidentiality of Information, Cybercrime, Computer Forensics, Cyber Law and IT Act, Appropriate Usage of Social Networks.
- **Online Access and Computer Security**: Introduction, Threats to Computer Security, Solutions to Computer Security Threats, Firewall.
- **Society, Law and Ethics**: Introduction, Ethical Issues, Technology and Society, E-Waste Management.

PRACTICAL

Suggested practical list for Python Programming

1. Write a program to read two numbers and print their quotient and remainder.
2. Input a number and check if the number is odd or even number.
3. Write a program to accept a string of characters and display whether its palindrome or not.
4. Input three integer numbers and display the largest number.
5. Write a python program to accept your name and display in capital letters.
6. Given two integers x and n, compute the followings:
    a) The value of x to the power n.
    b) $1 + 2 + 3 + \ldots. + n$
    c) $x + x^2 + x^3 + \ldots + x^n$
    d) $x/1 + x^2/2 + x^3/3 + \ldots + x^n/n$
    e) $1! + 2! + 3! + \ldots + n!$
7. Write a program that prints out a list of integers from 1 to 10 and print their squares.
8. Use for loop to print a triangle number like the one given below: Allow the users to specify height of the triangle.

    *
    * *
    * * *
9. Write a Python script to print the sum of negative numbers, positive numbers and sum of positive odd numbers from a list of numbers entered by the user. The script should end when the number entered is zero.
10. Take an integer input N from the user. Print N Fibonacci numbers. Recall that Fibonacci series progresses as 0 1 1 2 3 5 8…
11. Print the first 10 prime numbers.
12. Program to print elements of a list in separate lines along with element's positive and negative indexes.
13. Write a program that inputs a tuple T and print a tuple of the length of the sub-tuples. For example, if the tuple is

    T = ((1,2), (2, 4, 6), (4,), (6, 7, 8))

    Then it should print (2, 3, 1, 3)
14. Write a program to create a dictionary called Result that contains at least five Roll No. stored as keys and marks as values. Display all the contents of the dictionary.

CLASS XII

THEORY

Unit I: Computational Thinking and Programming – 2

- **Python Revision Tour-I**
- **Python Revision Tour-II**
- **Working with Functions**: Introduction, Understanding Functions, Defining Functions in Python, Flow of Execution in a Function Call, Passing Parameters, Returning Values from Functions, Composition, Scope of Variables.
- **File Handling**: Introduction, Data Files, Opening and Closing Files, Working with Text Files, Standard Input, Output and Error Streams, Working with Binary Files, Working with CSV Files.
- **Data Structures**: Introduction, Elementary Data Representation, Different Data Structures, Operations on Data Structures, Linear Lists.
- **Stacks and Queues Using Lists**: Introduction, Stacks, Stack Applications, Queue, Variations in Queues, Queue Applications.

Unit II: Computer Networks

- **Computer Networks- An Introduction**: Components of a Computer Network.
- **Types of Networks**: Types of Networks based on Geographical Spread, Types of Networks by Component Roles.
- **Evolution of Networking**: ARPANET, The Internet, The Interspace.
- **Switching Techniques**: Circuit Switching, Message Switching, Packet Switching.
- **Data Communication Terminologies**
- **Transmission Media**: Twisted Pair Cable, Coaxial Cable, Optical Fibers, Guided Media Compared, Microwave, Radio Wave, Satellite, Other Unguided Media.
- **Network Topologies**: Point-to-Point Link, The Star Topology, The Bus or Linear Topology, The Tree Topology, Factors to Consider for Topology Selection.
- **Identifying Nodes on a Computer Network**.
- **Network Devices**: Modem, RJ-45, NIC, Hub, Switch, Repeater, Bridge, Router, Gateway, WiFi Card, Network Devices and Components' Checklists.
- **Network Protocols**: HTTP, FTP, TCP/IP, SLIP/PPP, Protocols used in Email.
- **Wireless/Mobile Computing Technologies**: VolP, WiFi
- **Internetworking Terms and Concepts**: WWW, Telnet, Web Browser and Web Server, Web Sites, Web Addresses and Web Pages, URL and Domain Names, Domain Name System, Web Hosting, Web 2.0/3.0, HTML, Web Scripting.

Unit III: Database Management

- **Relational Databases**: Introduction, Purpose of DBMS, Relational Database Model, The Relational Model Terminology, Brief History of MySQL, MySQL Database System, Starting MySQL, MySQL and SQL.
- **Simple Queries in SQL**: Introduction, Some MySQL SQL Elements, SQL Command Syntax, Sample Database, Making Simple Queries, MySQL Functions, Aggregate Functions.
- **Table Creation and Data Manipulation Commands**: Introduction, Databases in MySQL, Creating Tables, Changing Data with DML Commands, More DDL Commands.
- **Grouping Records, Joins in SQL**: Introduction, Types of SQL Functions, Grouping Result - GROUP BY, Joins.

PRACTICAL

Suggested practical list for Python Programming

1. Write a program to find the side of a square which the perimeter is given from a user. (Hint: *Side = perimeter / 4*)
2. Write a program that prints on two columns: On the left side, the integer temperature between 0 and 10 (Fahrenheit) and in the right column the corresponding Celsius values.

   Formula: C = (F - 32) x (5/9)
3. Write a program that inputs two tuples and creates a third that contains all elements of the first followed by all elements of the second.
4. Write a program to sort a list that contain at least ten integers in ascending order.
5. Write a program to create a dictionary of at least 5 customers' name as keys and phone numbers as values. Display the phone numbers of the customer by asking the user to enter a customer name.
6. Write a program that reads a line from the keyboard and prints the number of alphabets, digits, small letters and capital letters.
7. Write a program with a function check_odd() that takes one argument (a positive integer) and prints if the argument is odd or not.
8. Create a module coversion.py that should contain the following two functions:

   function cels_to_fahr(temp)
   That converts given temperature in Celsius to Fahrenheit using
   formula: F = C x (9/5) + 32

   function fahr_to_cels(temp)
   That converts given temperature in Fahrenheit to Celsius using
   formula: C = (F - 32) x (5/9)
9. Write a program to save details of at least 5 employees' (emp_id, emp_name, salary) into a text file.
10. Write a program to read a text file line by line and print the size of the file.
11. Write a program to create a CSV file to store five students' roll_no, name and marks from a user and display the contains of the CSV file.
12. Write a program to get student data (roll_no, name, marks) from a user and write onto a binary file. The program should be able to get data from the user and write onto the file as long as the user wants.

Suggested practical list for MySQL Queries

1. Write SQL statements which would create the following tables:

(a) **Friends** table

(i) SlNo	Two digit number primary Key
(ii) Fullname	32 characters and compulsory
(iii) Contact	Ten digit mobile number

(b) **Student** table

(i) Sl No	Three digits number primary key
(ii) Fullname	32 characters and compulsory
(iii) Gender	6 characters and value can be "Male" or "Female" only.
(iv) Class	4 characters Roman Number compulsory.
(v) RollNo	3 digits number and compulsory
(vi) Address	100 characters address not null.
(vii) Mobile	10 digits number but not compulsory

(c) **Marks** table

(i) Sl No	Three-digit number primary key references to Sl No of Student table.
(ii) English	Three-digit number default value zero
(iii) Physics	Three-digit number default value zero
(iv) Chemistry	Three digit number default value zero
(v) Biology	Three-digit number default value zero
(vi) Computer	Three digit number default value zero

(d) Check and display the structure of all the three tables that you have created.

(e) Modify "Student" table by removing the Mobile column and then display the table structure to confirm.

(f) Add new column called "Fullname" to Marks table which is not compulsory fields and also check the table structure to confirm.

(g) Delete your first table "Friends" and check whether its deleted or not.

2. Write SQL statement to practice INSERT, UPDATE & DELETE commands

(a) Insert the following data to the existing Student table.

Sl No	**Fullname**	**Gender**	**Class**	**RollNo**	**Address**
1.	Andrews	Male	XII	15	London
2.	Lucy	Female	XII	32	Paris
3.	Boris	Male	XI	23	Delhi
4.	Benjamin	Male	XII	25	Chicago
5.	Christina	Female	XI	64	Beijing

(b) Also insert the following data into existing Marks table.

Sl No	English	Physics	Chemistry	Biology	Computer
1.	65	45	88	78	97
2.	86	57	90	76	34
3.	87	85	24	87	75
4.	35	64	34	46	43
5.	45	65	57	87	69

(c) Insert new student (11, Peter, Male, XI, 88, London) to Student table. And also check whether the total rows equal to 11 in Student table.

(d) Update any three names from Student table to Marks table.

(e) Now remove or delete the newly entered student details of Sl No 11.

3. Write SQL statement for SELECT, UNION, FUNCTIONS & VIEWS Using the two existing tables - Student and Marks, perform the followings using SQL commands.
   (a) Display all records from Student table.
   (b) Display Sl No, Fullname and Computer marks from Marks table. iii. Display all students who live in Paris. iv. Display marks detail of SlNo 5 only from Marks table.
   (c) Display all class - XII female students from student table. vi. Display marks details of Sl No 3 to 8 including both numbers. vii. Find the total marks obtained by Christina. viii. Find out the maximum mark obtained in Computer subject. ix. Find out the minimum mark obtained in English subject
   (d) What is the average mark score in Physics subject?

HOME SCIENCE

Objectives:

The general objectives at this stage are to enable the learners to:

- develop an understanding of the self and ones role and responsibilities as a productive individual and as a member of family, community and society.
- integrate learning across diverse domains and undertake a critical analysis of issues and concerns specific to family, community and society.
- appreciate the discipline of Home Science for professional careers.
- acquaint learners with the basic knowledge specific to five domains namely, Foods and nutrition, Human Development and Family studies, Fabric and Apparel, Resource Management and Communication and Extension.
- develop functional skills in the five domains for career and employment.
- equip learners for enrichment and higher studies.

CLASS XI

THEORY

Unit I: Introduction to Home Science

Unit II: Understanding oneself: Adolescence

- Understanding the Self:
  'Who am I'?
  Development and Characteristics of the Self (Development characteristics and needs of adolescents)
  Influences on Identity
- Food, Nutrition, Health and Fitness
- Management of Resources
- Fabric Around Us
- Media and Communication Technology

Unit III: Understanding family, community and society

- Concerns and Needs in Diverse Contexts:
  Nutrition, Health and Hygiene
  Resources Availability and Management
  Textile Traditions in India

Unit IV: Childhood

- Nutrition, Health and Well-being
- Our Apparel

Unit V: Adulthood

- Financial Management and Planning
- Care and Maintenance of Fabrics

PRACTICAL

1. Understanding oneself with reference to:
   a) Physical development in terms of age, height, weight, hip and chest circumference.
   b) Sexual maturity (Age at menarche, Development of breasts: girls). (Growth of beard, change in voice: boys)

2. Observe developmental norms: (Physical, Motor, Language and social - emotional) birth to three years.

3. List and discuss 4-5 areas of agreement and disagreement with
   a) Mother
   b) Father
   c) Siblings/ Friends
   d) Teacher

4. a) Record own diet for a day
   b) Evaluate qualitatively for adequacy

5. Preparation of different healthy snacks for an adolescent suitable in her/his context.

6. a) Record one day‟s activities relating to time use and work
   b) Prepare a time plan for yourself

7. Plan a budget for a given situation/purpose.

8. a) Record the fabrics and apparel used in a day
   b) Categorize them according to functionality

9. Relationship of fibre properties to their usage:
   a) Thermal property and flammability
   b) Moisture absorbency and comfort

10. a) Analyze label of any one garment with respect to: Clarity, fiber content, size and care instructions.
    b) Prepare one care label of any garment.
    c) Analyze two different fabric samples for color fastness.

