GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

Office of the Principal

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

Department of Bengali
Programme Specific Outcome (PSO) and Course Outcome (CO)

Programme Outcome

- **PO 1:** The curriculum of Bengali Honours is mainly literature based. Here an idea is given about different branches of Bengali literature of ancient, middle and modern period. In other words, one has to read poems, stories, novels, dramas etc. by various poets and writers. Ancient Indian alchemy and some translations of modern foreign literature are also taught. The students of Bengali department read about the rhetoric and rhythm of Bengali poetry, read the history of Bengali language, read grammar, read literary forms and customs. They have to study ancient manuscripts or parts of modern linguistics, learn literary criticism and research methods. Such diverse subjects open up new worlds of knowledge to the students. Due to this, students are interested to know more about this subject. They develop their own logic. In the light of their reasoning, they are able to find new ideas by analysing various literary texts.
- **PO 2:** Bengali Honours lessons have special importance in the professional field as well. There is an opportunity for education by doing B.A. with Honors in Bengali. Apart from this, there is also an opportunity to become a professor by passing NET/SET after graduation and post-graduation as well as.
- **PO 3:** There is room for book criticism in daily newspaper offices Exclusive rights of Bengali Honours students there too.
- **PO 4:** There is an opportunity to become a translator. By reading Bengali Honors, there is an opportunity to work as a translator in government or various private organizations.
- **PO 5:** Bengali Honours students have job opportunities in various advertising agencies if they have skills in Bengali language.

- **PO 6:** Currently students are getting jobs in various branches of print media Those who study with Bengali Honours in the editing department of the publication have proven their competence. Students get job opportunities in various media. Besides, one can make a living by writing scripts for films or dramas. There are many people who studied Bengali Honors who are living comfortably just by writing.
- **PO 7:** Apart from this, there are job opportunities in many other departments including editing and proof reading in publishing houses after studying Bengali Honours. At present, candidates who study with Bengali Honours have the opportunity to work in various government and private organizations.

Name of the Programme	**B.A. (Honours) in Bengali [Under Choice Based Credit System]**
Year of Introduction	**2018-19**

Year	**Semester**	**Course Type**	**Course Code**	**Core Course Title**	**Programme Specific Outcome**	**Course Outcome**
I	**I**	**Core-1**	**BNGH CC-1**	CT1: Origin and Identity of Bengali Language		• After successful completion of this course students will know about the source of Bengali language. Will be able to gain knowledge about how Bengali language evolved from the Indo-European language family. • Students will learn about different levels of Bengali language. Each level will gain knowledge about characteristics and literary patterns. • The diversity and richness of a language depends on the vocabulary used in a language. The stronger the vocabulary of

					The objective of this program is to introduce students to the origins of Bengali language, different levels of Bengali language, Bengali vocabulary, semantics, causes and formulas of sound change, Bengali terms, Bengali factors and divisions, Bengali vernacular and Bengali dialects. The purpose of the course is mainly to introduce the undergraduate course students to Bengali Linguistics and Bengali Grammar.	the language, the better and richer the language. At this stage, students will develop an understanding of different types of words as a result of discussing different words in Bengali vocabulary. • The subject of semantics is mainly related to linguistics. Semantics are given special importance in linguistics. Vocabulary is the soul of language; without this sense or meaning, language is of no use. At this stage, students will learn how the outer structure of language changes with the change of tense, as well as its inner meaning. • One of the branches of historical linguistics is the analysis of language change over time. This change in language takes place in him, in body and soul—in his external formation and in his inner speech. The main component of external structure of language is the sound of the language. Students will be informed about the causes of these sound changes. Not only that, historical linguists have discovered some sources of sound change from observing the many different types of sound changes that have occurred and are

						occurring in different languages due to external reasons. They will also be informed about these sources. • Each part of a sentence is called a term. Padas are formed in two ways—nouns by inflection of words and verbs by inflection of dhatu. There are five types of words— nouns, adjectives, pronouns, prepositions and verbs. The objective of this course is to inculcate in the students an understanding of all these terms. • The relation of the noun to the verb in the sentence is called causative. At the end of this course students will have an understanding of various factors. • From the descriptive point of view, the language of folk literature is called 'folk language'. This language is not saintly, nor fully respected, nor is it a particular regional dialect. In general, Bengali folk tales, folk tales, children's rhymes, vows, owl-baul songs etc. are found in folk language. Through this, students will know their heritage and identity of language-centric culture. • The Bengali language dialects are part of the eastern Indo-Aryan language group of the Indo-European language-family. Text

						The five dialects are Rahri, Bangali, Barendri, Jharkhandi and Kamrupi or Rajvanshi. Students will gain an understanding of how phonetic and semantic differences within a language have resulted in multiple dialects due to geographical variation.
I	**I**	**Core-2**	**BNGH CC-2**	CT2: History of Bengali Literature (Ancient and Medieval)	The objective of this program is to introduce students to the history of ancient and medieval Bengali literature.	• After successful completion of this course students will gain knowledge about different genres of ancient and medieval literature and their distinctive features.
I	**I**	**GE-1**	**BNGH GE-1**	GE1T: Different levels of Bengali language and Bengali language practice.	The objective of this program is to introduce students to the origins of Bengali language, different levels of Bengali language, Bengali vocabulary, semantics, causes and formulas of sound change, Bengali terms, Bengali factors and divisions, Bengali vernacular and Bengali dialects. The purpose of the course is mainly to introduce the undergraduate course students to Bengali Linguistics and Bengali Grammar.	• Students will know the general identity of the major language families of the world. In particular, the general outline of the Indo-European language family, the history of the origin of Bengali language and the different levels of the Bengali language will be known. • Students will learn about Bengali dialects, Bengali sadhu and spoken language, Bengali sentence structure (traditional), Bengali vocabulary. • Students will gain knowledge about the causes and mechanisms of sound change as well as the causes and mechanisms of semantic change.
I	**I**	**AECC-1 (Elective)**	**BNGMAE**	MILT: Bengali Language-Context, Translation and Speaking-Skills.	Basically the course is divided into three sections. The first part	• At this stage students will know about language planning. Besides this, they will know about the evolution of Bengali social

					contains a discussion of language planning, religion, profession, gendered Bengali sociolinguistics and the nature of current standard spoken Bengali. The second part deals with translation, and the third part deals with speaking skills.	language based on religion, profession, gender. Even today's standard spoken-Bengali forms will be able to be determined. • Students will be able to translate the topic especially Bengali to English and English to Bengali. • Speaking skill is also very important for Bengali students. At the end of this course students will be able to conduct and give interviews. Apart from this, speaking skills will also develop in them.
I	**II**	**Core-3**	**BNGH CC-3**	CT3: Reading ancient and medieval verses	At this stage mainly three genres of ancient and medieval literature are discussed. The categories are Charyapad, Vaishnava Padavali and Shakta Padavali.	• Students will gain knowledge about the contemporary political and socio-economic conditions as well as the sadhana of the Buddhist Sahajiya sadhaka through metaphors in various verses of Charyapad. • By reciting different verses of four important Vaishnava Padavali poets namely Vidyapati, Chandidasa, Gnanadasa and Govindadas, the students will learn about the different rasapariyas of Vaishnava Rasasastra. • Shakta Padavali is a special medieval style, related to Tantra. By reading various verses of Ramprasad Sen and Kamalakanta Bhattacharya, the two main poets of Shakta Padavali, the students will be able to understand the

						family, socio-economic, political picture of the Bengali family in the eighteenth century as well as the esoteric allusions to Tantra Sadhana.
I	**II**	**Core-4**	**BNGH CC-4**	C4T: Chaitanya Biography and Mangalkavya Literary Lessons	At this stage, a Chaitanyajivani written mainly in Bengali and two main Mangalkawyas have been discussed.	• At the end of this course, the students will read the "Chaitanya Bhagavatam" (Adikhanda) written by Vrindavan Dasa in detail and learn about the childhood and adolescent life of Mahaprabhu Sri Chaitanya as well as the socio-economic conditions of Navadwipa at that time. • Students will learn about the story of Kalketu and Phullara as well as the socio-economic and political conditions of the 18th century by reading "Chandimangal" (Akhetik Khanda) by Mukundaram Chakraborty, centered on the medieval goddess Chandi. • "Annadamangal" is a mangalkavya written by Raigunakar Bharatchandra. The poem, arranged in three parts, expresses the greatness of Goddess Annapurna. By reading this poem, students will learn about mythological stories such as Sati's sacrifice, Shiva-Parvati's marriage, as well as various socio-economic and political events of the 18th century, such as Lord Krishnachandra's reign,

						Bargi invasion of Bengal, etc.
I	**II**	**GE-2**	**BNGH GE-2**	GE2T: Genres of Bengali poetic literature and Vaishnava Padavali texts	This course basically includes a general discussion of various genres of ancient and medieval literature as well as a discussion of various poets in the genre of modern poetic literature and a few verses of some Vaishnava poets.	• Students will gain a general knowledge of some of the classics of ancient and medieval literature such as "Charyapad", "Sri Krishna Kirtan", "Mangalkavya" and "Vaishnava Padavali." • Students will gain knowledge about the contribution of several poets from Madhusudan Dutta to Shakti Chatterjee to the modern poetic literature. • By reciting two verses each of four Vaishnava poets viz. Vidyapati, Gnanadas, Chandidas and Govindas, the students will be able to learn about Radha-Krishvain's love theory as well as the rasasastras of Vaishnava padavali.
II	**III**	**Core-5**	**BNGH CC-5**	C5T: 19th-20th Century Essays and Literary History and Narrative Literature Lessons	In this course, students will study the history of nineteenth- and twentieth-century essay literature, the history of nineteenth- and twentieth-century poetic literature, as well as a narrative literature course.	. Nineteenth and Twentieth Century listory Students will gain knowledge literary works of Srirampur Mission, am College as well as writers from r, Bankimchandra to Buddhadeb Bose. vill get to know about the contribution n poets starting from poet Ishwar Gupta to contemporary Shankha Ghosh ory of poetic literature of the 19th and ries. know Vidyasagar's contribution to literature. Here students will know akuntala Kavya" in detail.
						• Rhythm is a very important subject for students. In this stage

II	**III**	**Core-6**	**BNGH CC-6**	C6T: Rhyme, Rhetoric and Selected Poetry Lessons	The course includes readings on rhyme, rhetoric and some special poetry by some modern poets.	students will be able to divide the rhythm by recognizing the rhythm, phase, dimension along with the definition and characteristics of the rhyming. • The subject of beauty is related to the subject of ornament. Ornaments have different words and meanings to enhance the beauty of literature as well as human life. Here the students will learn about the application of metaphors, similes, metaphors, similes. • At this stage, the students will be introduced to the emotions, feelings and different lifestyles of poets in addition to the then time by reading some poems of some modern poets.
II	**III**	**Core-7**	**BNGH CC-7**	C7T: Essay literature lesson	This course includes several essay readings by various authors including various essays by Bankimchandra Chatterjee.	• At this stage, the students will gain knowledge about the identity of the author's philosophy of the social system of the time by reading various articles of “Bibidha Prabandha” of Bankim Chandra Chattopadhyay. • Along with the various essays of Ramendrasundar Trivedi's “Charitaktha” Essay Book, the students will be informed about the genres of essay literature of the 19th and 20th centuries by reading various essays by Rabindranath, Amulyacharan Vidyabhushan, Pramath

						Chowdhury.
II	**III**	**SEC-1**	**BNGH SEC-1**	SEC-1: Bengali Grammar and Translation Theory	This course covers various aspects of Bengali grammar as well as idioms, proverbs and translation theory.	• Students will learn topics such as samas, sandhi, suffixes, use of intersection and punctuation, idioms, proverbs and monologues. Besides this they will gain knowledge about different aspects of translation theory and different terminologies.
II	**IV**	**Core-8**	**BNGH CC-8**	C8T: History and short story reading of nineteenth and twentieth century drama and fiction	The course includes a history of 19th and 20th century dramatic literature, a history of 19th and 20th century novels and short stories, and a few readings of short stories by several writers.	• Students will develop an understanding of the dramatization of dramatists from Ramnarayan Tarkaratna to Manoj Mitra in the history of nineteenth- and twentieth-century theatrical literature. Apart from this, during this period, students will get an idea about the themes and philosophies of fiction writers from Bankimchandra Chatterjee to Ashapurna Devi. • By reading a few short stories by some of the modern short story writers, from Rabindranath to Premendra Mitra, students will be able to identify the nature of fiction of this period.
						• At the end of this course, students will be able to identify how Michael Madhusoon Dutt's “Veerangana Kavya” explores the issue of women's freedom through a blend of mythology and modern thought.

II	**IV**	**Core-9**	**BNGH CC-9**	C9T: Poetry Reading	This course includes readings of Virangana by Michael Madhusudan Dutta, Balaka by Rabindranath Tagore and Vanalata Sen by Jibanananda Das.	• After reading Rabindranath Tagore's poetry book "Balaka", the students will be able to understand the contemporary world situation after the First World War as well as the excitement of the working life of people in Europe and America, the kinetic theory of French philosopher Henri Bergson as well as the excitement of winning the Nobel Prize as a personal recognition of Rabindranath.
II	**IV**	**Core-10**	**BNGH CC-10**	C10T: Reading Novels	The course includes readings of Bankimchandra's Kapalkundala, Rabindranath Tagore's late poems and Tarashankar Banerjee's poetic novel.	• At the end of this course students will be able to identify the wonderful blend of history and romance by reading Bankimchandra's novel "Kapalkundala". By reading Rabindranath's "Sesher Kabita", students will get to know the identity of old Rabindranath's modern philosophy of life. By reading Tarashankar's "Kavi" novel, the students will know that this famous novel was written in the context of the lifestyle of that time including Kabial, Jhumurdal.
II	**IV**	**SEC-2**	**BNGH SEC-2**	SEC-2: Project writing and project presentation on Bengali language and literature.	This course mainly covers project writing and project paper presentation.	• At the end of this course students will know what is project, what are its characteristics, how to write a project paper. Apart from this they will be able to write and present project papers on any topic.

III	**V**	**Core-11**	**BNGH CC-11**	CT11: Drama Lesson	This course includes one drama lesson each by Deenbandhu Mitra, Dwijendralal Roy and Rabindranath.	• Through Deenbandhu Mitra's “Sadhbar Ekadashi” drama, The students will be able to understand the manner in which the character of the upper classes of the Bengali society at that time, as well as the evils of drinking and the issue of prostitution in that society, have been highlighted. • Students will be able to understand how Dwijendralal Roy in the play “Sajahan” has transcended history with the help of his own imagination and portrayed socio-historical characters, using time and space as his own, focusing on the historical character Sajahan. • By reading Rabindranath's “Dakghar” play, students will be able to understand how the dramatist's death consciousness has been revealed in this play by focusing on various characters behind the metaphor.
III	**V**	**Core-12**	**BNGH CC-12**	CT12: Poetics, Western Literary Criticism and Literary Traditions.	This course includes a reading of Atul Chandra Gupta's book “Kavyajigyasa” (Sound and Rasa) as well as a discussion of various western ideologies and forms of poetry, drama and novels.	• At the end of this course, the students will know about the origin, history and influence of Western theories like classicism, romanticism, realism along with chemistry and phonetics in Bengali literature. Besides this, they will be able to identify different branches of literature like epic, tragedy, comedy, ode,

						vernacular novel separately.
III	**V**	**DSE-1**	**BNGH DSE-1**	DSE-1: Ancient literature and literary theorists.	This course mainly deals with the form-ritual, dramaturgy, style, rhetoric, guna, auchita and bakrokti of poetry according to the ancient tradition. Beside this, there are discussions of theories of various theorists including Bharata, Bhamha, Vaman.	• At the end of this course, students will know about poetics, dramatization as well as the doctrines of various theorists.
III	**V**	**DSE-2**	**BNGH DSE-2**	DSE-2: History of Bengali theatre, periodicals and translated literature	History of Bengali stage, history of Bengali periodicals, and history of Bengali translation literature have been discussed in this course.	• At the end of this course students will know about the history of Bengali theatre, history of Bengali periodicals and history of Bengali translated literature.
III	**VI**	**Core-13**	**BNGH CC-13**	CT13: Folklore	This course includes definitions of folklore, svarup, various similes as well as a special pala text of Gatha Kavya Mymensingh Gita.	• At the end of this course students will know the definition of folk literature, forms as well as chada, riddles, proverbs, folk songs, folk dramas, Mymensingha lyricist Mahua Pala.
III	**VI**	**Core-14**	**BNGH CC-14**	CT14: History of Sanskrit, English and neighboring literatures	History of Sanskrit, English and neighboring literature is discussed in this course.	• After successful completion of this course students will acquire a holistic understanding of history of Bengali literature as well as Sanskrit, English, Hindi, Oriya, Assamese literature.
III	**VI**	**DSE-3**	**BNGH DSE-3**	DSE-3: Drama Literary Lessons	This course includes several play readings by several playwrights.	• At the end of this course, the students of Dwijendralal Roy, The historical play “Chandragupta”, Manoj Mitra’s social play “Sajano Bagan”, and various one-act plays by different playwrights can be read to gain ideas.
						• Upon successful completion of this course, students will be able

III	**VI**	**DSE-4**	**BNGH DSE-4**	DSE4: Reading Rabindra Sahitya	The course includes readings of a Rabindranath story, an allegorical play and some poetry.	to analyze Rabindranath's story book "Se", plays "Muktadhara" and poems from poetry collection "Sanchayita" in a contemporary context with their own reasoning.
Name of the Programme				**B.A. (General) in Bengali [Under Choice Based Credit System]**		
Year of Introduction				**2018-19**		
I	**I**	**Core-1**	**BNGG DSC-1A**	CC-1T: History of Bengali Literature and Bengali Linguistics	The course covers ancient and medieval literature as well as 20th century poetry, fiction and Bengali linguistics.	• After successful completion of this course a student will be able to imbibe subjects like ancient, medieval as well as modern literature and Bengali linguistics. After learning about different dialects, you will be able to relate these dialects with your spoken language.
I	**I**	**AECC-1 (Elective)**	**BNGMAE**	MILT: Bengali Language-Context, Translation and Speaking-Skills.	Basically the course is divided into three sections. The first part contains a discussion of language planning, religion, profession, gendered Bengali sociolinguistics and the nature of current standard spoken Bengali. The second part deals with translation, and the third part deals with speaking skills.	• At this stage students will know about language planning. Besides this, they will know about the evolution of Bengali social language based on religion, profession, gender. Even today's standard spoken-Bengali forms will be able to be determined. • Students will be able to translate the topic especially Bengali to English and English to Bengali. Speaking skill is also very important for Bengali students. At the end of this course students will be able to conduct and give interviews. Apart from this, speaking skills will also develop

						in them.
I	**II**	**Core-2**	**BNGG DSC-1B**		The course includes two Padavali literatures of the medieval period especially Vaishnava Padavali and Shakta Padavali as well as the Veerangana Kavya of Madhisudana Dutta of the modern period as well as modern poetry of several modern poets.	• After successful completion of this course the student will understand the nature and difference of Vaishnava and Shakta terms. Will be able to understand the female empowerment aspect of Madhusudan's Veerangana Kavya. And reading some modern poetry will develop an idea about modern poetry.
I	**II**	**AECC Core**	**AECC MIL-1**	CL-1: Poems and DSC-1BT: Poetry short stories	This course consists of five selected modern poetry and five selected short story texts.	• After successful completion of this course the student will be able to understand and interpret the themes of modern poetry and short stories. They will develop new analytical skills and new perspectives.
II	**III**	**Core-3**	**BNGG DSC-1C**	DSC-1CT: Bengali fiction, drama and essays.	The course consists of one historical play, five selected essays, six selected short stories, and one novel text.	• After successful completion of this course, a student will be able to appreciate various aspects of literature through reading and interpretation of different forms of literature such as plays, short stories and novels. Interest in literature will develop in them. New perspectives will develop.
II	**III**	**SEC**	**BNGG SEC-1**	SEC1T: Improve writing skills	It is basically a course for skill enhancement and development, with a practical aspect.	• After successful completion of this course a student will be able to develop ideas and concepts, write useful newspaper reports. Can write paragraphs. Can write formal letters. Apart from this will also be able to write

						advertisement drafts.
II	**IV**	**Core-4**	**BNGG DSC-1D**	DSC-1DT: Literary theory and literary construction	This course includes texts on grammar-phonetics as well as Bengali rhythm and Bengali rhetoric.	• After successful completion of this course a student will develop a sense of chemistry. A sense of rhythm will be created in it. He will be able to correctly read a poem and determine the rhythm of the poem by matching the rhythm and melody. Apart from this one will also gain knowledge about the embellishments that enhance the beauty of words.
II	**IV**	**SEC**	**BNGG SEC-2**	SEC2T: Bengali phonetics and Bengali morphology	This course covers topics like Bengali vowels, consonants and sound change patterns and Bengali grammar prefixes, suffixes and inflections.	• After successful completion of this course, a student will know the definition and classification of Bengali sounds as well as the various patterns and formulas of sound change. Besides this he will be able to determine the suffixes of Bengali grammar. Can identify divisions.
II	**IV**	**AECC Core**	**AECC MIL-1**	CL-1: Nineteenth century Bengali essays and folklore	This course includes essays of five different flavours and Mymensingh lyricist Mahua Pala.	• After successful completion of this course students will be able to interpret and analyze essays. A new logic will develop in them.
III	**V**	**DSE-1A**	**BNGG DSE-1A**	DSE1AT: Bengali drama and poetry	This course includes a historical play by Madhusudan and six modern poems.	• After successful completion of this course the student will be able to analyze the form of historical novels. Will be able to link past history with the present. Be able to interpret and analyze modern poetry.
III	**V**	**SEC**	**BNGG SEC-3**	SEC3T: Style, poetic style judgement, prose style and	This course includes discussion of various aspects of style.	• After successful completion of this course a student will be able to analyze any genre of literature.

				drama style judgement		
III	**V**	**GE**	**BNGG GE-1**	GE1T: Children's literature and detective stories	This course includes the children's book 'Rajkahini' by Abanindranath Tagore and the story book 'Se' by Rabindranath.	• After successful completion of this course students will be able to acquire their basic knowledge of children's literature and detective stories.
III	**VI**	**DSE-1B**	**BNGG DSE-1B**	DSE1BT: Novels and short stories	The course includes five short stories and a novel 'Radha' by Tarashankar Bandyopadhyay.	• After successful completion of this course a student will be able to interpret and analyze novels and short stories.
III	**VI**	**SEC**	**BNGG DSE-4**	SEC4T: Presentation of thematic discussions and discussion papers	This course includes project paper writing and project presentation	• After successful completion of this course students will be able to write project papers and present the written project papers.
III	**V**	**GE**	**BNGG GE-2**	GE2T: Essays and Literary Approaches	The course includes four selected essays and literary criticism methods.	• After successfully completing this course a student essay; Be able to interpret and analyze. Apart from this, they will be able to analyze the forms of Romanticism, Classicism, Tragedy, Comedy, Lyric, Elegy, Regional novels and relate the topics with Bengali and foreign literature.

Name of the Programme	**B.A. 4-Year (Honours) in Bengali [Under Curriculum & Credit Framework for Undergraduate Programmes (CCFUP-2023 & NEP-2020)]**
Year of Introduction	**2023-24**

Year	**Semester**	**Course Type**	**Course Code**	**Core Course Title**	**Programme Specific Outcome**	**Course Outcome**
I	**I**	**Major-1**	**BENHMJ101**	Bengali land, Bengali race and Bengali language identity	This course includes the history of the identity of the land of Bengal and the origin of the Bengali nation, the origin of the Bengali language and	After completing this course, you will know the cultural, socio-economic, political and geographical identity of the territory of Bengal.

					its different levels, Bengali dialects, vernaculars, Bengali vowels, consonants, causes and formulas of sound change, overtones, international phonetic alphabet, Bengali vocabulary, causes and trends of semantic change, Bengali word identity, suffixes and suffixes, factors and division, gender, vocab society etc.	You will know the history of the origin of the Bengali nation. Learn about the different levels of Bengali language, the period of that level, its linguistic features, and different literary patterns. You will know the definition of various categories and categories of Bengali vowels and consonants. Learn about various causes and trends of sound change and syllabic change. Be able to relate yourself with the words spoken in the current environment. Understanding of various essential elements of Bengali grammar like dhatu, affixes, factor and division, gender, vocative, samas, which will help the student to acquire accurate and meaningful Bengali education in future life.
I	**I**	**SEC**	**BENSSEC01**	Bengali DTP and Proofreading	This course includes two important subjects like Bengali DTP and Proof Reading.	After successful completion of this course a student will know the use of Corel Draw, PageMaker and Adobe Photoshop software associated with Bengali publishing, which can be his future career. At the same time the student can earn a living by becoming a skilled proof reader.
I	**I**	**Minor BEN (Disc-1)**	**BENMI101**	Origin of Bengali language; Development and linguistic identity	This course includes the origin of the Bengali language and its different levels, Bengali dialects, vernaculars, Bengali vowels, consonants, causes and formulas of sound change, overtones, international phonetic alphabet, Bengali vocabulary, causes and trends of semantic change etc.	After completing this course, students will know the know the history of the origin of the Bengali nation. Learn about the different levels of Bengali language, the period of that level, its linguistic features, and different literary patterns. You will know the definition of various categories and categories of Bengali vowels and

						consonants. Learn about various causes and trends of sound change and syllabic change. Be able to relate yourself with the words spoken in the current environment.
I	**II**	**Major-2**	**BENHMJ102**	General introduction to Bengali religion and culture and Bengali literature	The subjects covered in this course are History of Buddhism-Vaishnava-Natha-Sakta-Sufi-Baul sects. General identity of Bengali food habits, clothing, festivals, social customs and events. This course has a detailed introduction to the ancient and medieval literature of Bengal. The modern period includes a history of nineteenth- and twentieth-century prose and essays, poetry, novels, and short stories.	After successful completion of this course, a student will know about the religious practices of Buddhist-Vaishnava-Nath-Sufi sects, their food habits, lifestyle, dress and festivals. Apart from this, one can learn about the discovery, publishing and writing period, social life and sadhantattva of the only literary artifacts of the ancient era. In addition to this The student will learn about the form and variety of medieval and modern poetry, drama and fiction, which will enable him to develop a well-rounded idea of literature.
I	**II**	**SEC**	**BENSSEC02**	Report writing, newspaper reading and briefings	This course includes topics like report writing, newspaper reading and instant messaging.	After successful completion of this course a student will be able to write useful newspaper reports, will be able to carry news in various news channels. Overall, a student can choose journalism as his future career by doing this course.
I	**II**	**Minor BEN (Disc-2)**	**BENM102**	General introduction to Bengali religion and culture and Bengali literature	The subjects covered in this course are History of Buddhism-Vaishnava-Natha-Sakta-Sufi-Baul sects. General identity of Bengali food habits, clothing, festivals, social customs and events. This course has a detailed introduction to the ancient and medieval literature of Bengal. The modern period includes a	After successful completion of this course, a student will know about the religious practices of Buddhist-Vaishnava-Nath-Sufi sects, their food habits, lifestyle, dress and festivals. Apart from this, one can learn about the discovery, publishing and writing period, social life and sadhantattva of the only literary artifacts of the

					history of nineteenth- and twentieth-century prose and essays, poetry, novels, and short stories.	ancient era. In addition to this The student will learn about the form and variety of medieval and modern poetry, drama and fiction, which will enable him to develop a well-rounded idea of literature.
Name of the Programme				**B.A. 3-Year (MDP) in Bengali [Under Curriculum & Credit Framework for Undergraduate Programmes (CCFUP-2023 & NEP-2020)]**		
Year of Introduction				**2023-24**		
I	**I**	**Major-1 (Disc-A1)**	**BENHMJ101**	Origin and evolution of Bengali language	Bengali land, Bengali race and Bengali language identity	This course includes the history of the identity of the land of Bengal and the origin of the Bengali nation, the origin of the Bengali language and its different levels, Bengali dialects, vernaculars, Bengali vowels, consonants, causes and formulas of sound change, overtones, international phonetic alphabet, Bengali vocabulary, causes and trends of semantic change, Bengali word identity, suffixes and suffixes, factors and division, gender, vocab society etc.
I	**I**	**SEC**	**SEC01**	Bengali DTP and Proofreading	This course includes two important subjects like Bengali DTP and Proof Reading.	After successful completion of this course a student will know the use of Corel Draw, PageMaker and Adobe Photoshop software associated with Bengali publishing, which can be his future career. At the same time the student can earn a living by becoming a skilled proof reader.
I	**I**	**Minor-1**	**BENMI-01/C1**	Origin of	This course includes the origin of the	After completing this course, students

		(Disc.-C1)		Bengali language; Development and linguistic identity	Bengali language and its different levels, Bengali dialects, vernaculars, Bengali vowels, consonants, causes and formulas of sound change, overtones, international phonetic alphabet, Bengali vocabulary, causes and trends of semantic change etc.	will know the know the history of the origin of the Bengali nation. Learn about the different levels of Bengali language, the period of that level, its linguistic features, and different literary patterns. You will know the definition of various categories and categories of Bengali vowels and consonants. Learn about various causes and trends of sound change and syllabic change. Be able to relate yourself with the words spoken in the current environment.
I	**II**	**Major-2 (Disc-B1)**	**BENHMJ101**	General introduction to Bengali religion and culture and Bengali literature	The subjects covered in this course are History of Buddhism-Vaishnava-Natha-Sakta-Sufi-Baul sects. General identity of Bengali food habits, clothing, festivals, social customs and events. This course has a detailed introduction to the ancient and medieval literature of Bengal. The modern period includes a history of nineteenth- and twentieth-century prose and essays, poetry, novels, and short stories.	After successful completion of this course, a student will know about the religious practices of Buddhist-Vaishnava-Nath-Sufi sects, their food habits, lifestyle, dress and festivals. Apart from this, one can learn about the discovery, publishing and writing period, social life and sadhantattva of the only literary artifacts of the ancient era. In addition to this The student will learn about the form and variety of medieval and modern poetry, drama and fiction, which will enable him to develop a well-rounded idea of literature.
I	**II**	**SEC**	**SEC02**	Report writing, newspaper reading and briefings	This course includes topics like report writing, newspaper reading and instant messaging.	After successful completion of this course a student will be able to write useful newspaper reports, will be able to carry news in various news channels. Overall, a student can choose journalism as his future career by doing this course.

I	**II**	**Minor-1 (Disc.-C1)**	**BENMI-02**	General introduction to Bengali religion and culture and Bengali literature	The subjects covered in this course are History of Buddhism-Vaishnava-Natha-Sakta-Sufi-Baul sects. General identity of Bengali food habits, clothing, festivals, social customs and events. This course has a detailed introduction to the ancient and medieval literature of Bengal. The modern period includes a history of nineteenth- and twentieth-century prose and essays, poetry, novels, and short stories.	After successful completion of this course, a student will know about the religious practices of Buddhist-Vaishnava-Nath-Sufi sects, their food habits, lifestyle, dress and festivals. Apart from this, one can learn about the discovery, publishing and writing period, social life and sadhantattva of the only literary artifacts of the ancient era. In addition to this The student will learn about the form and variety of medieval and modern poetry, drama and fiction, which will enable him to develop a well-rounded idea of literature.

3-YEAR BA HONOURS IN ENGLISH

PROGRAMME SPECIFIC OUTCOME

The **THREE-YEAR DEGREE COURSE WITH HONOURS IN ENGLISH** will help the learners acquire the following skills and aptitudes—

- ★ Proficiency in literary analysis with advanced theories and methodologies.
- ★ Effective written and oral communication skills.
- ★ Advanced research abilities for independent projects.
- ★ Deep understanding of cultural and historical contexts of literature.
- ★ Development of creative and critical thinking skills.
- ★ High-level writing proficiency across various formats.
- ★ Recognition of interdisciplinary connections with other fields.
- ★ Engagement with global perspectives and ethical considerations.
- ★ Competence in utilizing digital tools for literary analysis and research.
- ★ Preparation for diverse career paths in fields such as teaching, publishing, and journalism.

CC-1: British Poetry and Drama: Beginning to 14th Century and History of English Language **Credits 06**

Course Outcomes:

Upon successful completion of the course, learners will achieve the following:

- Gain a thorough understanding of Old English literature, including poetry and prose, as well as iconic works such as "Beowulf," enabling them to analyze and appreciate early British literary traditions.
- Develop insights into the literary and cultural significance of Chaucer's "The Wife of Bath’s Prologue," exploring themes of gender, class, and societal norms prevalent during the Middle Ages.
- Acquire knowledge of the historical development of the English language, tracing its influences from Greek, Latin, Scandinavian, and French sources, and understanding how these linguistic dynamics shaped early English literature.
- Enhance their critical thinking skills through the examination of primary texts and secondary sources, allowing for deeper analysis and interpretation of literary and linguistic phenomena.
- Cultivate interdisciplinary perspectives by integrating the study of literature and philology, fostering a holistic understanding of the historical, cultural, and linguistic contexts that underpin the development of British literature and the English language.

CC-2: British Poetry and Drama: Renaissance to 17th and 18th Centuries **Credits 06**

Course Outcomes:

Upon successful completion of the course, learners will achieve the following:

1. Develop a nuanced understanding of British poetry and drama from the Renaissance to the 17th and 18th centuries, exploring seminal works by

renowned authors such as Edmund Spenser, William Shakespeare, John Donne, Milton, Pope, and Christopher Marlowe.

2. Analyze and interpret a variety of poetic forms and techniques, including sonnets, epic poetry, and mock-heroic satire, enhancing their appreciation for the diverse range of literary expressions prevalent during this period.

3. Gain insights into the thematic, stylistic, and philosophical aspects of Renaissance and Enlightenment literature, including themes of love, morality, power, and human nature, through the study of key texts such as "Paradise Lost" and "Rape of the Lock."

4. Acquire proficiency in literary terms and concepts related to poetry and drama, such as allegory, blank verse, tragic flaw, and dramatic irony, enabling them to critically engage with and analyze literary texts with precision and depth.

5. Develop critical thinking skills by examining the socio-cultural and historical contexts of literary production during the Renaissance and Enlightenment periods, fostering a deeper understanding of the interplay between literature, society, and intellectual trends of the time.

CC-3: British Literature (fiction and non-fiction): 18th Century

Credits 06

Course Outcomes:

Upon successful completion of the course, learners will achieve the following:
1. Develop a comprehensive understanding of British literature from the 18th century, encompassing both fiction and non-fiction genres, through the study of influential works by renowned authors.
2. Analyze and interpret significant literary texts of the period, including William Congreve's comedic play "The Way of the World" and Jonathan Swift's satirical masterpiece "Gulliver’s Travels," with a focus on themes, characters, and narrative techniques.

3. Explore the socio-political and cultural contexts of 18th-century Britain by examining non-fiction prose works such as Addison and Steele's essay "Sir Roger at Church," gaining insights into contemporary society, manners, and values.
4. Engage critically with innovative narrative techniques and metafictional elements in Laurence Sterne's experimental novel "The Life and Opinions of Tristram Shandy, Gentleman," deepening their understanding of literary experimentation and narrative complexity in the 18th century.
5. Enhance their analytical and interpretive skills through close reading, discussion, and written assignments, fostering a deeper appreciation for the rich literary heritage of the 18th-century British literature and its enduring relevance to contemporary literary studies.

CC-4: British Romantic Literature (1798-1832) Credits 06

Course Outcomes:
Upon successful completion of the course, learners will achieve the following:

1. Develop a comprehensive understanding of British Romantic literature from the period 1798-1832, exploring key themes, stylistic features, and historical contexts prevalent in poetry and novels of the era.
2. Analyze and interpret seminal works of Romantic poetry, including William Blake's evocative poems "The Lamb" and "The Tyger," William Wordsworth's introspective "Tintern Abbey," and Percy Bysshe Shelley's enigmatic "Ozymandias," examining their exploration of nature, imagination, and the human condition.

3. Engage with Samuel Taylor Coleridge's Gothic masterpiece "Christabel" Part-1, delving into its themes of supernaturalism, suspense, and the uncanny, and gaining insights into the Romantic fascination with the mysterious and the sublime.

4. Examine the thematic richness and narrative complexities of two influential novels of the Romantic period, Mary Shelley's groundbreaking work "Frankenstein" and Jane Austen's beloved classic "Pride and Prejudice," exploring their treatment of social, cultural, and philosophical issues characteristic of the era.
5. Enhance their critical thinking and analytical skills through close reading, textual analysis, and scholarly discussion, fostering a deeper appreciation for the diversity and significance of British Romantic literature and its enduring legacy in literary history.

CC5T: British Literature: 19th Century (1832-1900) Credits 06

Course Outcomes:

After successful completion of the course the students should be able to—

1. Analyze and interpret selected poems from the Victorian period by Alfred Tennyson, Robert Browning and Matthew Arnold, including “Ulysses,” “My Last Duchess,” “The Last Ride Together,” and “Dover Beach”, examining their thematic concerns, stylistic features, and contributions to Victorian poetry.
2. Evaluate the cultural, social, and political contexts of the Victorian era as reflected in the selected poems, considering their responses to issues such as industrialization, religion, morality, gender, and the changing nature of society.
3. Examine the poetic techniques and forms employed by the Victorian poets, including dramatic monologue, lyricism, and symbolism, and analyze how these contribute to the overall meaning and effect of the poems.
4. Compare and contrast the thematic concerns and stylistic approaches of the Victorian poets, identifying common themes such as human

experience, mortality, faith, and the search for meaning, as well as differences in their perspectives and literary techniques.