CLASS XII

THEORY

Unit I: Work, Livelihood and Career

- Work, Livelihood and Career

Unit II: Nutrition, Food Science and Technology

- Clinical Nutrition and Dietetics
- Public Nutrition and Health
- Food Processing and Technology
- Food Quality and Food Safety

Unit III: Human Development and Family Studies

- Early Childhood Care and Education
- Management of Support Services, Institutions and Programmes for Children, Youth and Elderly

Unit IV: Fabric and Apparel

- Design for Fabric and Apparel
- Fashion Design and Merchandising
- Care and Maintenance of Fabrics in Institutions

Unit V: Resource management

- Hospitality Management
- Consumer Education and Protection

Unit VI: Communication and Extension

- Development Communication and Journalism
- Corporate Communication and Public Relations

PRACTICAL

Unit II: Nutrition, food science and technology

1. Modification of normal diet to soft diet for elderly person.
2. Development and preparation of supplementary foods for nutrition programme.
3. Planning a menu for a school canteen or mid-day meal in school for a week.
4. Design, prepare and evaluate a processed food product.
5. Qualitative test for food adulteration in: pure ghee, tea leaves, whole black pepper, turmeric powder, milk, asafoetida.

Unit III: Human development and family studies

1. Preparation and use of anyone teaching aid to communicate socially relevant messages for children/ adolescents /adults in the community.

OR

Preparation of any one toy for children (age appropriate) using locally available and indigenous material

Unit IV: Fabric and apparel

1. Preparation of any one article using applied textile design techniques; tie and dye/batik/block printing
2. Remove different types of stains from white cotton cloth –Ball pen, curry, grease, ink, lipstick, tea and coffee.

Unit V: Resource management

1. Evaluate any one advertisement for any job position.
2. Develop a leaflet/pamphlet for Consumer Education and Protection on any one of the following–
    a) Consumer Protection Act (CPA)
    b) Consumer responsibilities
    c) Consumer organization
    d) Consumer Problem

PROJECT

Any one of the following project may be undertaken and evaluated-

1. Study of an integrated community based, nutrition/health programme being implemented in own area, with reference to–
    a) Programme objectives
    b) Focal Group/Beneficiaries
    c) Modalities of implementation
2. Visit to the neighboring areas and interview two adolescents and two adults regarding their perception of persons with special needs.
3. Profile any two person (child/adult) with special needs to find out their diet, clothing, activities, physical and psychological needs.
4. Planning any five messages for nutrition, health and life skills using different modes of communication for different focal groups.
5. Market survey any five processed foods with their packaging and label information.

GEOGRAPHY

Objectives:
The general objectives at this stage are to enable the learners to:

- familiarise themselves with the terms, key concepts and basic principles of Geography;
- describe locations and correlate with Geographical Perspectives;
- list/describe ways a place is linked with other places;
- compare conditions and connections in one place to another;
- analyse/ describe how conditions in one place can affect nearby places;
- identify regions as places that are similar or connected;
- search for, recognize and understand the processes and patterns of the spatial arrangement of the natural as well as human features and phenomena on the earth's surface;
- understand and analyse the inter-relationship between physical and human environments and their impact:
- apply geographical knowledge and methods of inquiry to new situations or problems at different levels-local, regional, national and global;
- develop geographical skills, relating to collection, processing and analysis of data/information and preparation of report including maps and graphs and use of computers where possible; and
- utilize geographical knowledge in understanding issues concerning the community such as environmental issues, socio-economic concerns, and gender and become responsible and effective members of the community.
- develop the competency to analyse, evaluate, interpret and apply the acquired knowledge to determine the environmental issues effectively.

CLASS XI

PART A: FUNDAMENTALS OF PHYSICAL GEOGRAPHY

Unit 1: ***Geography as a Discipline***

- Geography as an integrating discipline, as a science of spatial attributes;
- Branches of geography; importance of physical geography.

Unit 2: ***The Earth***

- Origin and evolution of the earth; Interior of the earth; Wegener's continental drift theory and plate tectonics; Earthquakes and volcanoes.

Unit 3: ***Landforms***

- Landforms and their evolution;
- Geomorphic processes-weathering, mass wasting, erosion and deposition; soils-formation.

Unit 4: ***Climate***

- Atmosphere-composition and structure; elements of weather and climate;
- Insolation-angle of incidence and distribution; heat budget of the earth- heating and cooling of atmosphere (conduction, convection, terrestrial radiation and advection); temperature-factors controlling temperature; distribution of temperature-horizontal and vertical; inversion of temperature;
- Pressure-pressure belts; winds-planetary, seasonal and local; air masses and fronts; tropical and extra tropical cyclones;
- Precipitation-evaporation; condensation-dew, frost, fog, mist and cloud; rainfall-types and world distribution;
- World climates-classification (Koeppen), greenhouse effect, global warming and climatic changes.

Unit 5: ***Water (Oceans)***

- Hydrological Cycle.
- Oceans - submarine reliefs; distribution of temperature and salinity; movements of ocean water-waves, tides and currents.

Unit 6: ***Map work on identification of features based on the above units on the outline political map of the world.***

PART B: INDIA - PHYSICAL ENVIRONMENT

Unit 1: ***Introduction***

- Location-space relations and India's place in the world.

Unit 2: ***Physiography***

- Structure and Relief;
- Drainage systems: concepts of watershed; the Himalayan and the Peninsular;
- Physiographic divisions.

Unit 3: ***Climate and Vegetation***

- Weather and climate — spatial and temporal distribution of temperature, pressure winds and rainfall, Indian monsoon: mechanism, onset and withdrawal, variability of rainfalls: spatial and temporal; Climatic types;
- Natural vegetation-forest types and distribution; wild life; conservation; biosphere reserves;

Unit 4: ***Natural Hazards and Disasters: Causes, Consequences and Management (One case study to be introduced for each topic)***

- Floods and droughts
- Earthquakes and Tsunami
- Cyclones
- Landslides

Unit 5: ***Map Work of features based on above units for locating and labelling on the Outline Political map of India.***

PART C: MIZORAM

Unit 1: ***Introduction***

- Location and extent
- Geological structure

Unit 2: ***Physiography***

- Topography
- Drainage- Rivers of Mizoram

Unit 3: ***Climate, Vegetation and Agriculture***

- Climate - Temperature
  - Rainfall
- Vegetation - Natural Vegetations
- Agriculture - Land use
  - Shifting Cultivation
  - Settled agriculture

Unit 15*: Map Work of features based on above units for locating and labeling on the Outline Political map of India.*

PART D: Practical Work

Unit 1: ***Fundamentals of Maps***

- Maps-types; scales-types; construction of simple linear scale, measuring distance; finding direction and use of symbols;
- Latitude, longitude and time;
- Map projection-typology, construction and properties of projections: Conical with one standard parallel and Mercator's projection.

Unit 2: ***Topographic Map and Remote*** **Sensing**

- Study of topographic maps (1: 50,000 or 1: 25,000 Survey of India maps); contour cross section and identification of landforms-slopes, hills, valleys, waterfall, cliffs; distribution of settlements.
- Introduction to remote sensing; stages in remote sensing, advantages of remote sensing in geographical studies, platform & sensors and data products, (photographic & digital).

Unit 3: ***Practical Record Book and Viva voce***

CLASS XII

PART A : FUNDAMENTALS OF HUMAN GEOGRAPHY

Unit 1: ***Human Geography: Nature and Scope***

Unit 2: ***People***

- Population — distribution, density and growth
- Population change-spatial patterns and structure; determinants of population change;
- Age-sex ratio; rural-urban composition;
- Human development - concept; selected indications, international comparisons.

Unit 3: ***Human Activities***

- Primary activities - concept and changing trends; gathering, pastoral, mining, subsistence agriculture, modern agriculture; people engaged in agricultural and allied activities - some examples from selected countries.
- Secondary activities-concept; manufacturing: type - household, small scale, large scale; agro based and mineral based industries; people engaged in secondary activities - some examples from selected countries.
- Tertiary activities-concept; trade, transport and communication; services; people engaged in tertiary activities - some examples from selected countries.
- Quaternary activities-concept; knowledge based industries; people engaged in quaternary activities - some examples from selected countries.

Unit 4: ***Transport, Communication and Trade***

- Land transport - roads, railways; trans-continental railways.
- Water transport-inland waterways; major ocean routes.
- Air transport- Intercontinental air routes.
- Oil and gas pipelines.
- Satellite communication and cyber space.
- International trade-Bases and changing patterns; ports as gateways of international trade, role of WTO in International trade.

Unit 5: ***Map Works on identification of features based on above units on the outline Political map of World.***

PART B: INDIA – PEOPLE AND ECONOMY

Unit 1: ***People***

- Population: distribution, density and growth; composition of population - linguistic, religious; sex, rural-urban and occupational-population change through time and regional variations;
- Population, environment and development.

Unit 2: ***Human Settlements***

- Rural settlements - types and distribution;
- Urban settlements - types and distribution.

Unit 3: ***Resources and Development***

- Land resources-general land use; agricultural land use, Distribution of major crops (Wheat, Rice, Tea, Coffee, Cotton, Jute, Sugar cane and Rubber), agricultural development and problems.
- Water resources-availability and utilization-irrigation, domestic, industrial and other uses; scarcity of water and conservation methods-rain water harvesting and watershed management (one case study related with participatory watershed management to be introduced).
- Mineral and energy resources: distribution of metallic (Iron ore, Copper, Bauxite, Manganese) non-metallic (Mica, Salt) minerals; conventional (Coal, Petroleum, Natural gas and Hydroelectricity) and non-conventional energy sources (solar, wind, biogas).
- Planning in India-target area planning (case study); idea of sustainable development (case study)

Unit 4: ***Transport and Communication and International Trade***

- Transport and communication- roads, railways and airways: oil and gas pipelines; national electric grids; communication networking - radio, television, satellite and internet;
- International trade- changing pattern of India's foreign trade; sea ports and their hinterland and airports,

Unit 5: ***Geographical Perspective on Selected Issue and Problems (One case study to be introduced for each topic)***

- Environmental pollution; urban-waste disposal.
- Urbanisation rural-urban migration; problem of slum.
- Land Degradation.

Unit 6: ***Map work on locating and labelling of features based on above units on outline political map of India***

PART C: Practical Work

Unit 1: ***Data-its source and Compilation***

- Presentation of data, sources of data; methods of data collection; primary; personal observations, interview, questionnaire/schedule, secondary data; published sources and unpublished sources, data compilation and presentation; absolute data, percentage/ratio, index number; processing of data; frequency distribution.

Unit 2: ***Data Processing***

- Measures of Central Tendency; mean, median and mode, comparison of mean, median and mode.

Unit 3: ***Graphical representation of Data***

- General rules for drawing graph, diagrams and maps, construction of diagrams; line graph, bar diagram; multiple bar diagram, pie diagram, flow diagram/map, thematic maps; dot, choropleth and isopleth maps.

Unit 4: ***Spatial Information Technology***

- Introduction to GIS (Geographical Information System); advantages, components of GIS, spatial data formats; raster and vector data and sequence of GIS activities.

ECONOMICS

Objectives

- Understanding of some basic economic concepts and development of economic reasoning which the learners can apply in their day-to-day life as citizens, workers and consumers.
- Realisation of learners' role in nation building and sensitivity to the economic issues that the nation is facing today.
- Equipment with basic tools of economics and statistics to analyse economic issues. This is pertinent for even those who may not pursue this course beyond senior secondary stage.
- Development of understanding that there can be more than one view on any economic issue and necessary skills to argue logically with reasoning.

CLASS XI

PART- I: INTRODUCTORY MICROECONOMICS

Unit 1: Introduction

- Definition of Economics, Positive & Normative Economics.
- Micro & Macro Economics.
- Central problems of an economy: what, how and for whom to produce.
- Concepts of production possibility frontier and opportunity cost.