5. Interpret and analyze Charles Dickens's novel "Hard Times" exploring its narrative structures, characterizations, and thematic preoccupations within the context of Victorian fiction.
6. Evaluate the significance of the selected novels in the development of the Victorian novel as a literary form, considering their engagement with social issues, moral dilemmas, and psychological complexity.
7. Analyze the representation of Victorian society and culture in the selected novels, including its class divisions, urbanization, industrialization, and the impact of social change on individual lives and relationships.
8. Reflect critically on the enduring relevance of the themes and ideas explored in Victorian literature, considering their implications for contemporary society and culture, and their continued resonance in the 21st century.

CC6T: British Literature: The Early 20th Century **Credits 06**

Course Outcomes:

1. Analyze and interpret selected poems and fiction from the early 20th century by W.B. Yeats, T.S. Eliot, Joseph Conrad, and Katherine Mansfield, including "The Second Coming," "The Wild Swans at Coole," "The Love Song of J. Alfred Prufrock," "The Secret Sharer," and "The Fly," examining their themes, styles, and narrative techniques.
2. Evaluate the cultural, social, and historical contexts of the selected works, considering how they reflect the literary movements and concerns of the early 20th century, including modernism.
3. Examine the formal and stylistic features of poetry and fiction, including imagery, symbolism, narrative structure, and characterization, as well as the ways in which these forms engage with their audiences.

4. Compare and contrast the thematic concerns and artistic approaches of the poets and fiction writers studied, identifying common themes such as alienation, identity, existentialism, and the human condition, as well as differences in their perspectives and literary techniques.
5. Interpret and analyze the selected works within the broader context of literary modernism, considering their contributions to the development of poetry and fiction in the early 20th century.
6. Evaluate the significance of the selected works in the context of the literary canon, considering their enduring relevance and impact on subsequent generations of writers and readers.
7. Explore topics such as modernism and non-European cultures, and the women's movement in the early 20th century through background prose readings and class presentations, enhancing understanding of the socio-cultural milieu in which the literature of this period was produced.
8. Reflect critically on the ways in which poetry and fiction from the early 20th century engage with and respond to the tumultuous social, political, and cultural changes of the time, including the influence of non-European cultures and the evolving role of women in society.
9. Develop skills in close reading, textual analysis, and critical interpretation through engagement with the selected works and supplementary readings, enhancing overall proficiency in literary analysis and appreciation.

CC-7: American Literature **Credits 06**

Course Outcomes:

1. Analyze and interpret a diverse selection of American literature, spanning poetry, short stories, novels, and plays, showcasing the breadth and depth of American literary tradition.

2. Evaluate the socio-cultural, historical, and political contexts embedded within the selected works, elucidating the multifaceted layers of American identity and experience.
3. Examine the unique stylistic and thematic elements present in each genre, fostering an appreciation for the versatility and innovation within American literary expression.
4. Compare and contrast the thematic threads and artistic approaches across different authors and genres, revealing both commonalities and distinctiveness in their treatment of themes such as identity, social justice, and the American Dream.
5. Interpret the selected works within the larger framework of American literary traditions, recognizing their contributions to shaping the American literary canon and influencing subsequent generations of writers.
6. Evaluate the enduring significance and impact of the selected works on American culture and society, considering their resonance with contemporary issues and concerns.
7. Explore interdisciplinary themes and topics through supplementary readings and class presentations, enriching understanding of the broader historical, cultural, and social contexts surrounding American literature.
8. Reflect critically on the ways in which American literature reflects and responds to the dynamic complexities of the American experience, including the exploration of race, class, gender, and cultural identity.
9. Develop advanced analytical and interpretive skills through close reading, textual analysis, and critical engagement with the selected works, enhancing overall proficiency in literary analysis and appreciation.

CC-8: European Classical Literature **Credits 06**

Course Outcomes:

1. Analyze canonical works from European classical literature, spanning epic poetry, drama, and satire, showcasing the rich diversity and enduring relevance of classical literary traditions.
2. Evaluate the thematic and stylistic intricacies embedded within the selected texts, illuminating the complexities of human experience and societal dynamics depicted in classical literature.
3. Examine the dramatic conventions and narrative structures characteristic of classical drama, fostering an appreciation for the nuanced interplay between comedy and tragedy in theatrical performance.
4. Compare and contrast the socio-political contexts of ancient Greece and Rome, elucidating the cultural and historical significance of the Athenian city-state and literary cultures in Augustan Rome.
5. Interpret the concept of catharsis and mimesis within the context of classical literature, exploring their psychological and aesthetic implications in the portrayal of human emotions and actions.
6. Investigate the use of satire as a literary device in classical literature, discerning its role in social critique and political commentary within the ancient Greco-Roman world.
7. Explore interdisciplinary themes and topics through supplementary readings and class presentations, enriching understanding of the broader cultural, historical, and philosophical contexts surrounding classical literature.
8. Reflect critically on the enduring legacy and influence of European classical literature on subsequent literary traditions, considering its resonance with contemporary literary and artistic expressions.
9. Develop advanced analytical and interpretive skills through close reading, textual analysis, and critical engagement with the selected

works, enhancing overall proficiency in literary analysis and appreciation.

CC-9: Modern European Drama **Credits 06**

Course Outcomes:

1. Analyze seminal works of modern European drama by Henrik Ibsen, Bertolt Brecht, and Samuel Beckett, exploring their thematic depth and innovative theatrical techniques.
2. Investigate the intersection of politics, social change, and dramatic representation, discerning the ways in which modern European playwrights engage with contemporary socio-political issues on stage.
3. Examine the dynamic relationship between text and performance in modern European drama, considering how theatrical elements contribute to the overall meaning and impact of the works.
4. Explore the evolution of European drama from realism to experimental forms, appreciating the diversity of approaches and styles employed by modern playwrights.
5. Evaluate the portrayal of tragedy and heroism in modern European drama, analyzing how these concepts are redefined and subverted in the context of 20th-century European society.
6. Investigate the characteristics and themes of the Theatre of the Absurd, a distinctive movement within modern European drama, and its exploration of existential themes and absurdity.
7. Engage with supplementary readings on topics such as politics, social change, realism, and the Theatre of the Absurd, deepening understanding of the cultural, historical, and philosophical contexts surrounding modern European drama.

8. Reflect critically on the ways in which modern European playwrights challenge theatrical conventions and push the boundaries of dramatic representation, considering their contributions to the broader landscape of European literature and culture.
9. Develop advanced analytical and interpretive skills through close reading, textual analysis, and critical engagement with modern European drama, enhancing overall proficiency in literary analysis and appreciation.

CC-10: Popular Literature **Credits 06**

Course Outcomes:

1. Analyze works of popular literature from diverse cultural backgrounds, including novels, children's literature, and graphic novels, exploring their thematic richness and narrative techniques.
2. Investigate the theme of coming of age in popular literature, examining how protagonists navigate personal growth, identity formation, and societal expectations.
3. Examine the interplay between the canonical and the popular in literature, considering how popular works interact with and challenge established literary conventions and traditions.
4. Explore issues of caste, gender, and identity in popular literature, analyzing how these themes are depicted and addressed in narratives aimed at diverse audiences.
5. Evaluate the ethical and educational dimensions of children's literature, discerning how literature for young readers engages with moral dilemmas, social values, and educational objectives.
6. Investigate the role of humor, absurdity, and fantasy in popular literature, analyzing how works of humor and nonsense challenge

conventional storytelling norms and offer alternative perspectives on reality.

7. Engage with the graphic novel as a unique form of popular literature, considering its visual and narrative elements, as well as its capacity to address complex themes and appeal to diverse audiences.
8. Reflect critically on the ways in which popular literature reflects and shapes cultural norms, values, and ideologies, considering its impact on readers' perceptions and worldviews.
9. Develop advanced analytical and interpretive skills through close reading, textual analysis, and critical engagement with popular literature, enhancing overall proficiency in literary analysis and appreciation.

CC-11: Postcolonial Literatures **Credits 06**

Course Outcomes:

1. Analyze postcolonial literature from diverse cultural backgrounds, including poetry, novels, and short stories, exploring their thematic richness and narrative techniques.
2. Investigate the intersections of decolonization, globalization, and literature, examining how postcolonial writers negotiate the legacy of colonialism and the challenges of a globalized world.
3. Examine the role of literature in shaping and contesting identity politics, considering how postcolonial writers explore issues of identity, belonging, and cultural hybridity.
4. Explore the complexities of writing for a new world audience, analyzing how postcolonial writers navigate linguistic, cultural, and audience expectations in their literary productions.

5. Evaluate the ways in which postcolonial literature engages with questions of region, race, and gender, considering the intersections of power, privilege, and marginalization in postcolonial societies.
6. Investigate the diverse forms and styles employed in postcolonial literature, discerning how writers experiment with narrative techniques and literary forms to express their unique cultural and historical perspectives.
7. Engage with supplementary readings on topics such as globalization, identity politics, and questions of form in postcolonial literature, deepening understanding of the socio-political and cultural contexts surrounding postcolonial literary production.
8. Reflect critically on the ways in which postcolonial literature reflects and responds to the legacies of colonialism, considering its role in reshaping narratives of history, identity, and power.
9. Develop advanced analytical and interpretive skills through close reading, textual analysis, and critical engagement with postcolonial literature, enhancing overall proficiency in literary analysis and appreciation.

CC-12: Women's Writing **Credits 06**

Course Outcomes:

1. Analyze women's writing across various genres, including poetry, fiction, and non-fiction, exploring the diverse voices and perspectives within the literary landscape.
2. Investigate the confessional mode in women's writing, examining how authors use personal experiences and emotions to address broader social, political, and existential themes.
3. Examine the portrayal of sexual politics in women's literature, considering how writers explore issues of gender identity, sexuality, power dynamics, and patriarchal structures.

4. Explore the intersections of race, caste, and gender in women's writing, analyzing how authors navigate the complexities of identity and oppression within intersecting systems of discrimination.
5. Evaluate the role of women's writing in social reform and the fight for women's rights, considering how literature serves as a platform for advocacy, empowerment, and social change.
6. Engage with supplementary readings on topics such as the confessional mode, sexual politics, race, caste, and gender in women's writing, deepening understanding of the socio-political and cultural contexts surrounding women's literary production.
7. Reflect critically on the ways in which women's writing challenges dominant narratives and expands our understanding of gender roles, power dynamics, and social justice issues.
8. Develop advanced analytical and interpretive skills through close reading, textual analysis, and critical engagement with women's literature, enhancing overall proficiency in literary analysis and appreciation.

CC-13: Indian Classical Literature **Credits 06**

Course Outcomes:

1. Analyze Indian classical literature from various periods, including epic poetry and classical drama, exploring the thematic depth and literary techniques employed by renowned authors.
2. Investigate the Indian epic tradition, examining themes and recensions within works such as the Mahabharata and Abhijnana Shakuntalam, and discerning their cultural and philosophical significance.

3. Examine the theory and practice of classical Indian drama, considering the structural elements, narrative conventions, and performative aspects of plays like Mrcchakatika.
4. Explore the concepts of alankara (ornamentation) and rasa (aesthetic essence) in Indian literary theory, analyzing their role in shaping the emotional and aesthetic experiences of readers and audiences.
5. Evaluate the depiction of dharma (duty/righteousness) and the heroic ideal in Indian classical literature, considering how these concepts are represented and interrogated in epic narratives and dramatic performances.
6. Engage with supplementary readings on topics such as Indian epic tradition, classical drama, alankara, rasa, and dharma, enhancing understanding of the socio-cultural and philosophical contexts surrounding Indian classical literature.
7. Reflect critically on the enduring relevance and cultural significance of Indian classical literature, considering its impact on Indian literary traditions and its resonance with contemporary audiences.
8. Develop advanced analytical and interpretive skills through close reading, textual analysis, and critical engagement with Indian classical texts, enhancing overall proficiency in literary analysis and appreciation.

CC-14: Indian Writing in English **Credits 06**

Course Outcomes:

1. Analyze works of Indian writing in English across various genres, including poetry, fiction, and drama, exploring the thematic depth and narrative techniques employed by prominent authors.

2. Investigate the unique characteristics of Indian English, considering its linguistic nuances, cultural influences, and evolving identity within the broader landscape of world literature.
3. Examine the readership of Indian English literature, exploring its reception among diverse audiences and its role in shaping cultural identities and literary sensibilities.
4. Explore the themes and contexts of the Indian English novel, analyzing how writers like R.K. Narayan and Mulk Raj Anand depict social, political, and cultural realities in their works.
5. Evaluate the aesthetics of Indian English poetry, considering the fusion of Western poetic traditions with indigenous themes, imagery, and linguistic elements in poems by H.L.V. Derozio, Kamala Das, and Nissim Ezekiel.
6. Examine the influence of modernism on Indian English literature, analyzing how writers like Salman Rushdie and Girish Karnad experiment with narrative techniques, themes, and forms to reflect the complexities of modern Indian society.
7. Engage with supplementary readings on topics such as Indian English literature, its readership, themes, and aesthetics, deepening understanding of the socio-cultural and historical contexts surrounding Indian writing in English.
8. Reflect critically on the ways in which Indian writing in English reflects and responds to the diverse experiences, identities, and cultural landscapes of India, considering its impact on both Indian and global literary traditions.
9. Develop advanced analytical and interpretive skills through close reading, textual analysis, and critical engagement with Indian writing in English, enhancing overall proficiency in literary analysis and appreciation.

DSE-1: Nineteenth Century European Realism **Credits 06**

Course Outcomes:

1. Analyze key works of nineteenth-century European realism, focusing on novels by Fyodor Dostoyevsky and Gustave Flaubert, to understand the complexities of human nature and societal structures depicted in realist literature.
2. Investigate the historical context of European realism and its influence on the development of the novel form, examining how authors like Dostoyevsky and Flaubert use realism to represent the social, political, and economic realities of their time.
3. Examine the ethical dilemmas presented in realist novels, considering how characters grapple with moral choices and the consequences of their actions within the framework of nineteenth-century societal norms and values.
4. Explore the relationship between the novel and its readership in the nineteenth century, analyzing how realist authors engage with their audiences and address contemporary social concerns and cultural anxieties.
5. Investigate the political dimensions of the Russian novel, particularly the tensions between Slavophiles and Westernizers, and their impact on the themes, ideologies, and narrative strategies employed by Russian realist writers like Dostoyevsky.
6. Engage with supplementary readings on topics such as history, ethics, politics, and the novel form in nineteenth-century European realism, deepening understanding of the socio-cultural and historical contexts surrounding realist literature.
7. Reflect critically on the ways in which nineteenth-century European realist novels reflect and critique the social and moral landscapes of their

time, considering their enduring relevance and impact on subsequent literary traditions.

8. Develop advanced analytical and interpretive skills through close reading, textual analysis, and critical engagement with realist novels, enhancing overall proficiency in literary analysis and appreciation.

DSE-2: World Literatures **Credits 06**

Course Outcomes:

1. Analyze diverse works of world literature, including novels, short stories, and poetry, by authors such as V.S. Naipaul, Julio Cortazar, and Judith Wright, exploring the global dimensions of literary expression.
2. Investigate the concept of world literature, considering its implications for understanding cultural exchange, literary influence, and the interconnectedness of human experiences across geographical and temporal boundaries.
3. Examine themes of memory, displacement, and diaspora in world literature, analyzing how authors negotiate issues of identity, belonging, and cultural hybridity in their narratives.
4. Explore representations of hybridity, race, and culture in world literature, considering how authors challenge essentialist notions of identity and engage with the complexities of multiculturalism and globalization.
5. Investigate the adult reception of children's literature in a global context, analyzing how children's literature serves as a site for exploring universal themes and values that resonate across generations and cultures.
6. Examine the role of literary translation in facilitating the circulation of literary texts across linguistic and cultural borders, considering the

challenges and opportunities it presents for enhancing intercultural understanding and appreciation.

7. Reflect on the intersection of aesthetics and politics in poetry from around the world, analyzing how poets negotiate the complexities of artistic expression and social critique within their works.
8. Engage with supplementary readings on topics such as the idea of world literature, memory, diaspora, literary translation, and the politics of poetry, deepening understanding of the diverse cultural, historical, and ideological contexts surrounding world literary production.
9. Develop advanced analytical and interpretive skills through close reading, textual analysis, and critical engagement with world literature, enhancing overall proficiency in literary analysis and appreciation.

DSE-3: Science Fiction and Detective Literature **Credits 06**

Course Outcome:

- Analyze the themes and narrative techniques employed in science fiction and detective literature through close examination of Wilkie Collins' "The Woman in White" and Arthur Conan Doyle's "The Hound of the Baskervilles."
- Investigate the portrayal of crime across different forms of media, examining how literature reflects and intersects with other cultural representations of criminality.
- Examine the construction of criminal identity in detective fiction, considering how authors develop characters and plotlines to explore the complexities of morality and justice.
- Explore the role of cultural stereotypes in shaping narratives of crime fiction, analyzing how authors engage with and challenge prevalent cultural assumptions and biases.

- Reflect on the ethical implications of crime fiction, considering how the genre addresses issues of justice, morality, and societal norms, and the potential impact of censorship on literary expression.

DSE-3: Literature and Cinema **Credits 06**

Course Outcome:

- Analyze the process of adaptation in literature and cinema through the study of works such as William Shakespeare's "Romeo and Juliet" and its film adaptations directed by Franco Zeffirelli and Baz Luhrmann.
- Explore the concepts of transformation and transposition in adaptation, examining how stories are translated from one medium to another while maintaining or altering their thematic elements, characters, and settings.
- Investigate the influence of Hollywood and Bollywood on the adaptation process, considering how cultural, economic, and aesthetic factors shape the representation of literary works on screen.
- Examine the idea of "Two Ways of Seeing" in adaptation, analyzing how different filmmakers interpret and present the same source material through distinct cinematic styles, narrative techniques, and cultural lenses.
- Reflect on adaptation as interpretation, considering how filmmakers engage with and interpret literary texts to create new artistic expressions that resonate with contemporary audiences.

DSE - 4: Partition Literature **Credits 06**

Course Outcomes:

- Analyze representations of the Partition of India in literature through the study of works such as Amitav Ghosh's "The Shadow Lines" and short stories by authors like Dibyendu Palit, Manik Bandopadhyay, Sa'adat Hasan Manto, and Jibananda Das.

- Explore the themes of colonialism, nationalism, and the Partition, considering how these historical forces shaped the socio-political landscape of the Indian subcontinent and influenced literary representations of the Partition experience.
- Examine the manifestations of communalism and violence in Partition literature, analyzing how authors depict inter-community conflicts, riots, and the human cost of partitioning.
- Investigate themes of homelessness and exile in Partition literature, reflecting on the displacement, trauma, and loss experienced by individuals and communities as a result of the Partition.
- Discuss the portrayal of women in Partition literature, considering their experiences of violence, displacement, and resilience, and exploring how gender intersects with other dimensions of identity in the Partition narrative.

SEC-1: Soft Skills **Credits 02**

Course Outcomes:

- Define and explore key soft skills such as teamwork, adaptability, leadership, and problem-solving, emphasizing their importance in personal and professional development.
- Enhance soft skills through practical exercises like précis writing, comprehension tasks, and essay compositions, fostering effective communication and problem-solving abilities.

SEC-2: Creative Writing **Credits 02**

Course Outcomes:

- Define the concept of creative writing and discuss its significance as a form of self-expression and literary artistry.

- Explore the art and craft of writing through various units covering different modes of creative writing, including writing for different media and preparing work for publication.

GE- 1: Academic Writing and Composition Credits 06

Course Outcomes:

Upon successful completion of the course, learners will be able to:

- Demonstrate proficiency in academic writing by applying the writing process and adhering to conventions of scholarly communication.
- Effectively summarize and paraphrase information while maintaining academic integrity and avoiding plagiarism.
- Engage in critical thinking by synthesizing information, analyzing texts, and evaluating arguments in an academic context.
- Structure compelling arguments by organizing essays with clear introductions, well-supported body paragraphs, and concise conclusions.
- Accurately cite sources, edit written work for clarity and coherence, and craft insightful book and media reviews, contributing effectively to academic discourse.

GE- 2: Media and Communication Skills Credits 06

Course Outcomes:

Upon successful completion of the course, learners will achieve the following:

- Develop a comprehensive understanding of mass communication and its role in globalization, including an awareness of various forms of mass communication such as print, broadcast, and digital media.
- Acquire knowledge of advertising principles and ethics, along with practical skills in creating advertisements and storyboards, enabling them to design effective advertising campaigns.

- Master media writing techniques, including scriptwriting for television and radio, news reporting, and editorial writing for print and online media, enhancing their ability to communicate effectively across different media platforms.
- Gain proficiency in utilizing social media platforms and cyber media, recognizing their impact on society and learning to navigate them ethically and responsibly for communication and information dissemination purposes.

GE- 3: Contemporary India: Women and Empowerment Credits 06

Course Outcomes:

Upon successful completion of the course, learners will achieve the following:

- Gain an understanding of the social construction of gender and patriarchy in Indian history, exploring concepts of masculinity, femininity, and the impact of patriarchal structures on society.
- Develop knowledge of women's legal rights and their intersection with the Indian Constitution, including an examination of personal laws related to inheritance and marriage, supplemented by practical workshops on legal awareness.
- Explore the relationship between women and the environment, examining state interventions, issues such as domestic violence, female foeticide, and sexual harassment, and amplifying female voices through works like "Sultana's Dream" or Bama's "Karukku."

GE - 4: Environment & Literature Credits 06

Course Outcomes:

Upon successful completion of the course, learners will achieve the following:

- Develop an understanding of the relationship between the environment and literature, exploring diverse perspectives on nature from Oriental and Western thought, including concepts such as deep ecology and Third World environmentalism.

- Analyze literary works by G.M. Hopkins, Mahasweta Devi, and Ruskin Bond, examining their representations of nature and environmental themes in texts such as "Binsey Poplars," "Pterodactyl," and "Dust on the Mountains."
- Gain insights into how literature can serve as a medium for environmental awareness and advocacy, fostering appreciation for the natural world and encouraging reflection on human interactions with the environment.

REVISED SYLLABUS WITH EFFECT FROM 2022-2023

Honours

CC-1: History of English Literature and English Language

6 Credit

Course Outcome:

After successful completion of the course, students should be able to—

1. Demonstrate a comprehensive understanding of the historical progression of English literature from its origins to the 20th century, including key literary movements, genres, and authors.
2. Analyze and interpret representative works of Old English poetry, prose, and Middle English literature, such as the works of Chaucer, with attention to their historical and cultural contexts.
3. Evaluate the development of drama, including the works of Shakespeare and other playwrights, and its significance within the context of literary history.
4. Examine the evolution of English poetry, from Elizabethan sonnets to modernist and 20th-century verse, with a focus on major poets and their contributions to literary innovation.
5. Explore the emergence of the novel as a literary form in the 18th century and its subsequent evolution, with particular attention to key works and authors of the Victorian era.
6. Assess the impact of historical events and social changes on literary developments, particularly in relation to the two World Wars and their influence on modernist and post-modernist literature.
7. Investigate the history and development of the English language, including its linguistic influences from Greek, Latin, Scandinavian, and

French, and understand how these influences shaped the language over time.

8. Analyze Chaucer's "The Wife of Bath's Prologue" in terms of its linguistic features, literary techniques, and thematic concerns, within the broader context of medieval literature and society.

CC-2: British Poetry (Renaissance to 18th Century) 6 Credit

Course Outcome:

After successful completion of the course, students should be able to—

1. Analyze and interpret key poems from the Renaissance to the 18th century, including works by Sidney, Spenser, Shakespeare, Donne, Milton, Pope, Marvell, and Gray, with attention to their themes, styles, and historical contexts.
2. Evaluate the use of poetic devices and techniques such as metaphor, imagery, metre, and rhyme scheme in the selected poems, and recognize how these contribute to the overall meaning and effect of the works.
3. Demonstrate an understanding of the cultural, social, and political influences on British poetry during this period, including the impact of Renaissance humanism, religious turmoil, and the rise of neoclassicism.
4. Compare and contrast different poetic forms and styles represented in the selected works, including sonnets, metaphysical poetry, epic poetry, and elegies, and recognize their significance within the literary tradition.
5. Explore the thematic concerns addressed by the poets, such as love, mortality, spirituality, and the human condition, and analyze how these themes are expressed and developed across different poems.
6. Examine the relationship between rhetoric and prosody in poetry, including the use of rhetorical devices and the study of poetic meter, rhyme, and stanzaic structure, to deepen understanding of poetic craftsmanship and artistry.

CC-3: British Drama & Prose (Renaissance to 18th Century)

6 credit

Course Outcomes:

After successful completion of the course, students should be able to—

1. Analyze and interpret a selection of plays from different periods and playwrights, including Marlowe's "Edward II," Shakespeare's "Macbeth" and "Twelfth Night," and Sheridan's "The Rivals," with attention to their dramatic structure, themes, and characterizations.
2. Evaluate the cultural, historical, and social contexts in which the selected plays were written and performed, considering their significance within the broader traditions of English drama and theater.
3. Demonstrate an understanding of the conventions of dramatic genres such as tragedy, comedy, and comedy of manners, as exemplified in the plays studied, and recognize how these genres reflect and critique contemporary society.
4. Examine the representation of power, gender, identity, and morality in the selected plays, and analyze how these themes are developed through character interactions, plot developments, and dramatic devices.
5. Interpret and analyze selected novels from the assigned readings, including Behn's "Oroonoko" or Swift's "Gulliver's Travels" (Books III and IV), exploring their narrative techniques, themes, and social critiques.
6. Compare and contrast the narrative styles, themes, and socio-political commentary of the chosen novels, and consider their relevance within the contexts of colonialism, satire, and Enlightenment thought.
7. Evaluate the significance of the selected essays by Bacon, Addison, and Steele, considering their contributions to the development of the English prose style and their insights into topics such as education, social behavior, and the role of literature in society.

8. Analyze the rhetorical strategies employed by the essayists, including persuasive techniques, wit, irony, and humor, and assess how these contribute to the effectiveness of their arguments and observations.
9. Reflect on the enduring relevance of the themes and ideas explored in the plays, novels, and essays studied, considering their implications for contemporary society and culture.

CC-4: British Literature: Romantic Period **6 Credit**

Course Outcomes:

After successful completion of the course the students are expected to—

1. Analyze and interpret selected poems by the great Romantic poets and their poems focusing on their themes, imagery, and poetic techniques.
2. Evaluate the influence of Romanticism on the selected poems, considering how the poets explore themes such as nature, imagination, spirituality, and the human condition, and how they challenge established literary conventions.
3. Examine the historical and cultural contexts in which the selected poets lived and worked, including their relationships with other Romantic writers and their engagement with contemporary social and political issues.
4. Compare and contrast the styles and thematic concerns of the Romantic poets, identifying commonalities and differences in their approaches to poetry and their visions of the world.
5. Interpret and analyze selected works of fiction and non-fictional prose, including Mary Shelley's "Frankenstein," Jane Austen's "Pride and Prejudice," and Charles Lamb's essay "The Praise of the Chimney Sweepers," exploring their narrative techniques, characterizations, and thematic concerns.

6. Evaluate the significance of the selected works within the context of literary history, considering their contributions to the development of the novel as a literary form and their reflections of contemporary social and cultural values.
7. Analyze the thematic concerns of the selected works, including the representation of the individual versus society, the role of gender and class, the pursuit of knowledge and ambition, and the nature of human relationships.
8. Reflect critically on the enduring relevance of the themes and ideas explored in the poetry, fiction, and non-fictional prose studied, considering their implications for contemporary society and culture.

GENERAL

DSC1AT (CC-1): Poetry & Short story **6 Credit**

Course Outcomes:

1. Analyze and interpret selected poems and short stories from various periods and authors, including William Shakespeare's Sonnet 116, William Wordsworth's "A Slumber did my Spirit Seal," John Keats' "La Belle Dame Sans Merci," Wilfred Owen's "Strange Meeting," Katherine Mansfield's "The Fly," and H. E. Bates' "The Ox," examining their themes, styles, and narrative techniques.
2. Evaluate the cultural, social, and historical contexts of the selected works, considering how they reflect the literary traditions and concerns of their respective periods and authors.
3. Examine the formal and stylistic features of poetry, including rhyme, meter, imagery, and symbolism, as well as the narrative techniques employed in short fiction, such as characterization, plot development, and point of view.
4. Compare and contrast the thematic concerns and artistic approaches of the poets and short story writers studied, identifying common themes

such as love, nature, mortality, war, and human experience, as well as differences in their perspectives and literary techniques.

5. Interpret and analyze the selected works within the broader context of literary movements and genres, such as Romanticism, Modernism, and Realism, considering their contributions to the development of poetry and short fiction.
6. Evaluate the significance of the selected works in the context of the literary canon, considering their enduring relevance and impact on subsequent generations of writers and readers.
7. Reflect critically on the ways in which poetry and short fiction engage with and illuminate the human condition, offering insights into the complexities of human experience, emotion, and consciousness.
8. Develop skills in close reading, textual analysis, and critical interpretation through engagement with the selected poems and short stories, enhancing overall proficiency in literary analysis and appreciation.

DSC1BT (CC-2): Essay, Drama & Novel 6 Credit

Course Outcomes:

1. Analyze and interpret selected essays, dramas, and novels from various periods and authors, including George Orwell's "Shooting an Elephant," Charles Lamb's "Dream Children," George Bernard Shaw's "Arms and the Man," J.B. Priestley's "An Inspector Calls," and R. K. Narayan's "The Man Eater of Malgudi," examining their themes, styles, and narrative techniques.
2. Evaluate the cultural, social, and historical contexts of the selected works, considering how they reflect the literary traditions and concerns of their respective periods and authors.

3. Examine the formal and stylistic features of essays, dramas, and novels, including rhetorical strategies, dramatic techniques, and narrative structures, as well as the ways in which these forms engage with their audiences.
4. Compare and contrast the thematic concerns and artistic approaches of the essayists, playwrights, and novelists studied, identifying common themes such as identity, morality, social justice, and the human condition, as well as differences in their perspectives and literary techniques.
5. Interpret and analyze the selected works within the broader context of literary movements and genres, such as realism, satire, and social drama, considering their contributions to the development of essay writing, drama, and the novel.
6. Evaluate the significance of the selected works in the context of the literary canon, considering their enduring relevance and impact on subsequent generations of writers and readers.
7. Reflect critically on the ways in which essays, dramas, and novels engage with and illuminate the complexities of human experience, offering insights into society, politics, and culture.
8. Develop skills in close reading, textual analysis, and critical interpretation through engagement with the selected works, enhancing overall proficiency in literary analysis and appreciation.

3-YEAR BA GENERAL DEGREE IN ENGLISH

PROGRAMME SPECIFIC OUTCOME

The THREE-YEAR GENERAL DEGREE COURSE IN ENGLISH will help the learners acquire the following skills and aptitudes—

- Proficiency in written and oral communication skills, enabling them to articulate ideas effectively in English through essays, presentations, and discussions.
- Analysis and interpretation of various forms of literature, including fiction, poetry, drama, and non-fiction, from different cultural and historical contexts.
- Application of critical thinking skills to evaluate literary texts, identifying themes, motifs, and literary devices, and analyzing their significance within broader societal and cultural frameworks.
- Development of research skills to locate, assess, and integrate relevant secondary sources into academic writing, demonstrating the ability to engage with scholarly discourse in English studies.
- Understanding of linguistic concepts and principles, encompassing grammar, syntax, phonetics, and semantics, and their effective application in writing and analysis.
- Exploration of interdisciplinary connections between literature and other fields such as history, philosophy, psychology, and sociology, fostering a holistic understanding of human experiences and perspectives.
- Cultivation of awareness and appreciation of diverse voices and perspectives in English literature, emphasizing the importance of inclusivity, representation, and cultural sensitivity in academic discourse.

DSC-1A (CC-1): Poetry & Short story **Credits 06**

Course Outcome:

Upon completion of the course, learners will have achieved the following:

- Developed a nuanced understanding of poetic forms and techniques through the analysis of diverse works spanning different periods and styles, including sonnets, lyrical poems, and narrative verse.
- Enhanced their literary appreciation and critical thinking skills by engaging with the thematic richness and emotional depth of poems and short stories by renowned authors such as Shakespeare, Wordsworth, Keats, Owen, Lamb, and Bates.
- Explored the intersection of language, imagery, and emotion in poetry and short fiction, gaining insights into the craft of storytelling and the evocative power of language in conveying complex human experiences and emotions.
- Cultivated their ability to interpret and analyze literary texts, discerning underlying themes, motifs, and symbols, and articulating their insights effectively through oral presentations, discussions, and written assignments.

DSC-1B (CC-2): Essay, Drama & Novel **Credits 06**

Course outcome:

Upon completion of the course, learners will have achieved the following:

- Develop advanced analytical and critical thinking skills through the exploration of diverse literary forms, including essays, drama, and novels by renowned authors such as George Orwell, R.K. Narayan, George Bernard Shaw, J.B. Priestley, and Ernest Hemingway.
- Enhance their understanding of thematic and stylistic elements in literary works, including socio-political commentary, character development, and narrative structure, enabling them to engage in nuanced interpretations and discussions.

- Expand their literary repertoire and cultural awareness by studying a range of texts from different periods and cultural backgrounds, fostering a deeper appreciation for the richness and diversity of literary expression.
- Cultivate proficiency in academic writing and critical analysis, demonstrating the ability to articulate insights effectively, support arguments with evidence from the text, and engage with complex ideas and themes in essays, discussions, and written assignments.

DSC-1C (CC-3): Contemporary India: women and empowerment
Credits 06

Course Outcome:

Upon completion of the course, learners may achieve the following:

- Develop a nuanced understanding of the social construction of gender, including concepts of masculinity, femininity, patriarchy, and gender discrimination, as well as the impact of gender socialization and stereotyping.
- Explore the history of women's movements in India, examining their roles in nationalism, the partition, and political participation, through engagement with primary and secondary texts that offer diverse perspectives on these topics.
- Gain insights into women's legal rights and issues, including their constitutional rights, personal laws, and customary practices related to inheritance and marriage, through critical analysis of relevant legal texts and scholarly works.
- Enhance awareness of gender-based violence, including state interventions, domestic violence, female foeticide, and sexual harassment, by studying literary works that highlight these issues and provide insights into the lived experiences of women in contemporary India.

DSC-1D (CC- 4): Academic Writing and Composition **Credits 06**

Course Outcome:

Upon completion of the course, learners may achieve the following:

- Proficiency in academic writing and composition, including an understanding of the writing process, conventions of academic writing, and techniques for summarizing and paraphrasing information effectively.
- Enhanced critical thinking skills through the ability to synthesize, analyze, and evaluate information critically, enabling students to engage with complex ideas and arguments in academic contexts.
- Mastery in structuring persuasive arguments, including the development of clear introductions, well-supported interjections, and effective conclusions, fostering the ability to articulate and defend ideas coherently.
- Competency in citing sources and editing written work, as well as proficiency in conducting book and media reviews, demonstrating the ability to integrate and evaluate information from diverse sources while adhering to academic standards and conventions.

DSE -1: British Literature **Credits 06**

Or

DSE- 1: Indian Literature in Translation **Credits 06**

Course Outcome:

Upon completion of the course, students may achieve the following:

- Developed a comprehensive understanding of British or Indian literature through engagement with seminal works by renowned authors from the respective regions, such as William Shakespeare's "As You Like It" or Rabindranath Tagore's "The Wife’s Letter."
- Explored diverse literary themes, styles, and cultural contexts represented in the selected texts, including examinations of human

nature, societal norms, and existential questions, fostering critical thinking and analytical skills.

- Enhanced proficiency in literary analysis and interpretation, as well as the ability to evaluate and appreciate literature in translation, by studying works such as Thomas Hardy's "Ah, Are Digging on My Grave?" or Vijay Tendulkar's "Silence: The Court is in Session."
- Developed cross-cultural competence and empathy by engaging with literature from different regions and gaining insights into the socio-political, historical, and cultural contexts that shape the texts, fostering appreciation for diverse literary traditions and perspectives.

DSE-2 : Partition Literature **Credits 06**

Or

DSE-2 : Nation, Culture and India **Credits 06**

Course Outcome:

Upon completion of the course, students may achieve the following:

- Developed a nuanced understanding of Partition literature or critical discourse on nation, culture, and India through the exploration of seminal texts such as Sa’adat Hasan Manto's 'Toba Tek Singh' or Amartya Sen's “Secularism and its Discontents”.
- Explored the complexities of historical events, cultural identities, and socio-political contexts represented in the selected texts, fostering critical thinking and analytical skills.
- Enhanced proficiency in literary analysis or critical evaluation of socio-political issues, as well as the ability to engage with diverse perspectives and ideologies, by studying works by influential authors such as Rabindranath Tagore or Jibanananda Das.
- Developed empathy and cross-cultural understanding by examining literature or critical essays that reflect the multifaceted experiences and

perspectives of individuals and communities impacted by Partition or issues related to nation and culture in India.