Unit 2: Demand, supply & Market Mechanism

- **Demand**: Demand and its determinants.
  Law of Demand, Individual and Market Demand, Demand Schedule, Demand Curve, movement along and shifts in the demand curve
- **Supply**: Supply and its Determinants.
  Law of Supply, Individual and Market supply, supply schedule, supply curve, movements along and shifts in supply curve
- **Market Mechanism**: Equilibrium and Disequilibrium, Shortage and Surplus,
  Application of Demand and Supply Analysis.

Unit 3: Elasticity

- Meaning of Price Elasticity of Demand, Income Elasticity of Demand, Cross Elasticity of Demand.
- Factors Affecting the Elasticity of Demand.
- Methods of Calculating Price Elasticity —
  1. Percentage Method
  2. Total Expenditure Method
- Simple Numerical Problems on Each Method.
- Elasticity of Supply — Measurement of Elasticity of Supply - Percentage Method

Unit 4: Behavior of consumers & Producers.

- **Consumer Behavior**: Meaning of Utility, Total Utility, Marginal Utility, Law of Diminishing Marginal Utility.
  Consumer's Equilibrium, Conditions of Consumer's Equilibrium.

Indifference Curve Analysis of Consumer's Equilibrium. using marginal utility analysis
The consumer's budget (budget set and budget line).
Preference of the consumer (indifference curve, indifference map and conditions of consumer's equilibrium).

- **Meaning of Production function**: Short run and long run. Total Product, average Product and Marginal Product. Return to a factor.
- **Cost**: Short Run costs - Total cost, Total fixed cost, Total variable cost; Average Cost; Average fixed cost, Average variable cost and Marginal cost Meaning and their relationships.
- **Revenue**: Total revenue, Average Revenue, Marginal Revenue- Meaning and their relationships.
- **Producer's Equilibrium** - meaning and its conditions-under Marginal Revenue-Marginal Cost Approach

Unit 5: Perfect Competition – Price Determination and Simple Applications

- Perfect Competition – Features; Determination of market equilibrium and effect of shifts in demand and supply (Short Run Only).
- Simple Applications of Demand and Supply: Price ceiling, Price floor.

PART- II: STATISTICS FOR ECONOMICS

Unit 6: Introduction

- What is Economics? Meaning, Scope, Functions and Importance of Statistics in Economics.

Unit 7: Collection, Presentation and Organization of Data

- Collection of Data - Source of Data - Primary and Secondary.
- Method of Collecting Data. - How basic data is collected with concepts of sampling.
- Some Important Sources of Secondary Data- Census of India and National Sample Survey Organisation
- Organization of Data – Meaning and Types of Variables, Frequency distribution, Presentation of data — Tabulation, Diagrammatic presentation.
  (bar diagrams, pie-diagrams, line graphs, histogram, polygon and Ogive Curves).

Unit 8: Measures of Central Tendency

- Arithmetic Mean, Median, Mode

Unit 9: Correlation and Index Numbers

- Correlation – meaning and properties, Scatter diagram.
- Measures of correlation – Karl Pearson's method (two variables ungrouped data). Spearman's rank correlation (Non-Repeated Ranks and Repeated Ranks.)
- Introduction to Index Numbers – Meaning.
- Types – Wholesale Price Index, Consumer Price Index and Index of Industrial Production.
- Uses of index numbers, Inflation and Index Numbers, Simple Aggregative Method.

CLASS XII

PART A: INTRODUCTORY MACROECONOMICS

Unit 1: National Income and Related Aggregates

- Macroeconomics-Its meaning.
- Basic concepts in Macroeconomics: Consumption goods, Capital goods, Final goods, Intermediate goods; Stocks and Flows; Gross Investment and Depreciation.
- Circular flow of income (two sector model); Methods of calculating National Income-Value Added or Product Method, Expenditure Method, Income Method.
- Concepts and Aggregates related to National Income-Gross National Product (GNP) Net National Product (NNP)Gross Domestic Product (GDP)and Net Domestic Product (NDP)-at market price, at factor cost.
- Real and Nominal GDP
- GDP Deflator, GDP and Welfare

Unit 2: Theory of Income and Employment

- Aggregate demand and its components.
- Propensity to consume and Propensity to save (average and marginal).
- Short-run equilibrium output; Investment Multiplier and its mechanism.
- Meaning of full employment and involuntary unemployment.
- Problems of excess demand and deficient demand; measures to correct them-changes in government spending, taxes and money supply.

Unit 3: Money and Banking

- Money-Meaning and functions.
- Supply of Money-Currency held by the public and net demand deposits held by commercial banks.
- Money and credit creation by commercial banks.
- Central Bank-Meaning and Functions.
- Bank of Issue, Govt. Bank, Banker's Bank, Control of Credit through Bank Rate, Cash Reserve Ratio (CRR), Statutory Liquidity Ratio (SLR), Repo Rate and Reverse Repo Rate, Open Market Operations, Margin Requirement.

Unit 4: Government Budget and the Economy

- Government Budget-Meaning, Objectives and Components.
- Classification of Receipts-Revenue Receipts and Capital Receipts.
- Classification of Expenditure-Revenue Expenditure and Capital Expenditure.
- Balanced, Surplus and Deficit Budget.
- Various measures of Government Deficit-Revenue Deficit, Fiscal Deficit, Primary Deficit.

Unit 5: Balance of Payments

- Balance of payments account-meaning and components.
- Balance of payments-Surplus and Deficit.
- Foreign exchange rate-meaning of fixed and flexible rates and managed floating.
- Determination of exchange rate in a free market; Merits and demerits of flexible and fixed exchange rate.
- Managed floating exchange rate system.

PART- II: INDIAN ECONOMIC DEVELOPMENT

Unit 6: Development Experience (1947 – 1990)

- A brief introduction of the state of the Indian economy on the eve of independence.
- Indian Economic System and Common goals of Five-Year plan.
- Main features, problems and policies of agriculture.
  (Institutional aspects and new agricultural strategy)
- Industry (IPR 1956 – SSI – role and importance).
- Foreign Trade.

Unit 7: Economic Reforms since 1991

- Economic Reform since 1991 Features and appraisal of Liberalization, Globalisation, Privatisation (LPG policy).
- Concept of demonetization and GST.

Unit 8: Current challenges facing Indian economy

- Human capital formation: How people become resource, Role of human capital in economic development, Growth of Education sector in India.
- Sustainable Economic Growth: Meaning, Effects of Economic Development on Resources and Environment, including global warming
- Rural Development: Key issues, credit and marketing role of co-operatives, agricultural diversification, agriculture farming – organic farming.
- Employment: Growth and change in work force participation rate in formal and informal sectors: problem and policies.

Unit 9: A comparison with Neighbours.

- India and Pakistan
- India and China
- Issues: Economic growth, population, sectoral development and other Human development indicators.

Unit 10: Project Work

1) Effect of changing rate on interest on automobiles sale.
2) Collect logos of 10 nationalized commercial Bank also collect data on rates of interest (last l year) (CRR, SLR)
3) Information and pictures projecting evolution of money
4) **Economic Growth and Development**
   Identify any two indicators of economic growth and three indicators of economic development.
   Collect data on these indicators for the last 5 years for at least 4 countries - of which two are developing and 2 are developed.
   Analyze the data that is collected to see the differences between economic growth and economic development.
5) **Globalization**
   Divide the class into suitable groups. Each group shall make a wall magazine or collage that will critically analyse the impact of globalization on their and their families' lives
6) **Unemployment**
   Conduct a comparative study of any 2 localities and present the data by questionnaire or interview method. To find out type of unemployment that exists.

PUBLIC ADMINISTRATION

Objectives:

The general objectives at this stage are to enable the learners to:

- understand the core concepts of public administration and distinguish between public and private administration.
- analyze administrative systems globally and within India, focusing on organization, personnel, and administrative processes.
- apply theoretical knowledge to understand the development and functioning of Indian administration under its constitutional framework.
- evaluate administrative practices critically, considering decision-making, bureaucracy, and work division for effectiveness and improvement.
- develop a commitment to promoting ethical conduct, transparency, and accountability in public administration for effective governance.

CLASS XI

Unit I: Basic Concepts of Public Administration

- Public Administration: Meaning, Nature, Scope.
- Private Administration: Meaning, Similarities and Dissimilarities between public and private Administration.
- Relationship of Public with other Social Sciences: Political Science, Economics, Sociology and Psychology.
- Public Administration in Developing Societies: meaning and characteristics of developing societies/ countries, importances and role.

Unit II: Organisation and its Administration

- Organisation: Meaning, Theories of Organisation (Classical and Modern), Formal and Non Formal.
- Principles of Organisation: Hierarchy, Span of Control, Unity of Command,
- Staff and Line Agencies: Meaning, Functions, Dissimilarities.
- Centralisation and Decentralisation, Headquarters and Fields.

Unit III: Personnel Administration

- Meaning of Personnel System
- Recruitment: Meaning, Methods of Recreuitment (Ref. UPSC, SPSC and SSC)
- Merit System and Spoil System: Meaning, Advantages and disadvantages.
- Bureaucracy: Meaning, Characteristics, Role of Bureaucracy, Evils of Bureaucracy, Suggestion for Improvement.

Unit IV: Administrative at Works

- Division of Works: Meaning and Criteria, Reason for division of Works.
- Decision Making: Meaning, Nature, Decision making Process.
- Delegated Legislation, Delegation, Subordination.
- Leadership: Meaning, Leadership Style (Autocratic leadership, Democratic leadership, Laissez faire leadership), Qualities of leadership.

Unit V: Development Administration

- Development Administration: meaning, importance, non-development.
- Development Administration and Administrative Development.
- Planning: Meaning, Planning process, Planning Commission and National Development Commission (NDC)
- Public Relation: Meaning and importance, Agencies of Public Relations.

CLASS XII

Unit I: Development of Indian Administration

Development of Indian Administration during British rule (1858-1946) and Post Independence period (1947-1950), Evolution of Indian Constitution, Basic Principles of Indian Administration under the Constitution of India- Sovereign, Socialist, Secular, Democratic Republic; Federal System in India, Meaning and importance of Judiciary- Supreme court & High Court. Meaning and Role of Administrative Tribunal.

Unit II: Central Administration

Political Executive: President- Position, Powers and Functions.
Prime Minister: Powers, Functions, and Position as Political Chief and the Real Executive; Relationship with Cabinet/ Council of Ministers.
Cabinet Secretariat: Meaning, Organisation and Functions; Role and importance of the Cabinet Secretary; Relationship between Minister and Secretary in India.
Central Secretariat: Its Meaning, Organisation and Functions.

Unit III: State Administration

Governor: Powers and functions- Legislative, Executive, Financial, Judicial, Discretionary.
Chief Minister: Powers and Functions; Relationship with Council of Ministers.
State Secretariat: Its Organisation and Functions.
Chief Secretary: Role and importance in State Administration.
Meaning and Role of Directorates.
Planning Machinery: State Planning Board; role and importance.

Unit IV: District Administration

Development of District Administration: Nature of District Administration, Special Development Programmes (with references to NLUP & MIP)
Deputy Commissioner/District Collector: Evolution, Role and Importance.
District Council: Its Composition, Powers and Functions, District Council under the 5^{th} & 6^{th} Scheduled of the Constitution.
Local Self Government: Meaning, Nature (Rural and Urban), Importance of Local Self Government, State Election Commission-Composition and functions. Role of State Finance Commission.

Unit V: Personnel Administration

All India Services, Central Services, State Civil Services: Their Meaning, Recruitment and Role.
Union Public Service Commission and State Public Service Commission: Their Composition and Functions.
Comptroller and Auditor General of India: His appointment and Role.
Election Commission: Its Composition and Functions.
Integrity in Administration:x Information Commission (Central and State)- Meaning, Importance, Composition and Functions.
Meaning and Role of Lok Pal, Lok Ayukta, Lok Adalat

MATHEMATICS

Objectives:

- Facilitate the cultivation of a profound grasp of mathematical concepts, theories, and principles, empowering students to adeptly utilize them across a spectrum of real-world situations.
- Cultivate problem-solving proficiencies through the exploration of diverse mathematical challenges, nurturing analytical thinking, logical reasoning, and innovative strategies for overcoming obstacles.
- Enhance proficiency in articulating mathematical concepts clearly, both verbally and in writing, thereby proficiently conveying solutions to intricate problems.
- Promote the application of mathematical concepts and methodologies in interdisciplinary settings encompassing fields like science, economics, engineering, and social sciences, fostering a holistic approach to problem-solving.
- Encourage the development of critical thinking skills by scrutinizing and assessing mathematical data, thereby enabling well-informed decision-making and fostering continuous learning across diverse academic and practical spheres.

CLASS XI

Unit I: SETS AND FUNCTIONS

1. Sets

Sets and their representations. Empty set. Finite and Infinite sets. Equal sets. Subsets. Subsets of the 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 sets.

2. Relations and Functions

Ordered pairs, Cartesian product of sets. Number of elements in the Cartesian product of two finite sets. Cartesian product of the reals with itself (upto R x R x R).

Definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special kind of relation from one set to another. Pictorial representation of a function, domain, co-domain and range of a function. Real valued function of the real variable, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum 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- $\sin^2 x + \cos^2 x = 1$, for all x. Expressing $\sin(x \pm y)$ and $\cos(x \pm y)$ in terms of $\sin x$, $\sin y$. Deducing the identities like following:

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

$$\sin x + \sin y = 2\sin\frac{x+y}{2}\cos\frac{x-y}{2}, \cos x + \cos y = 2\cos\frac{x+y}{2}\cos\frac{x-y}{2}$$

$$\sin x - \sin y = 2\cos\frac{x+y}{2}\sin\frac{x-y}{2}, \cos x - \cos y = -2\sin\frac{x+y}{2}\sin\frac{x-y}{2}$$

Identities related to sin2x, cos2x, tan2x, sin3x, cos3x and tan3x.

Unit II: ALGEBRA

1. Complex Numbers and Quadratic Equations

Need for complex numbers, especially $\sqrt{-1}$, to be motivated by inability to solve every quadratic equation. Brief description of algebraic properties of complex numbers. Statement of Fundamental Theorem of Algebra.

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*. Permutations and combinations derivation of formulae and their connections, simple applications.

4. Binomial Theorem.

History, statement and proof of the binomial theorem for positive integral indices. Pascal's Triangle, general and middle term in binomial expansion, simple applications.

5. Sequence and Series

Geometric Progression (G.P.), general term of a G..P., sum of *n* terms of a G..P.
Arithmetic and geometric series, 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 2-D from earlier-classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two-point form, intercepts form.

2. Conic Sections

Sections of a cone: Circles, ellipse, parabola, hyperbola, a point, a straight line and 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

Limits and Derivatives

Derivative introduced as rate of change-both as that of distance function and geometrically intuitive idea of limit. $\lim_{x\to 0}\frac{\log_e(1+x)}{x}, \lim_{x\to 0}\frac{e^x-1}{x}$ .Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

Unit V: STATISTICS AND PROBABILITY

1. Statistics

Measure of dispersion; mean deviation, variance and standard deviation of ungrouped/grouped data.

2. Probability

Random experiments: outcomes, sample spaces (set representation). Events: Occurrence of events, ‘not’, ‘and’ & ‘or’ events, exhaustive events, mutually exclusive events. Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of ‘not’, ‘and’, & ‘or’ events.

CLASS XII

Unit I: RELATIONS AND FUNCTIONS

1. Relations and Functions

Types of relations: Reflexive, symmetric, transitive and-equivalence relations. One to one and onto functions, composite functions inverse of a function.

2. Inverse Trigonometric Functions

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

Unit II: ALGEBRA

1. Matrices

Concept, notation order, equality, types of matrices. zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Addition, multiplication and scalar multiplication of matrices, 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, cofactors 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, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function.

Concepts of exponential, logarithmic functions. Derivatives of log e^x and e^x.
Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives.

2. Applications of Derivatives

Applications of derivatives: Rate of change, 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, only simple integrals of the type-

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

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

$$\int \sqrt{ax^2 + bx + c}\, dx$$

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

4. Applications of the Integrals
Applications in finding the area under simple curves, especially lines, arcs of 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; 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 constant

$\frac{dx}{dy} + Px = Q$, where P and Q are functions of y or constant

Unit IV: VECTORS AND THEE-DIMENSIONAL GEOMETRY
1. Vectors
Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratios of vectors. 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. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors.

2. Three-dimensional Geometry
Direction cosines/ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Angle between two lines.

Unit V: LINEAR PROGRAMMING
Introduction, related terminology such as constraints, objective function, optimization, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions optimal feasible solutions (up to three non-trivial constrains).

Unit VI: PROBABILITY
Multiplications theorem on probability. Conditional probability, independent events, total probability, Baye's-theorem. Random variable and its probability distribution, mean and variance of haphazard variable.

PHYSICS

Objectives:

The general objectives at this stage are to enable the learners to:

- develop a profound grasp of fundamental concepts encompassing mechanics, electromagnetism, optics, and modern physics, establishing a robust groundwork for advancing studies in physics and related fields.
- hone adept problem-solving prowess by applying theoretical insights to real-world scenarios, nurturing critical thinking and analytical skills crucial for addressing intricate physics challenges.
- master experimental techniques through hands-on exercises and laboratory tasks, empowering students to autonomously conceive, execute, and analyze experiments while comprehending the scientific methodology.
- achieve clarity in conceptual comprehension via vivid illustrations, diagrams, and real-life instances, facilitating the visualization of abstract principles and their practical applications in everyday life and scientific progress.
- delve into interdisciplinary correlations between physics and allied domains such as science, technology, engineering, and mathematics (STEM), acknowledging the interplay among scientific disciplines and their ramifications on societal and natural realms.

CLASS XI

THEORY

Unit I: Physical World and Measurement

Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Significant figures. Dimensions of physical quantities, dimensional analysis and its applications.

Unit II: Kinematics:

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

Scalar and vector quantities: Position and displacement vectors, general vectors and notation, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Unit vectors; resolution of a vector in a plane, rectangular components. Scalar and Vector products of Vectors.

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

Unit III: 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 fiction, lubrication.

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

Unit IV: 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

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 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 equation of rotational motion, comparison of linear and rotational motions.

Moment of inertia, radius of gyration. Values of M.I. for simple geometrical objects(without derivation).

Unit VI: 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 velocity, orbital velocity of a satellite.

Unit VII: Properties of Bulk Matter

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

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.

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.

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.

Heat transfer-conduction, convection and radiation, thermal conductivity. Qualitative ideas of Black Body Radiation, Wein's displacement law. Stefan's law.

Unit VIII:Thermodynamics

Thermal equilibrium and definition of temperature, zeroth law of thermodynamics, heat, work and internal energy. First law of thermodynamics.

Second law of thermodynamics: gaseous state of matter, change of condition of gaseous state- isothermal, adiabatic, reversible, irreversible and cyclic processes.

Unit IX: Behaviour of Perfect Gas and Kinetic Theory

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

Kinetic theory of gases: Assumptions, concept of pressure. Kinetic energy and temperature; rms speed of gas molecules; degrees of freedom, law of equipartition 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

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

Simple harmonic motion (SHM) and its equations of motion; phase; oscillations of a loaded spring - restoring force and force constant; energy in SHM. Kinetic and potential energies; simple pendulum derivation of expression for its time period (qualitative ideas only).

Wave motion: Longitudinal and transverse waves, speed of wave motion, 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.

PRACTICAL

Section A

Experiments.

1. To measure diameter of a small spherical/cylindrical body using Vernier callipers.
2. To measure internal diameter and depth of a given beaker/calorimeter using Vernier callipers and hence find its volume.
3. To measure diameter of a given wire using screw gauge.
4. To measure thickness of a given sheet using screw gauge.
5. To measure volume of an irregular lamina using screw gauge.
6. To determine radius of curvature of a given spherical surface by a spherometer.
7. To determine the mass of two different objects using a beam balance,
8. To find the weight of a given body using parallelogram law of vectors.
9. Using a simple pendulum, plot L-T and L-T^2 graphs. Hence find the effective length of a second's pendulum using appropriate graph.
10. To study the relationship between force of limiting friction and normal reaction and to find the coefficient of friction between a block and a horizontal surface.
11. 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 sin θ.

Activities

1. To make a paper scale of given least count, e.g. 0.2 cm, 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 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 the range of a jet of water with the angle of projection.
6. To study the conservation of energy of a ball rolling down on 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 the 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 (i) solid (ii) liquid, by method of mixtures.
8. (i) To study the relation between frequency and length of a given wire under constant tension using sonometer. .
   (ii) To study the relation between the length of a given wire and tension for constant frequency using sonometer.
9. 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 meter scale loaded at (i) at its end (ii) in the middle.

CLASS XII

THEORY

Unit I: Electrostatics

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 a 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).

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 polarisation, 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.

Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, electrical resistance, *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 laws and simple applications, Wheatstone bridge.

Unit III: Magnetic Effects of Current 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 solenoids (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 a 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.

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

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

Alternating currents, relation between peak and RMS value of alternating current/voltage; reactance and impedance; LCR series circuit (phasor only), resonance (without sharpness of resonace); power in AC circuits, power factor, wattless current. AC generator and transformer

Unit V: Electromagnetic Waves

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

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

Unit VI: Optics

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

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

Wave optics: Wavefront and Huygens' principle, reflection and refraction of plane wave at a plane surface using wavefronts. Proof of laws of reflection and refraction using Huygens' 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 maximum (qualitative treatment only).

Polarisation, plane polarised light; uses of plane polarised light and Polaroids.

Unit VII: Dual Nature of Matter and 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 (expression only).

Unit VIII: Atoms and Nuclei

Alpha - particle scattering experiment; Rutherford's model of atom; Bohr model of hydrogen atom, Expression for radius, velocity and energy of possible n^{th} orbit (No derivation), energy levels, hydrogen spectrum (qualitative treatment only).

Composition and size of nucleus, atomic masses, isotopes, isobars; isotones, nuclear force.

Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission (without Nuclear reactor) and fusion.

Unit IX: Electronic Devices

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

Semiconductor diode — *I-V* characteristics in forward and reverse bias, diode as a rectifier.

PRACTICAL

Section A

Experiments

1. To find resistance of a given wire using metre bridge and hence determine the specific resistance of its material.
2. To determine resistance per cm of a given wire by plotting a graph of potential difference versus current.
3. To verify the laws of combination (series/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 of figure of merit) into an ammeter and voltmeter of desired range and to verify the same.

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 l/*u* and l/*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 the angle of incidence and the angle of deviation.
6. To find refractive index of a liquid by using (i) concave mirror, (ii) convex lens and plane mirror.
7. To draw the I-V characteristics curves of a p-n junction in forward bias and reverse bias.

Activities

1. To identify a diode, a resistor and a capacitor from mixed collection of such items.
2. Use of multimeter to see the unidirectional flow of current in case of a diode.
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 polarization of light using two polaroids.
6. To observe diffraction of light due to a thin slit.

7. To study the nature and size of the image formed by (i) convex lens (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/mirror).
8. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.

CHEMISTRY

Objectives:

The syllabus of Chemistry at Higher Secondary Stage aims to:

- promote understanding of basic facts and concepts in Chemistry while retaining the excitement of chemistry.
- make students capable of studying Chemistry in academic and professional courses (such as medicine, engineering, technology) at tertiary level.
- expose the students to various emerging new areas of Chemistry and apprise them with their relevance in future studies and their application in various spheres of chemical sciences and technology.
- equip students to face various challenges related to health, nutrition, environment, population, weather, industries and agriculture.
- develop problem solving skills in students.
- expose the students to different processes used in industries and their technological applications.
- apprise students with interface of Chemistry with other disciplines of science such as physics, biology, geology, engineering etc.
- acquaint students with different aspects of Chemistry used in daily life.
- develop an interest in students to study Chemistry as a discipline.
- integrate life skills and values in the context of Chemistry.