SEC-1: Soft Skills **Credits 02**

Course Outcome:

Upon completion of the course, students may achieve the following:

- Developed essential soft skills such as teamwork, emotional intelligence, adaptability, leadership, and problem-solving, enhancing their interpersonal and professional capabilities.
- Acquired practical skills and strategies to effectively navigate various interpersonal dynamics, manage challenges, and collaborate productively in diverse environments, contributing to their personal and professional growth.

SEC-2: Technical Writing **Credits 02**

Course Outcome:

Upon completing the course, students may achieve the following:

- Enhanced understanding of language and communication, including the disparities between speech and writing, enabling them to discern distinct features in both mediums.
- Developed proficiency in various writing skills such as topic selection, paragraph development, and different writing styles (descriptive, narrative, expository, and argumentative), facilitating effective expression in diverse contexts.
- Acquired technical writing expertise encompassing formal and informal writing formats like reports, letters, memos, notices, agendas, and minutes, along with the ability to identify and rectify common errors, thereby enhancing their written communication capabilities.

SEC-3: Translation Studies **Credits 02**

Course Outcome:

Upon completing the course, students may achieve the following:

- Profound understanding of translation's historical evolution and its significance within the context of a multilingual and multicultural society like India, enabling them to appreciate its diverse applications and implications.
- Mastery in various types and modes of translation through practical exercises, including semantic/literal, free sense/literary, functional/communicative, and transcreation, fostering proficiency in conveying meaning across languages effectively.
- Familiarity with fundamental concepts and terminology in Translation Studies, such as equivalence, language variety, dialect, idiolect, register, style, mode, and code mixing/switching, along with the comprehension of the translation process (analysis, transference, restructuring) through critical analysis of standard translated literary/non-literary texts.

SEC-4: Business Communications **Credits 02**

Course Outcome:

Upon completing the course, students may achieve the following:

- Proficiency in essential business communication practices, including report writing, citation, minutes of meetings, and e-correspondence.
- Enhanced oral communication skills for business contexts, demonstrated through effective presentations and spoken English proficiency.

GE-1: Contemporary India: Women and Empowerment **Credits 06**

Course Outcome:

Upon completing the course, students may achieve the following:

- Understanding of the social construction of gender, including concepts of masculinity, femininity, and patriarchy.

- Knowledge of the history of women's movements in India, spanning pre-independence and post-independence eras, with a focus on topics like nationalism, partition, and political participation.
- Familiarity with women and the law, including their rights under the Indian Constitution and customary practices related to inheritance and marriage.
- Awareness of women's issues related to the environment, including state interventions, domestic violence, female foeticide, sexual harassment, and the representation of female voices in literature such as "Sultana's Dream".

GE-2: Novel and Prose **Credits 06**

Course Outcome:

Upon completion of the course, students may achieve the following:

- Comprehensive understanding of Charles Dickens' "Oliver Twist," exploring themes of social injustice, poverty, and resilience.
- Insight into R.K. Narayan's "A Library without Books," examining the nuances of human nature and the significance of storytelling.
- Appreciation for Guy de Maupassant's "My Uncle Jules," delving into themes of family dynamics, morality, and societal expectations.

[AECC- Core] English -1

CL-1(English): British Poetry -1 **Credits 06**

Course Outcome:

Upon completing the course, students are expected to achieve the following outcomes:

- Proficient understanding and analysis of renowned British poems spanning from Shakespeare's "Shall I Compare Thee to a Summer's Day" to Pope's "Ode on Solitude."

- Enhanced appreciation and critical interpretation of William Blake's "A Poison Tree," Wordsworth's "To the Skylark," Shelley's "To a Skylark," and Keats' "To Autumn."
- Competency in analyzing rhetorical devices and prosodic elements employed in the studied poetry.

CL-2(English): Poetry - 2 **Credits 06**

Course Outcome:

Upon completing the course, students are expected to achieve the following outcomes:

- Comprehensive understanding and analysis of selected poems by Alfred Lord Tennyson, Robert Browning, T.S. Eliot, and W.B. Yeats.
- Enhanced critical interpretation and appreciation of Tennyson's "Break, Break, Break," Browning's "Porphyria’s Lover", Eliot's "Preludes," and Yeats' "The Lake Isle of Innisfree."
- Proficiency in identifying and analyzing poetic elements and techniques utilized in the studied poems.

BACHELOR OF ARTS (HONOURS)
MAJOR IN ENGLISH
4-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2023-2024)
Based on
Curriculum & Credit Framework for Undergraduate Programmes
(CCFUP), 2023 & NEP, 2020

Programme Outcome

Upon successful completion of the **BACHELOR OF ARTS (HONOURS) 4-YEAR UNDERGRADUATE PROGRAMME with MAJOR IN ENGLISH**, students will attain the following outcomes.

- **Advanced Literary Knowledge**: Acquire a deep understanding of English literature across different periods and genres, including poetry, prose, drama, and critical essays, from the beginnings to contemporary times.
- **Critical Thinking and Analysis**: Develop strong critical thinking skills to analyze and interpret literary texts, fostering the ability to evaluate and synthesize information from various sources and perspectives.
- **Effective Communication Skills**: Enhance verbal and written communication abilities, enabling clear and persuasive expression of ideas, both in academic and professional contexts.
- **Research Proficiency**: Gain expertise in conducting independent research, utilizing various methodologies and resources, and presenting findings in a coherent and scholarly manner.
- **Cultural and Historical Awareness**: Understand the cultural and historical contexts of literary works, recognizing the interplay between literature and societal changes, and appreciating the diversity of literary traditions.
- **Ethical and Reflective Thinking**: Develop an ethical perspective and reflective thinking, fostering a sense of social responsibility, empathy, and awareness of human rights issues as they relate to literature and society.
- **Career Readiness and Lifelong Learning**: Prepare for a wide range of career opportunities in education, media, publishing, and other fields, while also instilling a commitment to lifelong learning and personal growth in the ever-evolving global landscape.

Major-1: History of English Literature and English Language Credits 04

Upon completing the course, students are expected to achieve the following outcomes:

- Develop a comprehensive understanding of the historical development of English literature from its beginnings to the 20th century, including key periods such as the Commonwealth, Restoration, Romantic, Victorian, and early 20th century.
- Gain insight into the evolution of the English language, recognizing the significant influences of Greek, Latin, Scandinavian, and French on its development.
- Analyze and interpret Chaucer’s "The Wife of Bath’s Prologue," appreciating its historical and literary significance within the context of English literature.
- Cultivate the ability to critically examine and contextualize literary texts within their historical, cultural, and linguistic backgrounds.

Major-2: British Poetry (Renaissance to 18th Century) Credits 04

Upon completing the course, students are expected to achieve the following outcomes:

- Acquire an in-depth understanding of British poetry from the Renaissance to the 18th century, analyzing works by prominent poets such as Sir Philip Sidney, Edmund Spenser, William Shakespeare, John Donne, John Milton, Alexander Pope, Andrew Marvell, and Thomas Gray.
- Develop skills in critical analysis and interpretation of poetic texts, focusing on themes, stylistic devices, and historical contexts.
- Gain proficiency in the use of rhetorical and prosodic techniques, enhancing their ability to analyze and appreciate the formal elements of poetry.
- Cultivate the ability to contextualize and compare the works of different poets, understanding their contributions to the development of British poetry and their influence on later literary traditions.

Minor-1: Academic Writing and Composition Credits 04

Upon completing the course, students are expected to achieve the following outcomes:

- Develop a comprehensive understanding of the academic writing process, including the conventions of academic writing, and the ability to distinguish between academic and non-academic writing.

- Enhance study skills such as note-taking and note-making, and effectively gather, sort, and organize information.

- Gain proficiency in summarizing and paraphrasing, writing various types of paragraphs, and structuring well-organized arguments with clear introductions, interjections, and conclusions.

- Improve grammatical skills with a focus on sentence structure, verbs, nouns, and punctuation, and learn to effectively cite resources, edit their work, and conduct book and media reviews.

Minor-2: Gender & Human Rights Credits 04

Upon completing the course, students are expected to achieve the following outcomes:

- Gain insight into gender issues and human rights through the analysis of diverse literary forms, including poetry, short stories, and essays, enhancing their understanding of the portrayal of women's experiences and rights.
- Develop critical thinking skills by engaging with significant texts that address gender aggression, women's professions, and human rights, and apply these insights to contemporary discussions on gender and human rights.

SEC 1: Soft Skills Credits 03

Upon completing this course, students are expected to achieve the following outcomes:

- **Comprehensive Understanding of Soft Skills**: Gain a foundational understanding of soft skills, their importance in both personal and professional settings, and how they differ from hard skills. This includes mastering essential soft skills such as communication, personality development, and interpersonal relationships.
- **Emotional Intelligence and Leadership**: Develop emotional intelligence and leadership skills, including understanding and managing emotions, building effective teams, and applying different leadership styles and traits in various contexts.
- **Effective Teamwork and Stress Management**: Acquire skills for effective teamwork and stress management by learning about team development stages, types of teams, characteristics of high-performance teams, and strategies for recognizing and tackling stress.
- **Problem-Solving Abilities**: Enhance problem-solving abilities through understanding the need, process, stages, and methods of problem-solving, enabling students to tackle complex issues systematically and effectively.

SEC 2: Basic Phonetics Credits 03

Upon completing this course, students are expected to achieve the following outcomes:

- **Foundational Knowledge of Phonetics**: Develop a solid understanding of basic phonetic concepts including phonetics, phoneme, phonology, air-stream mechanisms, and the organs of speech. This includes gaining familiarity with vowel and consonant sounds, and various English pronunciation varieties.
- **Proficiency in Pronunciation and Phonetic Transcription**: Acquire the ability to distinguish and accurately produce different vowel and consonant sounds using the International Phonetic Alphabet (IPA) and Received Pronunciation (RP). Understand and apply concepts of syllable structure, word accent, rhythm, and intonation in spoken English.

BACHELOR OF ARTS WITH ENGLISH
(MULTIDISCIPLINARY STUDIES)
3-YEAR UNDERGRADUATE PROGRAMME

(w.e.f. Academic Year 2023-2024)
Based on
Curriculum & Credit Framework for Undergraduate Programmes
(CCFUP), 2023 & NEP, 2020

Programme Outcome

Upon successful completion of the 3-year Undergraduate Programme in English with a focus on Multidisciplinary Studies, students will:

- **Interdisciplinary Knowledge Integration**: Develop a broad understanding of English literature while integrating insights from other disciplines, fostering a holistic and versatile academic foundation.
- **Enhanced Communication Skills**: Improve proficiency in both written and oral communication, facilitating effective expression and articulation of complex ideas across various contexts and audiences.
- **Critical and Analytical Thinking**: Cultivate the ability to critically analyze and evaluate literary texts, while also applying these skills to interdisciplinary subjects, enhancing overall problem-solving capabilities.
- **Cultural and Contextual Awareness**: Gain an appreciation for the cultural, social, and historical contexts of literary works, enabling a nuanced understanding of literature's role in reflecting and shaping society.
- **Research and Inquiry**: Develop skills in research methodologies and inquiry, allowing for the exploration and investigation of interdisciplinary topics, and contributing to informed and evidence-based conclusions.
- **Ethical and Social Responsibility**: Foster an ethical mindset and social awareness, encouraging students to engage with literature and other disciplines in ways that promote social justice, equity, and human rights.
- **Career Versatility and Lifelong Learning**: Prepare for diverse career paths in fields such as education, media, public relations, and cultural organizations, while instilling a commitment to continuous personal and professional development in a dynamic and interconnected world.

Major A1/B1: Poetry & Short story **Credits 04**

Upon completing this course, students are expected to achieve the following outcomes:

1. **Appreciation and Analysis of Poetry**: Gain an understanding of various poetic forms and themes through the study of selected works by William Shakespeare, William Wordsworth, John Keats, and Wilfred Owen. Develop skills in literary analysis, focusing on the structure, language, and thematic content of the poems.
2. **Understanding and Interpretation of Short Stories**: Enhance the ability to read, interpret, and critically analyze short stories by Katherine Mansfield and H. E. Bates. Learn to explore narrative techniques, character development, and thematic elements in short fiction.

MINOR (MI)

MI-1/C1: Same as Minor-1 (ENGMI01) of English (Hons) programme **Credits 04**

MI-2/C2: Same as Minor-2 (ENGMI02) of English (Hons) programme **Credits 04**

SKILL ENHANCEMENT COURSE (SEC)

TO BE CHOSEN FROM THE BUCKET OF SECs OF SELECTED DISCIPLINE A/B/C

(As per A/B/C Hons. Prog. Syllabus)

COMMON COURSES UNDER CCFUP, 2023
FOR SEMESTER – I & II

Based on Curriculum & Credit Framework for Undergraduate Programmes
(CCFUP), 2023 & NEP-2020
FOR ALL UNDERGRADUATE PROGRAMMES (w.e.f. Academic Year 2023-2024)

AEC-1T: Communicative English-01 Credits 02

Upon completing this course, students are expected to achieve the following outcomes:

1. **Effective Communication Skills**: Develop a comprehensive understanding of different types and models of communication, including verbal and non-verbal communication, and learn to identify and overcome common barriers. Enhance interpersonal communication skills for more effective interactions.
2. **Proficient Listening and Speaking Skills**: Acquire the ability to distinguish between active and passive listening, and improve speaking skills through various formal and informal contexts. Gain practical experience in group discussions and everyday communication scenarios, such as making requests, giving directions, narrating events, and handling complaints and apologies.
3. **Advanced Reading and Comprehension Skills**: Master different types of reading techniques to enhance comprehension and interpretation of texts. Develop the ability to read critically and efficiently, which is essential for academic and professional success.

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

Office of the Principal

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

UNDER GRADUATE COURSE FOR SANSKRIT (HON.)
UNDER
CHOICE BASED CREDIT SYSTEM (CBCS)

India's Ministry of Human Resource Development (HRD) is leading the development of the New Education Policy (NEP) to reform the education system. The University Grants Commission (UGC) is actively involved in this process and has taken steps to increase equity, efficiency and academic excellence in higher education. However, the current education system is criticized for students lacking knowledge, confidence, values and skills, as education, employment and skills development are interconnected. Addressing these issues requires a change in the education system to a learner-centered approach and the introduction of a choice-based credit system (CBCS), which allows students to choose interdisciplinary skill-based courses and provides flexibility in the delivery and evaluation of education. . . Although CBCS has several advantages, such as promoting student-centered education, expanding learning opportunities, and facilitating mobility, it also presents challenges such as difficulties in grading, differences in teacher workloads, and the need for adequate infrastructure. Overall, the introduction of CBCS is considered important to align Indian education with global standards and promote holistic development of students.

Choice Based Credit System (CBCS):

Students can choose courses from core, elective, or skill-based categories under the Choice Based Credit System (CBCS). Grading is usually used for assessment. It is suggested that a unified grading system be implemented in India's higher education to promote student mobility and help hiring managers evaluate applicants. The curriculum of the CBCS consists of core courses, elective courses (dissertation/projects, discipline-specific electives, and general electives), and Ability Enhancement Courses (AECC/AEEC) that are designed to improve knowledge and skills. All disciplines must take AECC courses, like Environmental Science and English Communication, while AEEC courses offer instruction focused on values or skills. The approach also incorporates project work and dissertations, which provide knowledge application in a real-world setting. In general, the CBCS seeks to improve learning outcomes, simplify evaluation procedures, and offer flexibility in higher education.

Course Outcomes for Each Paper:

UG HONOURS:

SEMESTER-I

C-1

Classical Sanskrit Literature (Poetry)

This course provides students with a deep understanding of classical Sanskrit literature, including texts like Raghuvaṁśam, Kumārasambhavam, Kirātārjunīyam, and Nītiśatakam. Through intensive study, students develop proficiency in Sanskrit language skills, including grammar, syntax, and vocabulary. They learn to analyze poetic excellence, plot intricacies, and thematic content, gaining insight into characters and literary genres like Mahākāvya and Gītikāvya. By critically engaging with societal commentary, particularly Bhartṛhari's Nītiśatakam, students deepen their understanding of cultural, historical, and literary significance. They demonstrate their ability to synthesize information and produce coherent analyses of classical Sanskrit literature.

C-2

Critical Survey of Sanskrit Literature

This course provides students with a comprehensive understanding of Sanskrit literature across various periods and genres. They explore Vedic literature, including Saṁhitās, Brāhmaṇas, Āraṇyakas, Upaniṣads, and Vedāṅgas, examining their religious, philosophical, and social significance. Students analyze the Rāmāyaṇa and Mahābhārata, understanding their historical contexts, encyclopedic nature, and cultural importance. They also delve into the Purāṇas, exploring their subject matter and historical significance. Additionally, students receive an introduction to Vyākaraṇa, Darśana, and Sāhityaśāstra, including major schools of Indian philosophy and poetics. Through this course, students develop critical thinking skills, analytical abilities, and a deeper appreciation for Sanskrit literature's rich literary and philosophical heritage.

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

Office of the Principal

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

UG Syllabus (under CCFUP/ NEP w.e.f. 2023-24)

4 Year Honours Programme

BACHELOR OF ARTS (HONOURS) MAJOR IN SANSKRIT

MAJOR (MJ

MJ-1

Critical Survey of Sanskrit Literature

Students will graduate from this course with a thorough comprehension of Vedic literature, which includes the Upaniṣads, Āraṇyakas, Brāhmaṇas, Saṁhitās, and Vedāṅgas. The cultural and historical relevance of the Purāṇas and the epics Rāmāyaṇa and Mahābhārata will be examined. Introduction to the principles of grammar (Vyākaraṇa), philosophy (Darśana), and poetry (Sāhitya\āstra) will be given to the students. They will also gain an appreciation of the literary and cultural contributions of the major schools of Indian philosophy and poetics by learning about them.

SEC 1

Reading & Writing Skills in Devanāgarī & Brāhmī scripts

Upon completing this course, students will be able to identify and understand various early Indian scripts, including Siddhamātṛkā, Śāradā, Grantha, Gauḍī, Nandināgarī, and Devanāgarī. They will gain proficiency in reading and writing Devanāgarī alphabets, including compound letters and diphthongs, and using diacritics. Students will also be introduced to Brāhmī alphabets and their historical context, particularly from the Asokan period. Additionally, they will develop skills in transcribing between Devanāgarī and Brāhmī scripts.