CLASS XI

THEORY

Unit I: 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 II: 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 III: 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, valency. Nomenclature of elements with atomic number greater than 100.

Unit IV: 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 V: 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 U and H, 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 VI: 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 VII: 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 VIII: 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, electromeric 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 IX: Hydrocarbons

Classification of 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 monosubstituted benzene. Carcinogenicity and toxicity.

PRACTICAL

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

a) 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 universal indicator.

b) Study the pH change by common-ion in case of weak acids and weak bases.

D. Chemical Equilibrium

One of the following experiments:

a) Study the shift in equilibrium between ferric ions and thiocyanate ions by increasing/decreasing the concentration of either of the ions.
b) 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

i. Using a mechanical balance/electronic balance.
ii. Preparation of standard solution of Oxalic acid.
iii. Determination of strength of a given solution of Sodium hydroxide by titrating it against standard solution of Oxalic acid.
iv. Preparation of standard solution of Sodium carbonate.
v. Determination of strength of a given solution of hydrochloric acid by titrating it against standard Sodium Carbonate solution.

F. Qualitative Analysis

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

Cations – Pb^{2+}, Cu^{2+}, As^{3+}, 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-}, NO^{2-}, SO_3^{2-}, SO_4^{2-}, NO^{3-}, Cl^-, Br^-, I^-, PO_4^{3-}, $C_2O_4^{2-}$, CH_3COO^-

(Note: Insoluble salts excluded)

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

PROJECTS

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

A few suggested Projects

- Checking the bacterial contamination in drinking water by testing sulphide ion.
- Study of the methods of purification of water.
- 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).
- Investigation of the foaming capacity of different washing soaps and the effect of addition of Sodium carbonate on it.
- Study the acidity of different samples of tea leaves.
- Determination of the rate of evaporation of different liquids Study the effect of acids and bases on the tensile strength of fibers.
- 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.

CLASS XII

THEORY

Unit I: 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 vapour 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 II: 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 III: 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 IV: 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 $KMnO_4$.

Lanthanoids – Electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and its consequences.

Actinoids – Electronic configuration, oxidation states and comparison with lanthanoids.

Unit V: 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 VI: 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 VII: 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, electrophillic substitution reactions, uses of phenols.
Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.

Unit VIII: 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 IX: 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 X: 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

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

A. Surface Chemistry
a) Preparation of one lyophilic and one lyophobic sol

Lyophilic sol – starch, egg albumin and gum
Lyophobic sol – aluminium hydroxide, ferric hydroxide, arsenous sulphide.

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

B. Chemical Kinetics

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

C. Thermochemistry

Any one of the following experiments:

i. Enthalpy of dissolution of Copper Sulphate or Potassium Nitrate.
ii. Enthalpy of neutralization of strong acid (HCI) and strong base (NaOH).
iii. Determination of enthaply 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

i. Separation of pigments from extracts of leaves and flowers by paper chromatography and determination of Rf values.
ii. 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

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

G. Preparation of Organic Compounds

Preparation of any one of the following compounds:
i) Acetanilide ii) Di -benzalAcetone iii) p-Nitroacetanilide iv) Aniline yellow or 2 - Naphthol Anilinedye.

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 $KMnO_4$ solution by titrating it against a standard solution of:

i. Oxalic acid
ii. Ferrous Ammonium Sulphate

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

K. Qualitative analysis

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

Cations – Pb^{2+}, Cu^{2+} As^{3+}, Al^{3+}, Fe^{3+}, Mn^{2+}, Zn^{2+}, Cu^{2+}, Ni^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Mg^{2+}, NH^{4+}

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

(Note: Insoluble salts excluded)

PROJECTS

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

A few suggested Projects.

- Study of the presence of oxalate ions in guava fruit at different stages of ripening.
- Study of quantity of casein present in different samples of milk.
- Preparation of soybean milk and its comparison with the natural milk with respect to curd formation, effect of temperature, etc.
- Study of the effect of Potassium Bisulphate as food preservative under various conditions (temperature, concentration, time, etc.)
- Study of digestion of starch by salivary amylase and effect of pH and temperature on it.
- Comparative study of the rate of fermentation of following materials: wheat flour, gram flour, potato juice, carrot juice, etc.
- Extraction of essential oils present in Saunf (aniseed), Ajwain (carum), Illaichi (cardamom).
- Study of common food adulterants in fat, oil, butter, sugar, turmeric power, chilli powder and pepper.

Note: Any other investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher. In addition, models and exhibits for exhibition depicting basic principles and application in daily life may also be included.

BIOLOGY

Objectives:

The prescribed syllabus of Biology is expected to:

- promote understanding of basic principles of Biology.
- encourage learners to play a rational, responsible and informed role in society.
- encourage learning of emerging knowledge and its relevance to individual and society.
- promote conceptual understanding of underlying principles common to both plants and animals.
- enable learners to understand the interrelationships of Biology with other areas of knowledge.
- create awareness about diversity in living organisms and developing respect for other living beings.
- enable learners appreciate that the most complex biological phenomena are built on essentially simple processes.
- enhance awareness about environmental issues, problems and their solutions.
- promote scientific attitude towards issues related to population, environment and development.

CLASS XI

THEORY

I. Diversity of Living Organisms

Biodiversity; Need for classification; Three domain of life; Taxonomy& Systematics; Concept of species and taxonomical hierarchy; Binomial nomenclature.

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

Salient features and classification of plants into major groups- Algae, Bryophytes, Pteridophytes, Gymnosperm (three-to five salient and distinguishing features and at least two examples of each category).

Salient features and classification of animals- non chordate up to phyla level and chordate up to classes level (three to five salient features and at least two examples).

II. Structural Organisation in Animals and Plants

Morphology; Tissues; Anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence- cymose and racemose, flower, fruit and seed. Description of Solanaceae. (To be dealt along with the relevant practical of the Practical Syllabus).

Animal-tissues; Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of a frog.

III. Cell Structure and Function

Cell theory and cell as the basic unit of life; Structure of prokaryotic and eukaryotic cell; 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 (ultra structure and function); Nucleus—nuclear membrane, chromatin, nucleolus.

Chemical constituents of living cells: Biomolecules—structure and function of proteins, carbohydrates, lipid, nucleic acids; Enzymes—types, properties, enzyme action.

Cell division: Cell cycle, mitosis meiosis and their significance.

IV. Plant Physiology

Photosynthesis: Photosynthesis as a means of Autotrophic nutrition; Where does photosynthesis take place; How many pigments are involved in Photosynthesis (Elementary idea) Photochemical and biosynthetic phases of photosynthesis; Cyclic and non cyclic photophosphorylation; Chemiosmotic hypothesis; Photorespiration; C_3 and C_4 pathways, Factors affecting photosynthesis.

Respiration:. 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.

Plant growth and development: Seed germination; Phases of plant growth and plant growth rate; Conditions of growth; Differentiation, dedifferentiation and redifferentiation; Sequence of developmental process in a plant cell; Growth regulators—auxin, gibberellin, cytokinin, ethylene, ABA; Seed dormancy.

V. Human Physiology

Breathing and Respiration: Respiratory organs m' 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 volumes; Disorders related to respiration-Asthma, Emphysema, Occupational respiratory disorders.

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.

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-Uraemia, Renal failure, Renal calculi, Nephritis; Dialysis and artificial kidney.

Locomotion and Movement: Types of movement - ciliary, flagellar muscular; Skeletal muscle contractile proteins and muscle contraction; Skeletal system and its functions(To be dealt with the relevant practical of Practical syllabus);-Joints; Disorders of muscular and skeletal system- Myasthenia gravis, Tetany, Muscular dystrophy, Arthritis, Osteoporosis, Gout.

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.

Chemical coordination and regulation: 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 (Commondisorders e.g. Dwarfism, Acromegaly, Cretinism, goitre, exopthalmic goitre, diabetes, Addison's disease).

Imp: Diseases related to all the human physiology systems to be taught in brief.

PRACTICAL

A. List of experiments

1. Study and describe three locally available common flowering plants from the family Solanaccae including dissection and display of floral whorls and anther and ovary to show number of chambers. Types of root (Tap and Adventitious); 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. Test for the presence of sugar, starch, proteins and fats, To detect them in suitable plant and animal materials.
4. Separation of plant pigments through paper chromatography.
5. To study the rate of respiration in flower buds/leaf tissue and germinating seeds.
6. To test the presence of urea in urine.
7. To detect the presence of sugar in urine/blood sample.
8. To detect the presence of albumin in urine.
9. To detect the presence of bile salts in urine.

B. Study/observation of the following (spotting)

1. Study parts of a compound microscope.
2. Study of the specimens and identification with reasons- Bacteria, Oscillatoria, Spirogyra, Rhizopus, mushroom, yeast, liverwort, moss, fern, pine, one monocotyledonous plant and one dicotyledonous plant and one lichen.
3. Study of specimens and identification with reasons- Amoeba, Hydra, Liver fluke, Ascaris, leech, earthworm; prawn, silkworm, honeybee, snail, starfish; shark, rohu, frog, lizard, pigeon and rabbit
4. Study of tissues and diversity in shapes and sizes of plant and animal cells (e.g. palisade cells, guard cells, parenchyma, collenchyma, sclerenchyma, xylem, phloem, squamous epithelium, muscle fibers and mammalian blood smear) through temporary/permanent slides.
5. Study of mitosis in onion root tips cells and animals cells (grasshopper) from permanent slides.
6. Study and identification of different types of inflorescence.
7. Observation and comments on the experimental set up for showing:
   a. Anaerobic respiration
   b. Phototropism
   c. Apical bud removal
8. Study of human skeleton and different types of joints:
9. Study of external morphology of frog through models.

CLASS XII

THEORY

I. Reproduction

Sexual reproduction in flowering plants: Flower structure; Development of male-and female gametophytes; Pollination-types, agencies and examples; Outbreedings 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 and fruit formation.

Human Reproduction: Male and female reproductive systems, Microscopic anatomy of testis and ovary; Gametogenesis- spermatogenesis & oogenesis; Menstrual cycle; Fertilisation, embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea), Parturition (Elementary idea); Lactation (Elementary idea).

Reproductive health: Need for-reproductive health and prevention of sexually transmitted diseases (STD); 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).

II. Genetics and Evolution

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; Chromosome and genes, Sex determination= In humans, birds, 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.

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 and human genome project; DNA finger printing.

Evolution: Origin of life; Biological evolution and evidences for biological evolution (Paleontological, comparative anatomy, embryology and molecular evidence); Darwin's contribution, Modem Synthetic theory of Evolution; Mechanism of evolution—Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic dirft; Hardy- Weinberg's principle; Adaptive Radiation; Human evolution.

III. Biology and Human Welfare

Health and Disease: Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis, Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology—vaccines; Cancer; H1V and AIDS; Adolescence, drug and alcohol abuse.

Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

IV. Biotechnology and Its Applications

Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology).

Application of Biotechnology in health and. agriculture: Human insulin and vaccine production, gene therapy; Genetically modified organisms- Bt crops; Transgenic Animals; Biosafety issues— Biopiracy and patents.

V. Ecology and environment

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

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

Biodiversity and its conservation: Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity; Biodiversity conservation; Hotspots, endangered organism, extinction, Red Data Book, biosphere reserves, National parks and sanctuaries.

PRACTICAL

A. List of Experiments

1. Study pollen germination on a slide.
2. Collect and study soil from at least two different sites and study them for texture, moisture content, pH and water holding capacity of soil. Correlate with the kinds of plants found in them.
3. Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organisms.
4. Study the presence of suspended particulate matter in air at the two widely different sites.
5. Study of plant population density by quadrat method.
6. Study of plant population frequency by quadrat method.
7. Prepare a temporary mount of onion root tip to study mitosis.
8. To study the effect of the different temperatures and different pH on the activity of salivary amylase on starch.

B. Study/observation of the following (Spotting)

1. Flowers adapted to pollination by different agencies (wind, insect).
2. Pollen germination on stigma through a permanent slide.
3. Identification of stages of gamete development i.e. T.S. testis and T.S. ovary through permanent slides (from any mammal).
4. Meiosis in onion bud cell or grass hopper testis through permanent slides.
5. T.S. of blastula through permanent slides.
6. Mendelian inheritance using seeds of different colour/size of any plant.
7. Prepared pedigree charts of genetic traits such as rolling of tongue, blood groups, widow's peak, colour blindness.
8. Exercise on controlled pollination—Emasculation, tagging and bagging.
9. Identification of common disease causing organisms like Ascaris, Entamoeba, Plasmodium, ringworm through permanent slides or specimens. Comment on symptoms of diseases that they cause.
10. Two plants and two animals found in xerophytic conditions. Comment upon their morphological adaptations.
11. Plants and animals found in aquatic conditions. Comment upon their morphological adaptations.

GEOLOGY

Objectives:

- To explain the basic concept of Geology.
- To acquire the fundamental knowledge of different branches of Geology with their specific importance.
- To develop an interest to nature and its processes.
- To develop interest towards the constitution of the Earth's crust.
- To increase the awareness of the problems of environment due to mining and industrial activity and its remedial measures.
- To develop an ability to use and interpret a geological map.
- To know the importance of Geology contributing towards the national development especially the Engineering Projects.

CLASS XI

THEORY

Unit 1: General and Physical Geology

(i) **Introduction to Geology:** Definition, Branches of Geology and Scope of Geology

(ii) **Theories of Origin of the Earth**: Nebular Hypothesis, Planetesimal Hypothesis, Tidal Hypothesis and Gas-Dust Cloud Hypothesis.

(iii) **Age of the Earth**: Determination of age of the Earth using indirect methods (relative age) and Radioactive methods (actual age).

(iv) **Internal structure of Earth**: Origin, evolution and composition of Crust (Continental and Oceanic crust), Mantle and Core.

(v) **Plate Tectonic**s: Definition and Theory, Nature and types of Plate Boundary – Divergent, Convergent and Transform Fault Boundaries; Continental Drift and Sea Floor spreading with their supporting evidences.

(vi) Classification and processes of weathering, erosion, denudation. Erosional and Depositional landforms.

Unit 2: Crystallography and Mineralogy

(i) **Crystallography**: **Elements of crystals** – Symmetry elements (Plane of symmetry, Axis of symmetry and Centre of symmetry), Forms, Crystallographic axes and Miller's indices.

(ii) **Introduction to Crystal Systems** – Isometric (Cubic) system, Tetragonal system, Orthorhombic system, Monoclinic system, Triclinic system and Hexagonal system. Study of the normal class of Isometric, Tetragonal and Hexagonal systems (symmetry elements, forms, general symbol).

(iii) **Mineralogy: Minerals –** Definition, Physical properties of minerals (Colour, form, streak, lustre, hardness, cleavage, fracture and specific gravity). Moh's scale of hardness.

(iv) **Physical characteristics, chemical composition and uses of the following rock forming minerals:** Quartz, feldspar (orthoclase and plagioclase), calcite, augite, hornblende, olivine, tourmaline, micas (biotite and muscovite), talc and gypsum.

(v) **Introduction to Optical Mineralogy:** Workings of Polarising microscope or Petrological microscope. Ordinary light, Polarized light, Refractive index, Double refraction, Isotropic and Anisotropic substance.

(vi) **Optical properties of minerals under (a) Plane Polarized Light –** Form, colour, Cleavage, Refractive index and Pleochroism **(b) Cross Nicol –** Isotropism, Extinction and Interference colours.

Unit 3: Petrology

(i) **Rocks**: Definition and types of rocks (Igneous rocks, Sedimentary rocks and Metamorphic rocks); Magma – Definition, Type and Composition.

(ii) **Igneous Rocks**:

(a)**Texture** – Definitions, types of igneous texture (1) Degree of Crystallization, Granularity, and (2) Fabric – Shape of grains, Equigranular textures and Inequigranular textures

(b) **Structures** – Definitions, types of igneous structures (Flow structure, pillow structure, Ropy and blocky lavas and Joints)

(c) **Occurrence of Igneous rocks** – (a) **Concordant bodies** (Sills, Phacoliths, Lopoliths and Laccoliths).
(b) **Discordant bodies** (Dykes, Volcanic plugs, and Batholiths)

(d) **Mineralogical and Textural classification of Igneous rocks**.

(e) **Mineralogical composition and texture of common igneous rocks** – Granite, Gabbro, Prgmatite, Dolerite, Basalt and Rhyolite.

(iii) **Sedimentary Rocks:**

(a) **Processes of formation of sedimentary rocks**.

(b) **Texture –** Grain size, shape, packing and fabric.

(c) **Structures –** Bedding or stratification, Cross-bedding, Graded bedding, Sole marks (Flute, grooves and load casts), Ripple-marks, Mud cracks.

(d) **Simple classification of sedimentary rocks into clastic and non-clastic**

(e) **Mineralogical composition and texture of common sedimentary rocks –** Conglomerate, Sandstone, Shale and Limestone.

(iv) **Metamorphic Rocks:**

(a) **Definition and Kinds of metamorphism –** Thermal metamorphism, Clastic metamorphism, dynamothermal metamorphism, Plutonic metamorphism, Metasomatism and Regional metamorphism

(b) **Study of simple structure and textures of metamorphic rocks - Texture** (Cystaloblastic and Palimpsest or Relict textures); **Structure** (Cataclastic, Schistose, Gneissose, Maculose and Granulose structures)

(c) **Descriptive study of important metamorphic rocks –** Slate, Phyllite, Schist, Gneiss, Quartzite and Marble.

(v) **General Stratigraphy and Indian Stratigraphy**

(a) **Principles of Stratigraphy –** Stratigraphic units (Lithostatigraphy, Bios tratigraphy and Chronostratigraphy), Principles of Correlations and Geo logic Time Scale.

(b) **Physiographic divisions of India**

(c) **Study of the following stratigraphic systems of India –** Dharwars of Mysore, Cuddapah, the Vindhyan system of Sone Valley, Gondwana System and Tertiaries of N. E India (Assam, Meghalaya and Mizoram)

PRACTICAL

(i) **Cyrstallography –** Study of crystals belonging to the normal classes of Isometric, tetragonal and hexagonal systems with the help of models.

(ii) **Mineralogy** – (a) Identification of common rock forming minerals in hand Specimen – Quartz, feldspar (orthoclase and plagioclase), micas (Muscovite and Biotite), Tourmaline, Calcite, Hornblende, Olivine, Garnet, Magnetite, Haematite, Bauxite, Pyrite, Galena and Sphalerite.

(b) Identification of the following minerals in thin section – Quartz, Feldspar (Othoclase and Plagioclase), Augite, Hornblende, Micas (Muscovite and Biotite), Calcite and Garnet.

(iii) **Petrology –** Megascopic study of the following rocks – Dunite, Granite, Gabbro, Dolerite, Basalt, Rhyolite, Slate, Phyllite, Schist, Gneiss, Quartzite, Marble, Conglomerate, Sandstone, Shale and Limestone.

(iv) **Practical Record and Viva Voce.**

CLASS XII

THEORY

Unit 1: Structural Geology

(i) **Introduction to Structural Geology:** Definition and scope of structural Geology, Basic knowledge of Brunton Compass and Clinometer.

(ii) **Study of attitudes of bed –** Strike, True dip and Apparent dip, Dip amount and Dip direction.

(iii) **Definition and types of fold, fault, joint and unconformity.**

Unit 2: **Palaeontology**

(i) **Introduction to Palaeontology**: Definitions and Scope of Palaeontology.

(ii) **Fossil**: Definition of fossil and index fossil, Mode of Preservation and Significance of fossil in geological studies.

(iii) **Classification, geologic range and brief morphological study of –** Bivalvia, Gastropoda, Brachiopoda and Plant fossils.

Unit 3: Economic Geology

(i) **Introduction:** Definition of ore, gangue and tenor, Scope of Economic geology.

(ii) **Elementary idea of the Processes of mineral deposits** – Magmatic deposits, Hydrothermal deposits, Mechanical and Residual deposits, sedimentary deposits and Metamorphic deposits.

(iii) **Origin and mode of occurrence, Indian distribution and uses of the following mineral deposits –** coal, petroleum, Lead, copper, Zinc, Gold, Manganese, Iron (haematite and magnetite) and Chromite.

(iv) **Mineral resources of Assam, Meghalaya and Mizoram**.

Unit 4: Applied Geology

(i) **Hydrogeology**: Hydrologic cycle, types of precipitation, types of water, types of aquifers, Porosity, permeability and water table.

(ii) **Engineering Geology**: Engineering properties of rocks; Types of dam, geological considerations in selection of sites for dams; Types of tunnel, geological consideration in tunnels.

(iii) **Environmental Geology:** Soil – Factors affecting soil formation; Soil erosion and its prevention; Natural hazards – Landslide, types of landslides, causes and preventive measures; Earthquake – origin, types, causes and effects; volcanoes, Tsunamis; Pollution – definition, water and air pollutions, common water and air pollutants; Green house effects, Green house gases; Global warming.

PRACTICAL

(i) Determination of strike, dip amount and dip direction of a plane surface using Brunton Compass and Clinometer. Drawing of contour, profile and cross-sections of simple geological maps.

(ii) Identification and study of morphological characteristics of fossils - Arca, Cardium, Cardita, Pecten, Productus, Spirifer, Terebratulla, Turritella, Cyprea, Conus, Ammonites etc.

(iii) Identification and chemical compositions of the following ores in hand specimen – Galena, Sphalerite, Chalcopyrite, Pyrite, Haematite, Magnetite, Bauxite, Pyrolusite and Psilomelane,

(iv) Practical Record and Viva Voce.

GEOLOGICAL FIELDWORK

(i) Geological fieldwork must be carried out anywhere within Mizoram in order to have basic ideas on the geology of Mizoram, identification of different rock types, structural features like folds, faults and joints in the field.

(ii) Geological fieldwork report should be prepared for evaluation of mark.

BUSINESS STUDIES

Objectives:

- To develop an understanding of the processes of business and its environment;
- To acquaint with the dynamic nature and inter-dependent aspects of business;
- To develop an interest in the theory and practice of business, trade and industry;
- To familiarize theoretical foundations of organizing, managing and handling operations of a business firm;
- To appreciate the economic and social significance of business activity and the social cost and benefits arising therefrom;
- To acquaint with the practice of managing the operations and resources of business;
- To function more effectively and responsibly as consumers, employers, employees and citizens;
- To make the transaction from school to the world of work including self-employment;
- To develop a business attitude and skills to be precise and articulate.

CLASS XI

PART A: FOUNDATION OF BUSINESS

Unit 1: Nature and Purpose of Business

- Concept and characteristics of business.
- Business profession and employment — distinctive features.
- Objectives of business — economic and social, role of profit in business
- Classification of business activities: Industry and Commerce.
- Industry - Types: Primary, Secondary and Tertiary.
- Commerce Trade: Types (Internal, External, Wholesale, and Retail) and Auxiliaries to trade: Banking, Insurance, Transportation, Communication, and Advertising.
- Role of Commerce Trade and Auxiliaries to trade
- Business risks — Nature and Causes.