****

SEMESTER-II

C-3

Classical Sanskrit Literature (Prose)

In this course, students will gain a comprehensive understanding of classical Sanskrit prose literature. They will analyze texts like Śukanāsopadeśa and Viśrutacaritam, exploring themes of society, politics, and Āyurveda. Additionally, students will study the works of Daṇḍin and other authors, examining prose romances, fables, and renowned works like Paňcatantra. Through critical analysis, students will develop linguistic proficiency and a deeper appreciation for the cultural significance of classical Sanskrit prose literature.

C-4

Self Management in the Gītā

In this course, students will explore the teachings of the Bhagavad Gītā, gaining insights into self-management and cognitive functioning. They will learn techniques for controlling the mind, resolving conflicts, and nurturing moral virtues. Through practical tools and timeless wisdom, students will emerge empowered to navigate life's challenges with resilience and inner harmony.

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI
GOVERNMENT OF WEST BENGAL
Office of the Principal
P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516
Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

UG Syllabus (under CCFUP/ NEP w.e.f. 2023-24)
4 Year Honours Programme
BACHELOR OF ARTS (HONOURS) MAJOR IN SANSKRIT

MAJOR (MJ
MJ-2
Sanskrit Composition and Communication

After completing this course, the student will acquire Sanskrit translation, conjugation and indelibles, improving his grammar. They understand and apply Saṁjñā and Kāraka-vibhakti (case endings) according to Laghusiddhāntakaumudī. The student also learns sounds and Kṛt conjunctions and learns to use different grammatical forms. In addition, they develop translation skills by converting texts from Bengali to Sanskrit.

SEC 2
Computer Applications for Sanskrit

Students who successfully complete this course will be able to comprehend and make use of interactive Sanskrit teaching and learning resources, such as web-based development and multimedia fundamentals. They will become adept in typing in Unicode for Devanagari scripts and associated applications. Students will get knowledge of different instruments and approaches used in text processing and preservation of Sanskrit manuscripts. They will also investigate OCR (Optical Character Recognition) applications and techniques for Sanskrit and other Indian languages.

****

SEMESTER-III

C-5

Classical Sanskrit Literature (Drama)

In this course, students will study three prominent Sanskrit plays: Bhāsa's "Svapnavāsavadattam," Kālidāsa's "Abhijñānaśākuntalam," and Viśākhadatta's "Mudrārākṣasam." They will analyze the characters, plot, and societal themes, as well as the poetic elements and storyline intricacies of each play. Additionally, students will learn about the origins and evolution of Sanskrit drama, gaining insight into its cultural significance and the contributions of notable playwrights.

C-6

Poetics and literary criticism

By the end of this course, students will acquire a solid understanding of Sanskrit poetics, encompassing its origins, key concepts, and various literary forms. They will explore the definition, objectives, and causes of poetry as outlined in the Kāvyaprakāśa, gaining insights into the diverse forms of poetry such as dṛśya, śravya, and miśra. Additionally, students will delve into the intricate concepts of śabda-śakti and rasa-sūtra, examining the power of words and the transcendental nature of rasa according to Bharata's theories. Through the study of figures of speech and meters, students will learn about various rhetorical devices and poetic meters, enhancing their appreciation of the nuances of Sanskrit literary composition. By the end of the course, students will emerge with a deeper appreciation for the richness of Sanskrit poetics and a heightened ability to analyze and appreciate classical Sanskrit literature.

C-7

Indian Social Institutions and Polity

This course offers a comprehensive study of Indian social institutions, polity, and values from ancient to modern times. Students explore diverse sources such as Vedic literature and Dharmaśāstra to understand the evolution and significance of these institutions. They examine the structure of Indian society, including the varṇa-system and caste system, as depicted in texts like the Mahābhārata. Additionally, students analyze the development of Indian polity, from ancient republic states to modern concepts like the welfare state and Gandhian thought. By studying key theories and thinkers, students gain a deep understanding of Indian civilization's social, political, and ethical foundations.

SEC-1:

Acting and Script Writing

This course covers acting and script writing, providing students with a comprehensive understanding of fundamental principles and techniques in both areas. In the acting section, students learn about performer qualities, role assignment, and various expressions including physical gestures and vocal expression. They also explore costume and makeup use. In script writing, students study plot development, dialogue writing, and unity in playwriting. Exemplary works like Abhijñānaśākuntalam are analyzed. By the course's end, students gain practical skills in acting and script writing for creating compelling theatrical productions.

OR

SEC-1:

Reading skills in Brāhmī Scripts

Upon completion of the course in Reading Skills in Brāhmī Scripts, students will develop a strong foundation in understanding and interpreting ancient scripts. In the Brāhmī Alphabet section, students will familiarize themselves with the early Brāhmī alphabet used during the Aśokan period, gaining proficiency in recognizing and writing its characters. Through Translation to Variations, students will learn to decipher and translate Brāhmī inscriptions from different regions up to the 4th century C.E., honing their skills in interpreting historical texts. In the Kind of Scripts section, students will explore various script styles across different regions, including North Indian, South Indian, East Indian, West Indian, and the Vākāṭaka variety, enhancing their understanding of regional variations in script evolution. By the end of the course, students will acquire the ability to read and comprehend Brāhmī scripts across different historical periods and geographical regions, facilitating their engagement with ancient texts and historical artifacts.

****

SEMESTER-IV

C-8

Indian Epigraphy, Paleography and Chronology

Upon completion of the Epigraphy course, students will gain a comprehensive understanding of ancient inscriptions, enabling them to reconstruct Indian history and culture. They will learn about the different types of inscriptions and their importance in historical research. Additionally, students will explore the history of epigraphical studies in India and the contributions of prominent scholars to deciphering ancient scripts, such as Fleet, Cunninghum, and Princep. Through the study of paleography, students will delve into the antiquity of writing, writing materials, and inscribers, providing them with valuable contextual knowledge. The course also includes the examination and interpretation of selected inscriptions, including those of Aśoka, Rudradāman, and Samudragupta, among others. Furthermore, students will develop skills in dating inscriptions and understanding ancient Indian chronology, including the Vikrama Era, Śaka Era, and Gupta Era. Overall, the course equips students with essential skills for historical research and analysis in the field of ancient Indian studies.

C-9

Modern Sanskrit Literature

This course explores classical poetry through renowned works like "SvātantryaSambhavam" and "Bhimāyanam," analyzing specific verses for poetic expression and themes. It covers Gadya, Rūpaka, and Gitikāvya, studying compositions by various poets. Additionally, notable literary figures like Pandita Kshama Rao and Ram Karan Sharma are surveyed. By the course's end, students gain a profound appreciation for classical literature and critical analysis skills essential for engaging with literary texts.

C-10

Sanskrit and World Literature

This course explores the global influence of Sanskrit literature, covering Vedic cultural elements, Sanskrit words in world languages, and the significance of Classical Sanskrit Literature in Eastern and Western traditions. It examines the impact of Upaniṣads, Gītā, and Sanskrit fables on various cultures, including their translations and influences on Sufism, Latin thought, and Western literature. The dissemination of Rāmāyaṇa, Mahābhārata, and Kālidāsa's works in South-Eastern Asia and the West is also studied. Additionally, students survey Sanskrit study centers worldwide, gaining insight into the global reach and importance of Sanskrit studies.

SEC-2:

Machine Translation: Tools and Techniques

This course provides a comprehensive understanding of machine translation principles and practices. Students learn theoretical concepts, compare human and computer translation methods, and explore tools and techniques used in machine translation. They study various machine translation approaches, including rule-based, statistical, and example-based methods, as well as hybrid approaches. The course also covers challenges such as ambiguity and acceptability issues. Overall, students gain the knowledge and skills to comprehend, evaluate, and contribute to advancements in machine translation technology.

OR

SEC-2

Evolution - of Indian scripts

Upon completing the course on the Antiquity and Evolution of Writing Systems in India, students will acquire a comprehensive understanding of the historical development and characteristics of ancient Indian scripts. They will explore the origins of writing in India, including the use of signs and symbols in pre-scripts, and delve into the early Brahmi and Kharoshthi scripts. Additionally, students will examine the Indus Valley script and its significance. Through the study of various types of Brahmi scripts and their evolution by 400 A.D., students will gain insights into the transition to early modern Indian scripts and the factors contributing to variations in the Brahmi script over time. By the end of the course, students will be equipped with the knowledge to analyze and interpret ancient Indian inscriptions and scripts, facilitating a deeper understanding of India's rich cultural and historical heritage.

OR

SEC-2

Sanskrit Meter and Music

Upon completing the course on Sanskrit Meter and Music, students will gain a comprehensive understanding of the principles and techniques of Sanskrit prosody and its musical applications. They will be introduced to the fundamentals of Chhandashastra (the science of meter), including the classification and elements of Sanskrit meter. Through the analysis of selected Vedic and Classical meters, students will learn to identify, analyze, and apply various lyrical methods associated with different meters, such as syllabic verse, syllabo-quantitative verse, and quantitative verse. By examining examples and engaging in practical exercises, students will develop the skills necessary to appreciate the rhythmic and melodic nuances of Sanskrit poetry and its musical rendering. Ultimately, students will emerge with a deeper appreciation for the intricate relationship between Sanskrit meter and music, enriching their understanding of classical Indian literature and culture.

****

SEMESTER-V

C-11

Vedic Literature

Upon completion of this course, students will acquire a comprehensive understanding of Vedic texts, including Saṁhitā, Brāhmaṇa, and Muṇḍakopaniṣad, as well as Vedic grammar. They will be able to analyze and interpret select hymns from the Ṛgveda, Yajurveda, and Atharvaveda, such as those dedicated to Agni, Uṣas, Akṣa, Hiraṇyagarbha, and Śiva. Additionally, students will develop proficiency in Vedic grammar, including declensions, subjunctive mood, gerunds, Vedic accentuation, and padapāṭha. Through the study of Muṇḍakopaniṣad, students will gain insight into its philosophical teachings and spiritual concepts, examining its verses in detail to comprehend its significance. By the end of the course, students will possess a deeper appreciation of Vedic literature, grammar, and philosophy, enriching their understanding of ancient Indian culture and heritage.

CC 12

Sanskrit Grammar

Upon completion of this course, students will develop a thorough understanding of Sanskrit grammar through the study of Laghusiddhāntakaumudi. They will master the concepts presented in the Samjñā, Sandhi, and Vibhakti prakaranas, enabling them to analyze and apply grammatical rules effectively. By studying Samjñā, ac, hal, and visarga sandhi, students will learn to identify and comprehend various types of sandhi formations. Additionally, they will gain proficiency in recognizing and utilizing different vibhaktis or grammatical cases for accurate interpretation and expression in Sanskrit. Through this course, students will enhance their grammatical skills and deepen their understanding of Sanskrit language structure, preparing them for further studies and applications in Sanskrit literature and linguistic analysis.

DSE-1A

Indian System of Logic and Debate

Upon completing this course, students will gain a thorough understanding of the science of debate, syllogistic logic, and the theory of debate. They will learn about the evolution of inquiry into formal debate structures, including the roles of participants such as discussants, opponents, and judges, as well as the methods and types of debates. Through the study of syllogistic logic, students will become proficient in constructing and analyzing arguments using propositions, reasons, examples, and conclusions. They will also learn about the nature of inference and the establishment of invariable concomitance. Additionally, students will explore the theory of debate, examining concepts such as examples, tenets, and dialogue, while gaining insight into various debate strategies and tactics. By the end of the course, students will be well-equipped to engage in reasoned debates, analyze arguments critically, and apply logical principles effectively in a range of contexts.

OR

DSE-1B

Art of Balanced Living

Upon completing this course, students will develop a comprehensive understanding of self-presentation, concentration, and refinement of behavior. They will learn various methods of self-presentation, including hearing, reflection, and meditation, as outlined in the Bṛhadāraṇyakopaniṣad. Through the study of concentration, students will grasp the concept of yoga as described in the Yogasūtra, focusing on the restriction of mental fluctuations through practice and passionlessness. They will also explore the eight aids to yoga, the yoga of action, and the means of mental purity leading to oneness. Furthermore, students will delve into the refinement of behavior, examining methods such as jñāna-yoga, dhyāna-yoga, karma-yoga, and bhakti-yoga, with a special emphasis on karma-yoga. By the end of the course, students will be equipped with practical techniques for enhancing self-presentation, concentration, and behavior refinement, facilitating personal growth and spiritual development.

DSE-2A

Theatre and Dramaturgy in Sanskrit

This course provides a comprehensive understanding of Indian theatre, covering various types of theatres, construction elements, and the history of drama. Students explore the definition of drama, its subject matter, characters, and the concept of rasa or aesthetic experience. The course also delves into the tradition and development of Indian theatre from prehistoric times to modern forms. By the end, students gain knowledge to understand and appreciate the nuances of theatrical performances and their cultural significance in Indian society.

OR

DSE-2B

Tools and Techniques for Computing Sanskrit Language

Upon completion of this course, students will acquire a comprehensive understanding of Sanskrit and language computing, covering aspects such as phonology, morphology, syntax, semantics, lexicon, and corpora in Sanskrit language studies. They will also delve into the introduction, objectives, tools, techniques, and methodologies of Sanskrit language resources and tools, enabling them to explore various computational approaches in Sanskrit language processing. Additionally, students will gain insights into language computing methodologies, including rule-based, statistical, and hybrid approaches, and conduct a survey of language computing techniques. By the end of the course, students will be equipped with the knowledge and skills to analyze Sanskrit language data, develop computational tools and resources, and contribute to advancements in Sanskrit language computing research and applications.

****

SEMESTER-VI

C-13

Ontology and Epistemology

Upon completion of this course, students will gain a thorough understanding of ontology and epistemology in Indian philosophy. They will explore darśana (philosophical systems), classifications of philosophical schools, and key concepts such as realism, idealism, monism, dualism, and pluralism. The study of ontology includes delving into padārtha (categories of existence) and attributes of dravyas (substances), qualities, and karma (action). Additionally, students will examine epistemological concepts like buddhi (cognition), pramāṇa (valid means of knowledge), including pratyakṣa (perception), anumāna (inference), upamāna (analogy), and śabda (testimony), along with their classifications. By course end, students will be equipped to critically engage with foundational concepts in ontology and epistemology in Indian philosophy.

C-14

Sanskrit Composition and Communication

Upon completing this course, students will develop proficiency in Sanskrit language and communication skills. They will learn about Vibhaktyartha and voice in Sanskrit grammar, as well as key formations of words. Through translation exercises, they will enhance their ability to translate between Hindi/English and Sanskrit. Additionally, students will engage in spoken Sanskrit for communicative practice. Essay writing will further their understanding of traditional and contemporary topics. Overall, students will emerge with improved language comprehension, translation abilities, and communication proficiency in Sanskrit.

DSE-3A
Sanskrit Linguistics

Upon completing this course, students will gain a comprehensive understanding of Sanskrit linguistics, covering philology, phonology, phraseology, syntax, semantics, and comparative linguistics. They'll explore language's nature, linguistics' role, and its application in understanding linguistic phenomena. Through Sanskrit's relation to the Indo-European language family, students will grasp historical and comparative aspects. They'll also delve into Sanskrit's phonological, syntactical, and semantic structures, gaining insight into its linguistic features. Ultimately, students will analyze Sanskrit systematically and comprehend its linguistic intricacies within a broader comparative linguistic framework.

OR

DSE-3B
Computational Linguistics for Sanskrit

Upon completion, students will understand computational linguistics basics, including language levels, phonemes, syntax, semantics, and discourse. They'll explore distinctions between natural and artificial languages, and the role of computers in language processing. Additionally, they'll survey applied areas such as speech recognition, synthesis, and machine translation. Introduction to databases will be provided. Overall, students will be equipped to engage with language-related technologies effectively.

DSE-4A

Fundamentals of ayurveda

Upon completion of this course, students will gain a foundational understanding of Ayurveda, including its introduction, historical background, and key figures. They will explore the pre-Caraka period of Indian medicine and the major Ayurvedic schools: Dhanvantari and Punarvasu. Students will study prominent Ācāryas such as Caraka, Suśruta, Vāgbhaṭa, Mādhava, Sārṅgadhara, and Bhāvamiśra, and their contributions. Delving into the Carakasaṃhitā's Sūtra-sthānam, they'll learn about seasonal regimens and the body's response to nature across the six seasons for optimal health. Additionally, students will analyze the Bhṛguvallī section of the Taittirīyopaniṣad, focusing on anuvakas 1-3 for philosophical insights. By course end, students will have a solid foundation in Ayurvedic principles, seasonal regimens, and philosophical teachings, facilitating critical engagement with Ayurveda's holistic approach to health and well-being.

OR

DSE-4B

Environmental Awareness in Sanskrit literature

Upon completion of this course, students will gain an understanding of environmental awareness in Sanskrit literature. They will explore modern environmental perspectives and crises, Vedic concepts of environmental preservation, and classical Sanskrit literature's portrayal of environmental issues and preservation efforts. Through studying texts like the Vedas and works by authors like Kalidasa, students will learn about the ecological wisdom embedded in ancient Sanskrit literature and its relevance to contemporary environmental challenges.

****

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

Office of the Principal

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

UNDER GRADUATE COURSE FOR SANSKRIT GE/MINOR
Interdisciplinary for other department
UNDER
CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER - I
GE-1
Basic Sanskrit

This course in Sanskrit grammar and composition covers a wide range of topics to develop students' proficiency in the language. In the first part, students learn about the forms of pronouns and nouns in different genders and cases, along with their usage with simple verbs. They also study instrumental, dative, and ablative forms, focusing on singular, dual, and plural forms. Additionally, feminine words ending in 'ā' and 'ī' are explored in various cases, including the imperative mood. The course further delves into the genitive and locative cases of feminine nouns, as well as masculine and feminine nouns ending in specific vowels and consonants. In the second part, students explore special verb forms, including past, present, future, and imperative forms, along with participles and pratyayas. They also learn about phonetic changes, such as visarga sandhi and vowel sandhis. The course concludes with a study of literature, focusing on Gita Chapter XII. By completing this course, students will gain a comprehensive understanding of Sanskrit grammar, composition, and literary analysis, enhancing their language skills and appreciation for classical texts.

UG Syllabus (under CCFUP/ NEP w.e.f. 2023-24)
3 Year Multidisciplinary Studies Programme
BACHELOR OF ARTS WITH SANSKRIT (MULTIDISCIPLINARY STUDIES)

MINOR (MI)
MI-1/C1
History of Sanskrit Literature

Students will have a firm grasp on the evolution of Vedic, Classical, and Scientific Sanskrit literature after finishing this course. The main texts and their literary and cultural significance will be known to them. Pupils will understand how the Purāṇa, Mahābhārata, and Rāmāyaṇa have influenced Indian culture. They will also look at the contributions that Sanskrit literature has made to many scientific and technological domains, such as Jyotirvijñān, Ayurveda, and Gaṇitaśāstra.