Unit 2: Forms of Business Organizations

- Sole proprietorship: Meaning, Merits and Limitations.
- Partnership: Meaning, Merits and Limitations; Types of partnership and Types of partners; Registration of a partnership firm; Partnership Deed.
- Cooperative Societies: Meaning, Merits, Limitations and Types.
- Company: Private and Public - Merits, Limitations and Differences.
- One Person Company: Meaning.
- Hindu Undivided Family (HUF): Concept.
- Choice of form of business organization: Differences between various forms of business; Factors influencing choice of suitable form of business organization.

Unit 3: Public, Private and Global Enterprises

- Private Sector and Public Sector.
- Forms of Public Sector Enterprises: Departmental Undertakings, Statutory Corporation, Government Company (Features, Merits and Limitations)
- Global enterprises: Meaning and Features.
- Public-Private Partnership: Meaning and Features.

Unit 4: Business Services

- Banking: Types of Bank Accounts- Saving, Current, Recurring, Fixed Deposit and Multiple Option Deposit Accounts.
- Banking Services with particular reference to —Issue of Bank Draft; Banker's cheque (Pay order); Bank overdraft; Cash Credits; SMS alerts.
- E-Banking: RTGS (Real Time Gross Settlement); NEFT (National Electronic Funds Transfer).
- Insurance: Principles, Concept of Life, Health, Fire and Marine Insurance.
- Postal and Telecom Services: Mail - UPC, Registered Post, Parcel, Speed Post, Courier.

Unit 5: Emerging Modes of Business

- E-Business — Meaning, Scope and Benefits.
- Differences between E-Business and Traditional Commerce.

Unit 6: Social Responsibility of Business and Business Ethics

- Concept of social responsibility.
- Case for social responsibility.
- Responsibility towards Investors, Consumers, Employees, Government and Community.
- Role of Business in Environmental Protection.
- Business ethics — Concept and Elements.

PART B: FINANCE AND TRADE

Unit 7: Sources of Business Finance

- Business Finance: Meaning, Nature and Importance.
- Owner's Funds — Equity Shares, Preference Shares, and Retained Earnings.
- Borrowed funds- Debentures and Bonds; Loan from Financial Institutions; Loans from Commercial banks; Public Deposits; Trade Credit; Inter Corporate Deposits (ICD).

Unit 8: Small Business and Enterprises

- Entrepreneurship Development: Concept, Characteristics, Need and Process; Start-up India Scheme; Funding Sources for Start-ups; Intellectual Property Rights and Entrepreneurship.
- Small Scale Enterprise as defined by Micro Small and Medium Enterprises Development (MSMED) Act 2006.
- Role of small business in India with special reference to rural areas.
- Government schemes and agencies for Small Scale Industries: National Small Industries Corporation (NSIC) and District Industries Centre (DIC) with special reference to Rural, Backward & Hilly Areas.

Unit 9: Internal Trade

- Services of a Wholesaler and Retailer.
- Types of Retail Trade- Itinerants and Small scale Fixed Shops.
- Large Scale Retailers- Departmental stores, Chain Stores, Mail Order Business.
- Goods and Services Tax (GST) - Concept and Key Features.

Unit 10: International Trade

- International Trade- Concept, Benefits and Scope.
- Export and Import- Meaning, Objectives, Procedures and Documents.
- World Trade Organization - Meaning and Objectives.

CLASS XII

PART A: PRINCIPLE AND FUNCTION OF MANAGEMENT

Unit 1: Nature and significance of Management

- Management: Concept, Objective, Importance.
- Management as Science, Art, Profession.
- Levels of Management.
- Management Functions: Planning, Organising, Staffing, Directing and Controlling.
- Coordination: Characteristics and Importance.

Unit 2: Principle of Management

- Principles of Management: Concept and Significance.
- Fayol's Principles of Management
- Taylor's Scientific Management: Principles and Techniques.
- Comparison between contributions of Fayol and Taylor.

Unit 3: Business Environment

- Business Environment - Concept and Importance.
- Dimensions of Business Environment - Economic, Social, Technological, Political and Legal.
- Demonetization - Concept and Features.

Unit 4: Planning

- Concept, Importance, Limitations.
- Planning Process.
- Types of Plans: Concepts of - Objectives, Strategies, Policies, Procedures, Methods, Rules, Budget and Programme.

Unit 5: Organising

- Concept and Importance.
- Steps in the Process of Organising.
- Structure of Organisation- Functional and Divisional: Concept and Differences.
- Formal and Informal Organisation: Concept and Differences.
- Delegation: Concept, Elements and Importance.
- Decentralization: Concept and Importance.
- Difference between Delegation and Decentralization.

Unit 6: Staffing

- Concept and Importance of staffing.
- Staffing as a part of Human Resource Management.
- Staffing Process: Steps in the process
- Recruitment: Meaning and Sources.
- Selection: Meaning and Steps.
- Training and Development: Concept, Importance, Differences, Methods of Training – On the Job, Off the Job, Vestibule, Apprenticeship and Internship trainings (Meanings only).

Unit 7: Directing

- Concept and Importance
- Elements of Directing
  - Motivation: Concept, Maslow's Hierarchy of Needs.
  - Financial and Non Financial Incentives.
  - Leadership: Concept, Styles (Authoritative, Democratic and Laissez Faire).
  - Communication: Concept, Formal and Informal Communication, Barriers to effective communication, How to overcome the barriers.

Unit 8: Controlling

- Concept and Importance.
- Relationship between Planning and Controlling.
- Steps in the process of Control.

PART B: BUSINESS FINANCE AND MARKETING

Unit 9: Financial Management

- Concept, Objective and Role of financial management.
- Investment, Financing and Dividend Decisions: Meaning and Factors Affecting.
- Financial Planning: Concept and Importance.
- Capital Structure: Concept and Factors Affecting.
- Fixed and Working Capital: Concept and Factors affecting its requirements.

Unit 10: Financial Markets

- Financial Markets: Concept.
- Money Market: Concept.
- Capital Market (Primary and Secondary): Meaning and Differences.
- Stock Exchange: Meaning, Functions, Trading Procedure (Depository Services & Demat Account: Meanings only).
- Securities Exchange Board of India (SEBI) - Objectives and Functions.

Unit 11: Marketing Management

- Marketing: Meaning, Functions and Features.
- Marketing Management Philosophies.
- Marketing Mix: Concept
  - Product: Concepts of Branding, Labeling and Packaging.
  - Price: Concept and Factors Determining Price.
  - Physical Distribution: Concept, Components, Channels of Distribution.
  - Promotion: Concepts of Advertising, Sales Promotion, Public Relations and Personal Selling.

Unit 12: Consumer Protection

- Concept and Importance.
- Consumer Protection Act 2019
  - Scope of Consumer Protection Act 2019.
  - Concept of a Consumer
  - Rights of a Consumer.
  - Responsibilities of a Consumer.
  - Who can file a complaint and against whom?
    - Legal redressal machinery.
    - Remedies Available to Consumers.
- Consumer Awareness: Role of consumer organizations and NGO's

ACCOUNTANCY

Objectives:

- To familiarise with accounting as an information system;
- To acquaint with basic concepts of accounting and accounting standards;
- To develop the skills of using accounting equation in processing business transactions;
- To develop an understanding about recording of business transactions and preparation of financial statements;
- To enable the students with accounting for reconstitution of partnership firms.
- To understand and analyse the financial statements;

CLASS XI

PART A: FINANCIAL ACCOUNTING - I

Unit 1: Theoretical Frame Work

Introduction to Accounting

- Accounting- concept, meaning, as a source of information, objectives, advantages and limitations, types of accounting information; users of accounting information and their needs. Qualitative Characteristics of Accounting Information. Role of Accounting in Business.
- Basic Accounting Terms- Entity, Business Transaction, Capital, Drawings. Liabilities (Non Current and Current). Assets (Non Current, Current); Expenditure (Capital and Revenue), Expense, Revenue, Income, Profit, Gain, Loss, Purchase, Sales, Goods, Stock, Debtor, Creditor, Voucher, Discount (Trade discount and Cash Discount)

Theory Base of Accounting

- Fundamental accounting assumptions: GAAP: Concept
- Basic Accounting Concept: Business Entity, Money Measurement, Going Concern, Accounting Period, Cost Concept, Dual Aspect, Revenue Recognition, Matching, Full Disclosure, Consistency, Conservatism,
- Materiality and Objectivity
- System of Accounting. Basis of Accounting: cash basis and accrual basis
- Accounting Standards: Applicability of Accounting Standards (AS) and Indian Accounting Standards (IndAS)
- Goods and Services Tax (GST): Characteristics and Advantages.

Unit 2: Accounting Process

Recording of Business Transactions

- Voucher and Transactions: Source documents and Vouchers, Preparation of Vouchers, Accounting Equation Approach: Meaning and Analysis, Rules of Debit and Credit.
- Recording of Transactions: Books of Original Entry- Journal
- Special Purpose books:
- Cash Book: Simple, cash book with bank column and petty cashbook
- Purchases book
- Sales book

- Purchases return book
- Sales return book
- Journal proper

Note: Including trade discount, freight and cartage expenses for simple GST calculation.

- Ledger: Format, Posting from journal and subsidiary books, Balancing of accounts

Bank Reconciliation Statement:

- Need and preparation, Bank Reconciliation Statement

Depreciation, Provisions and Reserves

- Depreciation: Meaning, Features, Need, Causes, factors
- Other similar terms: Depletion and Amortisation
- Methods of Depreciation:
  i. Straight Line Method (SLM)
  ii. Written Down Value Method (WDV)

Note: Excluding change of method

- Difference between SLM and WDV; Advantages of SLM and WDV
- Method of recoding depreciation
  i. Charging to asset account
  ii. Creating provision for depreciation/accumulated depreciation account
- Treatment of disposal of asset
- Provisions, Reserves, Difference Between Provisions and Reserves.
- Types of Reserves:
  i. Revenue reserve
  ii. Capital reserve
  iii. General reserve
  iv. Specific reserve
  v. Secret Reserve
- Difference between capital and revenue reserve

Trial balance and Rectification of Errors

- Trial balance: objectives, meaning and preparation

(Scope: Trial balance with balance method only)

- Errors: classification-errors of omission, commission, principles, and compensating; their effect on Trial Balance.
- Detection and rectification of errors;
  (i) Errors which do not affect trial balance
  (ii) Errors which affect trial balance
- preparation of suspense account.

PART B: FINANCIAL ACCOUNTING - II

Unit 3: Financial Statements of Sole Proprietorship

Financial Statements

Meaning, objectives and importance; Revenue and Capital Receipts; Revenue and Capital Expenditure; Deferred Revenue expenditure. Opening journal entry. Trading and Profit and Loss Account: Gross Profit, Operating profit and Net profit. Preparation. Balance Sheet: need, grouping and marshalling of assets and liabilities. Preparation. Adjustments in preparation of financial statements with respect to closing stock, outstanding expenses, prepaid expenses, accrued income, income received in advance, depreciation, bad debts, provision for doubtful debts, provision for discount on debtors, Abnormal loss, Goods taken for personal use/staff welfare, interest on capital and managers commission. Preparation of Trading and Profit and Loss account and Balance Sheet of a sole proprietorship with adjustments.

Incomplete Records

Features, reasons and limitations. Ascertainment of Profit/Loss by Statement of Affairs method. (excluding conversion method).

CLASS XII

PART A: ACCOUNTING FOR PARTNERSHIP FIRMS AND COMPANIES

Unit 1: Accounting for Partnership Firms

- Partnership: features, Partnership Deed.
- Provisions of the Indian Partnership Act 1932 in the absence of partnership deed.
- Fixed v/s fluctuating capital accounts. Preparation of Profit and Loss Appropriation account- division of profit among partners, guarantee of profits.
- Past adjustments (relating to interest on capital, interest on drawing, salary and profit sharing ratio).
- Goodwill: meaning, nature, factors affecting and methods of valuation - average profit, super profit and capitalization.