SEMESTER - II

GE-2

Indian Culture and Social Issues

This course on "Indian Culture and Social Issues" aims to provide students with a deep understanding of the rich cultural heritage of India as well as critical insights into contemporary social issues. In the section focusing on culture, students will explore the multifaceted dimensions of Indian culture, including its ancient roots in Vedic and Sindhu civilizations, the influence of Sanskrit literature in the Indo-Islamic tradition, and the vibrant expressions of culture in folk music, traditional dance forms, and major festivals across India. Additionally, the course delves into social issues such as the evolving concept of Dharma, caste dynamics, women's identity and rights, and struggles for gender equality and property rights as depicted in ancient texts like the Mahabharata and legal texts like the Yajnavalkya Smriti. By the end of the course, students will develop a nuanced understanding of Indian culture and society, enabling them to engage critically with both traditional cultural practices and contemporary social challenges.

OR

Sanskrit and other Modern Indian Languages

This course on "Sanskrit and other Modern Indian Languages" provides students with a comprehensive understanding of the Indo-Aryan languages, philology, and literature. In the section focusing on Indo-Aryan languages, students will explore the historical development of these languages, including Old Indo-Aryan and Middle Indo-Aryan stages, and examine their evolution in contemporary times. The philology section covers phonetics, morphology, and syntax in both Sanskrit and other modern Indian languages, enabling students to understand the structural aspects of these languages. Finally, the literature section explores Sanskrit as a foundational source of modern Indian literature and highlights how vernacular languages enrich Sanskrit literature. By the end of the course, students will have gained a deep appreciation for the linguistic diversity of India and a solid foundation in Sanskrit and modern Indian languages, preparing them for further academic study or professional pursuits in language and literature.

OR

Indian Epigraphy & Paleography

This course on "Indian Epigraphy & Paleography" delves into the study of ancient inscriptions, palaeography, and the Brahmi script, providing students with a comprehensive understanding of the historical, cultural, and linguistic aspects of Indian epigraphy. In the section focusing on the study of selected inscriptions, students will analyze notable inscriptions such as Asokan edicts, Junagadh Inscription of Rudradaman, Eran Pillar Inscription, and others, gaining insights into moral values, administrative practices, and historical events depicted in these inscriptions. The section on Indian Palaeography explores the antiquity of writing in India, the importance of studying inscriptions, different types of inscriptions, and the materials used for writing. Additionally, students will learn about the origin and development of the Brahmi script, its varieties, and the history of the study of Indian epigraphy, including notable epigraphists and their contributions. The course also covers the system of dating and the use of eras in Indian epigraphy, along with ethical concepts like Karma and Punarjanma theory. By the end of the course, students will have acquired valuable knowledge and skills in deciphering ancient inscriptions, understanding their historical significance, and interpreting the cultural context of ancient India.

UG Syllabus (under CCFUP/ NEP w.e.f. 2023-24)
3 Year Multidisciplinary Studies Programme
BACHELOR OF ARTS WITH SANSKRIT (MULTIDISCIPLINARY STUDIES)

MI-2/C2
General Grammar and Composition

After completing this course, the student will have a thorough understanding of Sanskrit grammar, including declension, conjugation, sandhi, samāsa and kāraka-vibhakti. They govern the use of kṛt and taddhita suffixes in different contexts. Students develop the ability to accurately translate texts from Bengali or English into Sanskrit. In addition, they develop their composition skills in Sanskrit.

SEMESTER - III
GE-3
Indian Aesthetics

This course provides an overview of Indian Aesthetics, covering the essence of beauty, the process of aesthetic experience, aesthetic elements in various art forms, and the contributions of prominent thinkers. Students will define beauty, recognize synonyms, understand aesthetic experience, identify aesthetic elements in arts, and analyze perceptions of beauty in drama. This course fosters critical thinking and appreciation for Indian artistic traditions.

OR

Fundamentals of Indian Philosophy

This course aims to equip students with a foundational understanding of Indian philosophy, covering its diverse schools, fundamental concepts, and key philosophical problems. By the end of the course, students will be able to comprehend the concept and aims of Darśana (philosophy) along with the classification of Indian philosophical schools. They will also gain insights into the heterodox schools such as Cārvāka, Jainism, and Buddhism, focusing on their core tenets. Furthermore, students will explore orthodox schools like Sāṁkhya, Yoga, Nyāya, Advaita Vedānta, Mīmāṃsā, and Bhakti Schools of Vedānta, delving into their philosophical principles and doctrines. Additionally, students will examine various philosophical problems including epistemology, metaphysics, and ethics, exploring topics such as perception, reality, causation, consciousness, self, karma, and liberation. Through this course, students will develop critical thinking skills and a deeper understanding of the rich philosophical heritage of India.

OR

Ancient Indian Polity

This course aims to provide students with a comprehensive understanding of Ancient Indian Polity, covering its name, scope, origin, types of states, governance structures, legal systems, taxation policies, and inter-state relations. By the end of the course, students will be able to recognize the various names and sources of Ancient Indian Polity, understand its relation with dharma, artha, and nīti, and trace its origins according to classical texts. They will also gain insights into different types of states and their nature, explore the structures of kingship, councils of ministers, and assemblies, and analyze the mechanisms of law, justice, taxation, and inter-state relations in ancient India. Through this course, students will develop critical thinking skills and a deeper appreciation for the political and administrative systems of ancient India.

SEMESTER-IV

GE-4

Basic Principles of Indian Medicine System (Ayurveda)

This course aims to provide students with a comprehensive understanding of the basic principles of Ayurveda, the ancient Indian system of medicine. By the end of the course, students will be able to define Ayurveda and its key concepts including Ayuh (life), Sarira (body), and health, and understand its aims and subject matter. They will explore the salient features of Ayurveda, its concept of health, and its unique historical development, tracing its origins to early texts like the Atharvaveda and major treatises such as the Susrut Samhita and Caraka Samhita. Furthermore, students will delve into the eight components of Ayurveda and grasp its foundational principles such as the Trigunas, Panchamahabhutas, Tridoshas, and Saptadhatus. They will also learn about Ayurvedic lifestyle practices, preventive medicine, and diagnostic methods. Additionally, students will study Ayurvedic dietetics, nutrition, and treatments, including common medicinal plants and their therapeutic properties, pharmacology, Panchakarma therapies, and prenatal/postpartum care. Through this course, students will develop a holistic understanding of Ayurveda and its application in promoting health and wellness.

OR

Computer Applications for Sanskrit

This course aims to equip students with practical skills in utilizing computer applications for Sanskrit, enabling them to enhance interactive teaching and learning experiences, ensure standardization of Indian languages using Unicode, efficiently process and preserve Sanskrit texts, and utilize Optical Character Recognition (OCR) for Sanskrit and Indian languages. By the end of the course, students will be proficient in employing interactive Sanskrit teaching tools, developing multimedia content, and utilizing web-based tools for effective e-learning. They will also gain proficiency in typing Devanagari scripts using Unicode, utilizing text processing and preservation techniques and tools, and understanding the applications and techniques of Optical Character Recognition for Sanskrit and Indian languages. Through this course, students will develop practical skills to effectively utilize computer applications for various Sanskrit-related tasks, contributing to the preservation and promotion of Sanskrit language and literature in the digital age.

OR

Nationalism and Indian Literature

Course Outcome: This course explores the interplay between nationalism and Indian literature, covering key concepts, historical contexts, and literary expressions. By the end of the course, students will understand the basic features of Indian nationalism, delve into the Sanskrit concept of 'Rashtra,' and analyze the rise of nationalism during the modern period. They will also examine nationalist themes in modern Indian literature, including Sanskrit poetry, Hindi, and Urdu works. Through this study, students will gain insights into the relationship between literature and nationalism in shaping India's cultural and political landscape.

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

Office of the Principal

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

UNDER GRADUATE COURSE FOR SANSKRIT GEN / Multidisciplinary UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER-I
DSC-1A
Sanskrit Poetry

Upon completion of this course on Sanskrit poetry, students will master the analysis and appreciation of classical Sanskrit literary works. They will explore texts such as Raghuvaṃśam, Śiśupālavadham, and Nītiśatakam, gaining insights into characters, themes, and linguistic intricacies. Furthermore, they will understand the historical evolution of Sanskrit poetry, including the contributions of renowned poets like Aśvaghoṣa, Kālidāsa, and Bhartṛhari, as well as the development of various poetic forms. Through this journey, students will develop enhanced literary appreciation and critical thinking skills.

UG Syllabus (under CCFUP/ NEP w.e.f. 2023-24)

3 Year Multidisciplinary Studies Programme

BACHELOR OF ARTS WITH SANSKRIT (MULTIDISCIPLINARY STUDIES)

MAJOR (MJ)

MJA1/B1T

An Introduction to Vedic, Classical Scientific and Technical Sanskrit Literature

Students will have a thorough understanding of Vedic, Classical, and Scientific Sanskrit literature after finishing this course. The main works and their literary, historical, and cultural relevance will be known to them. The contributions of important individuals like Bhāsa and Kālidāsa will be valued by the students. They will also study the fundamentals of the scientific and technical aspects of Sanskrit literature, such as Jyotirvijñān, Āyurveda, and Gaṇitaśāstra.

SEC 1

Reading & Writing Skills in Devanāgarī & Brāhmī scripts

Upon completing this course, students will be able to identify and understand various early Indian scripts, including Siddhamātṛkā, Śāradā, Grantha, Gauḍī, Nandināgarī, and Devanāgarī. They will gain proficiency in reading and writing Devanāgarī alphabets,

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

including compound letters and diphthongs, and using diacritics. Students will also be introduced to Brāhmī alphabets and their historical context, particularly from the Asokan period. Additionally, they will develop skills in transcribing between Devanāgarī and Brāhmī scripts.

SEMESTER-II

DSC-1B

Sanskrit Prose

Upon completion of the course on Sanskrit literature, students will achieve a comprehensive understanding of various classical texts and their significance in Indian culture and literary traditions. They will be able to analyze and interpret texts such as Śukanāsopadeśa, focusing on the authorship, societal and political themes, as well as the logical meanings and practical applications of the sayings contained within. Additionally, students will gain insights into the narrative structures, linguistic nuances, and thematic richness of texts like Śivarājavijayam, with a focus on poetic excellence, plot development, and the timing of actions within the narrative. Furthermore, through a survey of Sanskrit prose literature, students will explore the origins and evolution of prose writing in Sanskrit, while also studying prominent prose romances and the works of influential authors such as Subandhu, Bāṇa, Daṇḍin, and others. By the end of the course, students will have developed critical thinking skills, cultural awareness, and a deeper appreciation for the literary heritage of Sanskrit literature.

UG Syllabus (under CCFUP/ NEP w.e.f. 2023-24)

3 Year Multidisciplinary Studies Programme

BACHELOR OF ARTS WITH SANSKRIT (MULTIDISCIPLINARY STUDIES)

SEC 2

Computer Applications for Sanskrit

Students who successfully complete this course will be able to comprehend and make use of interactive Sanskrit teaching and learning resources, such as web-based development and multimedia fundamentals. They will become adept in typing in Unicode for Devanagari scripts and associated applications. Students will get knowledge of different instruments and approaches used in text processing and preservation of Sanskrit manuscripts. They will also investigate OCR (Optical Character Recognition) applications and techniques for Sanskrit and other Indian languages.

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

Office of the Principal

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

SEMESTER-III
DSC-1C
Sanskrit Drama

Upon completion of this course on Sanskrit drama, students will gain a comprehensive understanding of classical texts and dramatic techniques. Through the study of works such as Bhāsa's "Pratimānāṭaka" and Kālidāsa's "Abhijñānaśākuntalam," students will analyze plot structures, linguistic elements, and thematic complexities. They will explore technical terms of Sanskrit dramaturgy and understand the personification of nature in the texts. Additionally, students will delve into the language and poetic excellence of Kālidāsa's works, examining concepts like upamā (simile) and dhvani (suggestive meaning). By learning about the history of Sanskrit drama and prominent dramatists such as Bhāsa, Kālidāsa, and others, students will develop a deeper appreciation for the cultural and literary significance of Sanskrit drama. Through text readings, translations, and explanations, students will enhance their language proficiency and critical analysis skills, enabling them to interpret and appreciate Sanskrit drama within its historical and cultural context.

SEC-1
Computer awareness for Sanskrit

Upon completion of this course on computer awareness for Sanskrit, students will acquire fundamental knowledge and skills essential for utilizing computers in the context of Sanskrit language preservation and digitalization. They will gain an understanding of computer design, architecture, and operating systems, along with proficiency in using MS Office tools for document creation and management. Additionally, students will learn how to effectively navigate the internet, conduct web searches in Roman and Devanagari scripts, and utilize email for communication. Furthermore, students will be equipped with the ability to type in Unicode, understanding character encoding principles such as ASCII, UTF-8, and UTF-16, and utilizing various software tools for Sanskrit text input and digitalization. Lastly, students will gain insights into web publishing techniques, including HTML, Java Scripts, CSS, and basics of databases, enabling them to contribute to the digital preservation and dissemination of Sanskrit texts online. Through practical exercises and theoretical knowledge, students will develop essential computer skills tailored specifically for Sanskrit language applications, facilitating their engagement with Sanskrit texts in the digital age.

OR
Indian Architecture System

Upon completion of the course on Vāstusaukhyam of Todaramala, students will acquire a comprehensive understanding of traditional Indian architecture and its principles as outlined in Todaramala's text. Through the study of various chapters and verses, students will delve into the significance of Vastu principles, including Vastu Prayojana, Bhumi Pariksha, and Gha

Paryavaranam. They will analyze concepts such as dwelling placement, environmental considerations, and purification rituals in architecture. Furthermore, students will explore the different types of houses, structural elements like Dvārajānam and Stambha, and the layout of architectural spaces according to traditional guidelines. By examining chapters on Vastuchakram and Marmasthanani, students will gain insights into the symbolic and practical aspects of architectural design and spatial organization. Additionally, through the study of Vāsādisanirūpaam and Dvārafalam, students will learn about the functional aspects of architecture, including the significance of doorways and their effects on energy flow. Overall, students will develop a deeper appreciation for the philosophical, practical, and aesthetic dimensions of traditional Indian architecture as elucidated in Todaramala's Vāstusaukhyam.

SEMESTER-IV
DSC-1D
Sanskrit Grammar

Upon completion of the course on Laghusiddhantakaumudi, students will attain a solid understanding of Sanskrit grammar, focusing on the concepts of Samjñā Prakara, Sandhi Prakara, and Vibhaktyartha Prakara. They will learn the foundational principles of Sanskrit grammar, including the classification of words based on their meanings, the rules and types of Sandhi (morphophonemic combination), and the grammatical functions of different cases (vibhaktis). Through the study of Samjñā Prakara, students will grasp the essential categories and concepts necessary for understanding the structure and organization of Sanskrit language. In the Sandhi Prakara units, students will delve into the various types of Sandhi, including ac, hal, and visarga, learning the rules governing phonetic changes in word combinations. Additionally, students will explore the application of Vibhaktyartha Prakara, which deals with the interpretation and usage of different grammatical cases to convey meaning in sentences. By the end of the course, students will have developed a strong foundation in Sanskrit grammar, enabling them to analyze and construct sentences accurately and effectively in Sanskrit.

SEC-2
Basic Elements of Āyurveda

This course provides students with a comprehensive understanding of Ayurveda and related texts. They will learn about Ayurveda's origins, major schools, and prominent Ācāryas. Through the study of Carakasahitā, students will explore seasonal regimens, and in Taittirīyopaniad, they'll delve into philosophical teachings. By the end, students will gain insights into traditional Indian medicine, health practices, and spiritual wisdom.

OR

Yogasūtra of Patanjali

Upon completion of this course on the Yogasūtras of Patanjali, students will acquire a deep understanding of the foundational text of yoga philosophy. Through the study of the Samādhi Pāda, Sādhana Pāda, and Vibhūti Pāda, students will explore the principles and practices of yoga as elucidated by Patanjali. They will analyze key sutras, learning about the stages of yoga, including concentration, meditation, and enlightenment. Additionally, students will delve into the concept of sādhana (spiritual practice) and the methods prescribed for achieving mental clarity and self-realization. By the end of the course, students will have gained insights into the philosophical underpinnings of yoga, as well as practical techniques for cultivating inner peace, mindfulness, and spiritual growth.

SEMESTER-V

DSE-1A

Philosophy, Religion and Culture in Sanskrit Tradition

Upon completion of this course, students will gain a deep understanding of key concepts in Hindu philosophy and ethics. They will explore Dharma, focusing on forms of worship and moral evolution as outlined in the Bhagavad Gita. Additionally, students will examine Puruṣārtha (aims of human life) and Swadharma (personal duty), learning about cultural conditioning and the importance of individual responsibilities. Through this study, students will develop insights into Hindu ethics and spirituality, enabling them to apply these principles for personal growth and societal harmony.

OR

Indian Perspectives in Personality Development

This course provides students with a deep understanding of Hindu philosophical concepts and their practical applications. Through the study of ancient texts like the Rigveda and Upanishads, students explore the historical perspective. They also delve into the concept of a person, understanding the nature of the soul and various personality types as outlined in the Bhagavad Gita. Furthermore, students learn practical measures for behavioral improvement, including controlling senses and mind, cultivating right faith, and recognizing inner urges for societal harmony.

SEC-3

Basic Elements of Jyotisha

Upon completing this course on Jyotisha, students will acquire a comprehensive understanding of its fundamental elements and branches. They will explore the origin and historical development of Jyotisha, gaining insights into its significance and evolution over time. Additionally, students will receive a general introduction to various branches of astrology, including Siddhānta, Saṁhitā, Horā, Tājika, Praśna, Vāstuśāstra, and Muhūrtaśāstra, understanding their distinct areas of focus and application. Through the study of Jyotiṣa Chandrikā, students will delve into its Saṁjñā Prakaraṇam, analyzing verses that elucidate key concepts and techniques within Jyotisha. By the end of the course, students will have developed a solid foundation in Jyotisha, enabling them to comprehend its principles and methodologies and apply them effectively in various astrological contexts.

OR

E- Learning Tools and Techniques for Sanskrit

Upon completing this course on Interactive Sanskrit Teaching Learning Tools, students will gain a comprehensive understanding of e-learning principles and techniques tailored for Sanskrit language education. They will explore the advantages and pitfalls of e-learning, learning about its architecture and methodologies. Through units focusing on multimedia basics, web development tools, and surveying various e-learning techniques, students will develop proficiency in utilizing interactive tools for Sanskrit language instruction. Furthermore, students will learn about Unicode typing in Devanagari scripts and explore the standardization of Indian languages for e-learning purposes. Additionally, students will delve into the creation of e-content for Sanskrit texts, covering digitalization techniques, text processing, and database management. By the end of the course, students will have the skills and knowledge to effectively utilize e-learning tools and techniques to create engaging and informative digital content for teaching and learning Sanskrit.