Note: Interest on partner's loan is to be treated as a charge against profits.
Goodwill: meaning, factors affecting, need for valuation, methods for calculation (average profits, super profits and capitalization), adjusted through partners capital/ current account.

Accounting for Partnership firms – Reconstitution and Dissolution.

- Change in the Profit Sharing Ratio among the existing partners - sacrificing ratio, gaining ratio, accounting for revaluation of assets and reassessment of liabilities and treatment of reserves, accumulated profits and losses. Preparation of revaluation account and balance sheet.
- Admission of a partner - effect of admission of a partner on change in the profit sharing ratio, treatment of goodwill (as per AS 26), treatment for revaluation of assets and reassessment of liabilities, treatment of reserves, accumulated profits and losses, adjustment of capital accounts and preparation of capital, current account and balance sheet.
- Retirement and death of a partner: effect of retirement / death of a partner on change in profit sharing ratio, treatment of goodwill (as per AS 26), treatment for revaluation of assets and reassessment of liabilities, adjustment of accumulated profits, losses and reserves, adjustment of capital accounts and preparation of capital, current account and balance sheet. Preparation of loan account of the retiring partner.
- Calculation of deceased partner’s share of profit till the date of death. Preparation of deceased partner’s capital account and his executor’s account.
- Dissolution of a partnership firm: meaning of dissolution of partnership and partnership firm, types of dissolution of a firm. Settlement of accounts - preparation of realization account, and other related accounts: capital accounts of partners and cash/bank a/c (excluding piecemeal distribution, sale to a company and insolvency of partner(s)).

Note:

(i) If the realized value of tangible assets is not given it should be considered as realized at book value itself.
(ii) If the realized value of intangible assets is not given it should be considered as nil (zero value).
(ii) In case, the realization expenses are borne by a partner, clear indication should be given regarding the payment thereof.

Unit 2: Accounting for Companies
Accounting for Share Capital

- Features and types of companies.
- Share and share capital: nature and types.
- Accounting for share capital: issue and allotment of equity and preferences shares. Public subscription of shares – over subscription and under subscription of shares; issue at par and at premium, calls in advance and arrears (excluding interest), issue of shares for consideration other than cash.
- Concept of Private Placement and Employee Stock Option Plan (ESOP), Sweat Equity.
- Accounting treatment of forfeiture and reissue of shares.
- Disclosure of share capital in the Balance Sheet of a company. (As per Schedule III of the companies Act, 2013)

Accounting for Debentures

- Debentures: Meaning, types, Issue of debentures at par, at a premium and at a discount. Issue of debentures for consideration other than cash; Issue of debentures with terms of redemption; debentures as collateral security-concept, interest on debentures (concept of TDS is\ excluded). Writing off discount / loss on issue of debentures.

Note: Discount or loss on issue of debentures to be written off in the year debentures are allotted from Security Premium Reserve (if it exists) and then from Statement of Profit and Loss as Financial Cost (AS 16)

PART B: FINANCIAL STATEMENT ANALYSIS
Unit 3: Analysis of Financial Statements
Financial statements of a Company:
Meaning, Nature, Uses and importance of financial Statement.
Statement of Profit and Loss and Balance Sheet in prescribed form with major headings and sub headings (as per Schedule III to the Companies Act, 2013)

Note: Exceptional items, extraordinary items and profit (loss) from discontinued operations are excluded.

- Financial Statement Analysis: Meaning, Significance Objectives, importance and limitations.
- Tools for Financial Statement Analysis: Comparative statements, common size statements, Ratio analysis, Cash flow analysis.
- Accounting Ratios: Meaning, Objectives, Advantages, classification and computation.
- Liquidity Ratios: Current ratio and Quick ratio.
- Solvency Ratios: Debt to Equity Ratio, Total Asset to Debt Ratio, Proprietary Ratio and Interest Coverage Ratio. Debt to Capital Employed Ratio.
- Activity Ratios: Inventory Turnover Ratio, Trade Receivables Turnover Ratio, Trade Payables Turnover Ratio, Fixed Asset Turnover Ratio, Net Asset Turnover Ratio and Working Capital Turnover Ratio.
- Profitability Ratios: Gross Profit Ratio, Operating Ratio, Operating Profit Ratio, Net Profit Ratio and Return on Investment.

Note: Net Profit Ratio is to be calculated on the basis of profit before and after tax.

Unit 4: Cash Flow Statement

- Meaning, objectives Benefits, Cash and Cash Equivalents, Classification of Activities and preparation (as per AS 3 (Revised) (Indirect Method only)

Note:

(i) Adjustments relating to depreciation and amortization, profit or loss on sale of assets including investments, dividend (both final and interim) and tax.
(ii) Bank overdraft and cash credit to be treated as short term borrowings.
(iii) Current Investments to be taken as Marketable securities unless otherwise specified.

Note: Previous years' Proposed Dividend to be given effect, as prescribed in AS-4, Events occurring after the Balance Sheet date. Current years' Proposed Dividend will be accounted for in the next year after it is declared by the shareholders.

BUSINESS MATHEMATICS

Objectives:

- To be aware of the usages/applications of Mathematics in day to day life and business.
- To be familiar with the concepts of ratio, proportion, variation and percentage and enable them to calculate the same.
- To understand various terms and formulae involved in computation of profit or loss and enable them to calculate the same.
- To be equipped with the concepts of interest, rate of interest, annuity
- To use mathematical models to optimise business operations
- To understand how to process and interpret information to arrive at logical conclusions to common Business Mathematics applications.
- To develop proficiency in the application to solve Business Mathematics problems.
- To understand the important role Mathematics plays in all facets of the business world.

CLASS XI

PART A: COMMERCIAL ARITHMETIC

Unit I: Profit and Loss

Cost Price, Selling Price, Gross Profit, Net Profit, Marked Price, Trade discount, Cash discount, Successive Discounts.

Unit 2: Logarithms

Laws of logarithm, change of Base, Common Logarithms, Antilogarithms, characteristics and Mantissa, use of log table.

Unit 3: Instalment Schemes

Simple interest, Instalment Plan, Instalment Purchase, Repayment of loans in instalment.

Unit 4: Compound Interest

Amount, Principal, Compound Interest, Interest Period, Rate of interest, Depreciation.

Unit 5: Annuities

Annuity and its types, present value, amount in case of ordinary annuity, present value of perpetuity, annuity due and deffered annuity, sinking fund.

PART B:

Unit 1: Basic Trigonometry

Basic trigonometric ratios and angles: relation and reciprocal relation between sine, cosine, tangent, cotagent, secant and cosecant.

Proof of the identities: $\sin^2\theta + \cos^2\theta = 1$, $\sec^2\theta = 1 + \tan^2\theta$,

$\text{Cosec}^2\theta = 1+\cot^2\theta$, application of the identities in problems.

Ratios and Angles: Values of trigonometric functions at 0°, 30°, 45°, 60° and 90°, trigonometrical ratios of angles $90°- \theta$, $90°+ \theta$, $180°- \theta$, $180°+ \theta$, $270° - \theta$, $270° + \theta$, $360° - \theta$, $360°+ \theta$ and also of any magnitude.

Unit 2:Compound Angles

Proofs of the following identities with application:

$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$; $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$

$\sin(A + B)\sin(A - B) = \sin^2 A - \sin^2 B = \cos^2 B - \cos^2 A$

$\cos(A + B)\cos(A - B) = \cos^2 A - \sin^2 B = \cos^2 B - \sin^2 A$

$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$; $\cot(A \pm B) = \frac{\cot A \cot B \mp 1}{\cot B \mp \cot A}$

$2\sin A \cos B = \sin(A+B) + \sin(A - B)$; $2\cos A \sin B = \sin(A+B) - \sin(A - B)$

$2\cos A \cos B = \cos(A+B) + \cos(A - B)$; $2\sin A \sin B = \cos(A - B) - \cos(A + B)$

Unit 3:Multiple Angles

Application of the following formulae with their proof:

$\sin 2A = 2\sin A \cos A$; $\sin 2A = \frac{2\tan A}{1+\tan^2 A}$

$\cos 2A = \cos 2A - \sin^2 A = \cos^2 A - 1 = 1 - 2\sin^2 A$

$\cot 2A = \frac{1 - \tan^2 A}{1 + \tan^2 A}$; $\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$

$\cot 2A = \frac{\cot^2 A - 1}{2\cot A}$; $\sin 3A = 3\sin A - 4\sin^3 A$

$\cos 3A = 4\cos^3 A - 3\cos A$; $\tan 3A = \frac{3\tan A - \tan^3 A}{1 - 3\tan^2 A}$

Unit 4:Inverse trigonometric functions

Definition, principal value branches, Elementary properties of inverse trigonometric functions.

Unit 5:Coordinate geometry

Cartesian system, distance between two points, section formula, slope of a line, various forms of equations of a line (parallel to axes, point-slope form, two point form, intercept form)

Unit 6:Linear inequalities

Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables.

PART C:

Unit 1: Probability

Random experiment, sample space, Event: simple event, compound event, sure event, impossible event, mutually exclusive events, independent events, probability of an event, probability of occurrence of a complementary event. Results on probability, addition theorem for two events (Simple applications).

Unit 2: Relations & Functions

Ordered pairs, cartesian product of sets, relation, function, different types of functions (into, onto, one-one).

CLASS XII

PART A: COMMERCIAL ARITHMETIC

Unit 1: Ratio & Proportion

Ratio, Proportion, simple proportion, fourth proportion (Rule of three), Direct Rule of three, Inverse Rule of three, chain Rule.

Unit 2: Commission, Brokerage, Insurance

Commission, Percentage of Commission, Brokerage, Percentage of Brokerage, new selling price, new buying price, Insurance, declared value, rates or taxes, rateable value, Assessment.

Unit 3:Partnership

Agreement, Interest on Capital, Interest on Drawings, Salary, Problems related to Partnership.

Unit 4: Tender & Quotation

Tender, tender method, tender method of purchase, sealed tender, Quotation, cost sheets.

PART B:

Unit 1: Permutations & Combinations

Fundamental principle of counting. Factorial n ($n!$), Permutations and combinations, simple application.

Unit 2:Binomial Theorem

Statement and proof of binomial theorem for positive integral indices, general and middle terms in binomial expansion, simple application, application of Binomial theorem for approximation.

Unit 3:Sequence and Series

Arithmetic progression (A.P.), Arithmetic mean (A.M), Geometric progression (G.P), general term of a G.P., sum of n terms of a G.P, geometric mean (G.M.), sum to n terms of the special series Σn and Σn^2 and Σn^3. Insertion of G.M as well as A.M between two real numbers.

Unit 4:Probability

Application of addition theorem, conditional probability, probability of independent events.

Unit 5:Matrices & Determinants

Determinant of order 2 and 3. Elementary properties of determinants and their use in evaluating a determinant. Matrices - order, types of matrices. Equality of matrices. Addition and multiplication of matrices. Symmetric and Skew-symmetric matrices. Adjoint and inverse of a matrix. Application of matrices in sloving simulteneous equations in two and three variables.

Unit 6: Linear Programming

Introduction, definition of constraints, objective function, optimization. Optimization problems using graphical method, when the objective function and constraints are given.

PART C:

Unit 1: Functions, Limits and Continuity

Function, different types of functions (constant, identity, modulus, reciprocal, polynomial, exponential, trigonometric, logarithmic, rational, inverse trigonometric). Limit, continuity (simple problems only).

Unit 2: Differentiation and Integration

Definition of derivative, sum, difference, product and quotient of functions. Derivative of composite functions, chain rule, derivative of inverse trigonometric and trigonometric functions, derivative of implicit functions, concept of exponential and logarithmic functions and their derivative. Logarithmic differentiation (simple problems). Derivative of functions in parametric forms.

Integration as reverse process of differentiation, Integration of functions by substitution (simple problems).