GE- 1

Nationalistic Thoughts in Sanskrit Literature

Upon completion of this course on Nationalistic Thought in Sanskrit Literature, students will develop a comprehensive understanding of the concepts of nationhood, nationalism, and patriotic sentiment as depicted in Sanskrit texts across various epochs. In Section A, students will explore the definitions and concepts of the nation, examining perspectives from classical Sanskrit literature and modern interpretations. They will delve into factors contributing to nationalism and the significance of national symbols in shaping Indian identity. In Section B, students will trace the roots of nationalistic thought in Vedic and classical literature, analyzing references to Bharata and Rashtra in texts like the Rigveda, Atharvaveda, and Ramayana. They will explore the geographical, sociological, and cultural dimensions of Bharatavarsha and its significance in ancient Sanskrit literature. In Section C, students will examine nationalistic trends in modern Sanskrit poetry, both pre and post-independence, studying works that reflect the spirit of nationalism and patriotism. By the end of the course, students will have gained insights into the rich heritage of nationalistic thought in Sanskrit literature, fostering a deeper appreciation for the role of literature in shaping collective identity and fostering national pride.

OR

Political Thought in Sanskrit

This course on Ancient Indian Political Thought provides students with a deep understanding of the foundations, development, and theories of political governance in ancient India. In Section A, students explore the fundamental concepts, scope, and sources of Indian political thought, examining texts such as the Vedas, Puranas, and Kautilya's Arthashastra. They also study the nature and theories of the state, including the Saptanga theory and various types of states mentioned in ancient texts. Section B delves into the origin and evolution of Indian political thought from the Vedic to Buddhist periods, highlighting democratic practices, parliamentary institutions, and republican ideals. Additionally, students analyze key political thinkers such as Kautilya and Mahatma Gandhi, understanding their contributions to political philosophy and governance. Finally, in Section C, students examine cardinal theories of Indian political science and prominent political thinkers, gaining insights into concepts like state power and inter-state relations. By the end of the course, students will have a comprehensive understanding of ancient Indian political thought and its relevance to contemporary governance and political discourse.

OR

Sanskrit Media

Upon completion of this course, students will gain practical skills and theoretical understanding in media communication within the realm of Sanskrit language and literature. Through comprehensive exploration of television, radio, magazines, newspapers, and online platforms, they will learn essential techniques such as news translation, editing, anchoring, graphics, voice-over, and article collection. Additionally, students will delve into the historical journey and various types of Sanskrit magazines, while also developing proficiency in editing, reporting, and packaging for print media. Furthermore, they will explore the utilization of the internet, social networks, blogs, and platforms like Sanskrit Wikipedia for disseminating information related to Sanskrit language and culture. Overall, students will emerge from this course equipped with the necessary skills to contribute effectively to media production and promotion within the domain of Sanskrit studies.

SEMESTER-VI

DSE-1B

Literary Criticism

Upon completion of this course, students will gain a comprehensive understanding of Sanskrit poetry as explored in Kavya Prakasha. They will delve into the distinctive characteristics and objectives of poetry (Kavya Vaisishtya and Kavya Prayojana), acquiring insights into its creative essence and intended purposes. Furthermore, students will explore the underlying factors influencing poetic creation (Kavya Karana), allowing for a deeper comprehension of the artistic processes involved. Additionally, they will examine the diverse nature and classifications of poetry (Kavya Swarupa and Kavyabheda), enabling them to recognize and appreciate the various forms and styles of Sanskrit poetic expression. Overall, this course will equip students with the knowledge and analytical skills necessary to engage with Sanskrit poetry critically and appreciatively.

OR

Nationalism in Sanskrit Literature

Underlying the completion of this course is a comprehensive comprehension of Indian nationalism, spanning from its rudimentary notions to its portrayal in contemporary Sanskrit literature. Delving into the intricate facets of Indian nationhood ('Rashtra') and nationality, students will dissect their definitions, core elements, and historical origins. Exploring the symbolic representations affiliated with India, including its national anthem, song, flag, emblem, and calendar, learners will unravel their cultural and historical significance. Additionally, the course will chart the trajectory of Indian nationalism, from its inception to its culmination in the freedom struggle, emphasizing the pivotal role of socio-religious reform movements and significant nationalist figures. Through an analysis of modern Sanskrit literature, participants will discern the contributions of Sanskrit writers to the nationalist cause, both preceding and following Independence, with a particular focus on Gandhian principles and their manifestation in contemporary Sanskrit literary works. Overall, this course aims to foster a holistic understanding of Indian nationalism and its diverse manifestations across various facets of society and culture.

OR

Mathematical Tradition in Sanskrit

This course provides an overview of Indian mathematics, covering topics from ancient texts to classical and post-classical periods. Students learn about foundational concepts like Lagadh Jyotisha, classical works such as Līlavatī by Bhāskarācārya, and Vedic mathematics. They also explore technical terms and the historical development of mathematics in Sanskrit literature, focusing on key figures like Āryabhaṭa and Brahmagupta. By the end, students gain a deeper understanding of Indian mathematical heritage and its significant contributions.

SEC-4

Indian Theatre

This course offers a comprehensive exploration of Indian theatre, tracing its origins from pre-historic times to modern forms. Students delve into various stages of development, including the Vedic age, epic-puranic age, court, temple, open, folk, commercial, and modern theatre. They learn about different types and constructions of theatres, understanding the nuances of acting through the Āgika, Vācika, Sāttvika, and Āhārya aspects. Additionally, the course covers key elements of drama such as vastu (subject matter), netā (hero), and rasa (sentiment), providing a holistic understanding of theatrical traditions in India.

GE-2

Sanskrit Meter and Music

This course provides a comprehensive understanding of Chandaśāstra, the science of Sanskrit meter. It begins with an introduction to Chandaśāstra, followed by an in-depth exploration of the classification and elements of Sanskrit meter. Students learn about syllabic verse, syllabo-quantitative verse, and quantitative verse, while also studying syllables, gaṇa, and feet. The course further analyzes selected Vedic and classical meters, focusing on their definition, examples, analysis, and lyrical methods. Through this study, students gain insights into the intricacies of Vedic and classical meters and their musical rendering, enhancing their appreciation and understanding of Sanskrit poetry and prosody.

OR

Ethical and Moral Issues in Sanskrit Literature

This course explores ethical and philosophical themes in ancient Indian literature, focusing on the Mahābhārata and the Rāmāyaṇa. Students examine issues like truthfulness, ethical dilemmas, obedience, loyalty, and self-respect. They also analyze concepts of poetic freedom, personal duty (svadharma), and steady wisdom (sthitaprajña) as depicted in the Bhagavad Gītā. Through this study, students gain insights into Indian cultural values and their relevance today.

OR

Basics of Sanskrit Linguistics

This course provides a comprehensive overview of linguistics, focusing on language structure and classification. Students delve into the fundamentals of phonology and phonetics, exploring the articulation of sounds and their classification. They also study morphology and syntax, examining the structure of words and sentences, including morphemes, affixes, and phrase structure rules. Additionally, the course covers pragmatics and semantics, exploring the meaning conveyed by language in different contexts. Through this study, students gain a deeper understanding of the principles underlying language structure and use, enhancing their analytical and communication skills.

सत्यमेव जयते

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

Office of the Principal

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

Curriculum and Credit Framework for Undergraduate Programmes (CCFUP)

The National Education Policy (NEP) 2020 (hereafter referred to as NEP or Policy) recognizes that higher education plays an extremely important role in promoting human as well as societal well-being and in developing India as envisioned in its Constitution - a democratic, just, socially conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all. It notes that “given the 21st -century requirements, quality higher education must aim to develop good, thoughtful, well-rounded, and creative individuals”.

In accordance with the NEP 2020, the UGC has formulated a new student-centric “Curriculum and Credit Framework for Undergraduate Programmes (CCFUP)” incorporating a flexible choice-based credit system, multidisciplinary approach, and multiple entry and exit options. This will facilitate students to pursue their career path by choosing the subject/field of their interest.

UG Syllabus (under CCFUP/ NEP w.e.f. 2023-24)
4 Year Honours Programme
BACHELOR OF ARTS (HONOURS) MAJOR IN SANSKRIT

SEMESTER-I

MAJOR (MJ

MJ-1

Critical Survey of Sanskrit Literature

Students will graduate from this course with a thorough comprehension of Vedic literature, which includes the Upaniṣads, Āraṇyakas, Brāhmaṇas, Saṁhitās, and Vedāṅgas. The cultural and historical relevance of the Purāṇas and the epics Rāmāyaṇa and Mahābhārata will be examined. Introduction to the principles of grammar (Vyākaraṇa), philosophy (Darśana), and poetry (Sāhitya\āstra) will be given to the students. They will also gain an appreciation of the literary and cultural contributions of the major schools of Indian philosophy and poetics by learning about them.

SEC 1
Reading & Writing Skills in Devanāgarī & Brāhmī scripts

Upon completing this course, students will be able to identify and understand various early Indian scripts, including Siddhamātṛkā, Śāradā, Grantha, Gauḍī, Nandināgarī, and Devanāgarī. They will gain proficiency in reading and writing Devanāgarī alphabets, including compound letters and diphthongs, and using diacritics. Students will also be introduced to Brāhmī alphabets and their historical context, particularly from the Asokan period. Additionally, they will develop skills in transcribing between Devanāgarī and Brāhmī scripts.

MINOR (MI)
MI-1/C1
History of Sanskrit Literature

Students will have a firm grasp on the evolution of Vedic, Classical, and Scientific Sanskrit literature after finishing this course. The main texts and their literary and cultural significance will be known to them. Pupils will understand how the Purāṇa, Mahābhārata, and Rāmāyaṇa have influenced Indian culture. They will also look at the contributions that Sanskrit literature has made to many scientific and technological domains, such as Jyotirvijñān, Ayurveda, and Gaṇitaśāstra.

SEMESTER-II
MAJOR (MJ
MJ-2
Sanskrit Composition and Communication

After completing this course, the student will acquire Sanskrit translation, conjugation and indelibles, improving his grammar. They understand and apply Saṁjñā and Kāraka-vibhakti (case endings) according to Laghusiddhāntakaumudī. The student also learns sounds and Kṛt conjunctions and learns to use different grammatical forms. In addition, they develop translation skills by converting texts from Bengali to Sanskrit.

SEC 2
Computer Applications for Sanskrit

Students who successfully complete this course will be able to comprehend and make use of interactive Sanskrit teaching and learning resources, such as web-based development and multimedia fundamentals. They will become adept in typing in Unicode for Devanagari scripts and associated applications. Students will get knowledge of different instruments and approaches used in text processing and preservation of Sanskrit manuscripts. They will also investigate OCR (Optical Character Recognition) applications and techniques for Sanskrit and other Indian languages.

MI-2/C2
General Grammar and Composition

After completing this course, the student will have a thorough understanding of Sanskrit grammar, including declension, conjugation, sandhi, samāsa and kāraka-vibhakti. They govern the use of kṛt and taddhita suffixes in different contexts. Students develop the ability to accurately translate texts from Bengali or English into Sanskrit. In addition, they develop their composition skills in Sanskrit.

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

Office of the Principal

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

UG Syllabus (under CCFUP/ NEP w.e.f. 2023-24)
3 Year Multidisciplinary Studies Programme
BACHELOR OF ARTS WITH SANSKRIT (MULTIDISCIPLINARY STUDIES)

SEMESTER-I

MAJOR (MJ)

MJA1/B1T

An Introduction to Vedic, Classical Scientific and Technical Sanskrit Literature

Students will have a thorough understanding of Vedic, Classical, and Scientific Sanskrit literature after finishing this course. The main works and their literary, historical, and cultural relevance will be known to them. The contributions of important individuals like Bhāsa and Kālidāsa will be valued by the students. They will also study the fundamentals of the scientific and technical aspects of Sanskrit literature, such as Jyotirvijñān, Āyurveda, and Gaṇitaśāstra.

SEC 1

Reading & Writing Skills in Devanāgarī & Brāhmī scripts

Upon completing this course, students will be able to identify and understand various early Indian scripts, including Siddhamātṛkā, Śāradā, Grantha, Gauḍī, Nandināgarī, and Devanāgarī. They will gain proficiency in reading and writing Devanāgarī alphabets, including compound letters and diphthongs, and using diacritics. Students will also be introduced to Brāhmī alphabets and their historical context, particularly from the Asokan period. Additionally, they will develop skills in transcribing between Devanāgarī and Brāhmī scripts.

MINOR (MI)

MI-1/C1

History of Sanskrit Literature

Students will have a firm grasp on the evolution of Vedic, Classical, and Scientific Sanskrit literature after finishing this course. The main texts and their literary and cultural significance will be known to them. Pupils will understand how the Purāṇa, Mahābhārata, and Rāmāyaṇa have influenced Indian culture. They will also look at the contributions that Sanskrit literature has made to many scientific and technological domains, such as Jyotirvijñān, Ayurveda, and Gaṇitaśāstra.

SEMESTER-II

SEC 2
Computer Applications for Sanskrit

Students who successfully complete this course will be able to comprehend and make use of interactive Sanskrit teaching and learning resources, such as web-based development and multimedia fundamentals. They will become adept in typing in Unicode for Devanagari scripts and associated applications. Students will get knowledge of different instruments and approaches used in text processing and preservation of Sanskrit manuscripts. They will also investigate OCR (Optical Character Recognition) applications and techniques for Sanskrit and other Indian languages.

MI-2/C2
General Grammar and Composition

After completing this course, the student will have a thorough understanding of Sanskrit grammar, including declension, conjugation, sandhi, samāsa and kāraka-vibhakti. They govern the use of kṛt and taddhita suffixes in different contexts. Students develop the ability to accurately translate texts from Bengali or English into Sanskrit. In addition, they develop their composition skills in Sanskrit.

सत्यमेव जयते

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

Programme Specific Outcome (PSO) and Course Outcome (CO) Department of Santali Government General Degree College, Salboni

Name of the Programme	**B.A. (Honours) in Santali [Under Choice Based Credit System]**
Year of Introduction	**2018-19**

Programme Outcome

- **PO 1:**The curriculum of Santali Honours is mainly literature based. Here an idea is given about different branches of Santali literature of ancient, middle and modern period. In other words, one has to read poems, stories, novels, dramas etc. by various poets and writers. The students of Santali department read about the rhetoric and rhythm of Santali poetry, read the history of Santali language, read grammar, read literary forms and customs. They have to study ancient manuscripts or parts of modern linguistics, learn literary criticism and theory of literature.Such diverse subjects open up new worlds of knowledge to the students. Due to this, students are interested to know more about this subject. They develop their own logic. In the light of their reasoning, they are able to find new ideas by analyzing various literary texts.As a result, they will be able to develop fundamental research perspectives. As a result, they will be able to do new research in this Santali language.
- **PO 2:**Santali Honours lessons have special importance in the professional field as well. There is an opportunity for education by doing B.A. with Honors in Santali. Apart from this, there is also an opportunity to become a Teacher by passing D. El.Ed, B. Ed, NET/SET after graduation and

Post-graduation as well as.

- **PO 3:**There is scope for book criticism in magazine offices Exclusive rights of Santali Honours students there too.
- **PO 4:**There is an opportunity to become a translator. By reading Santali Honors, there is an opportunity to work as a translator in government or various private organizations.
- **PO 5:**Santali Honours students have job opportunities in various advertising agencies if they have skills in Santali language.
- **PO 6:**Currently students are getting jobs in various branches of print media Those who study with Santali Honours in the editing department of the publication have proven their competence. Students get job opportunities in various media. Besides, one can make a living by writing scripts for films or dramas. There are many people who studied Santali Honors who are living comfortably just by writing.
- **PO 7:**Apart from this, there are job opportunities in many other departments including editing and proof reading in publishing houses after studying Santali Honours. At present, candidates who study with Santali Honours have the opportunity to work in various government and private organizations.

Year	**Semester**	**Course Type**	**Course Code**	**Core Course Title**	**Programme Specific Outcome**	**Course Outcome**
I	**I**	**Core-1**	**SNTH CC-1**	C1T: History of Santali Ancient Literature	The objective of this program is to introduce students to the origins of Santali language, classification of Santali literature, Santali story, Songs, Rhyme, Proverbs, Riddle, Idioms and folk songs like, Baha, Sahray, Karam, Danshay, Dong, Langre and Pata. The purpose of the course is mainly to introduce the undergraduate course students to SantaliFolk literature.	• After successful completion of this course students will know about the Origin of Santali language. Will be able to gain knowledge about Santali language of ancient period. • The diversity and richness of a language depends on Folk. At this stage, students will know the rituals and traditional of Santal Society. • The subject of Santali Folk story recall the students that how to tell the stories in ancient age. • The subject of Rhyme students gains knowledge of Rhyme and they learn the uses of Rhyme in daily life. • The subject of Proverbs the

						students learns how to use the proverb in language. That is when they talk with the people how and when these are used. • The Riddle Chapter students must know the characteristics of Riddles. Also they learn how to deliver the Riddle before the people or the group of peoples. • From the chapter of Idioms students of Santali Honours can know about the Idioms. They also gain the knowledge of different types of Idioms and their uses in language as well as Santali language. • The language of folk literature is called 'folk language'. This language is not saintly, nor fully respected, nor is it a particular regional dialect. In general, Santali folk tales, folk tales, children's rhymes, Baha, Sahray, Karam, Dansay and Pata songs etc. are found in folk language. Through this, students will know their heritage and identity of language-centric culture. • In the lesson of Folk Songs students can know the knowledge of ancient songs of Santal. They also gain the knowledge of different types of

						folk songs. • The Chapter of Baha students learn the tradition, rituals and usages of Baha festival and the related philosophy. In the chapter they gain the knowledge of deities, gods and goddesses related to the festival of flowers. • Sahray is the biggest festival of Santals. In the chapter of Sahray students can know the usages, traditions, songs, dances of the festival. How many days the festival is celebrated and how to welcome the cows, they can learn. • Karam is the festival of wealth. In this chapter students learn the process of gain the wealth. In this chapter they know about the story of Karmu and Dharmu. • Dasay is the festival of search. How, who and why the santals search. This is the interesting topics. • Dong is the songs of marriage ceremony. In this chapter students know about the marriage, its characteristics, types of Santal marriage, types of Dong and the marriage system in the society. • Langre is one type of dance as

						well as song. It has special characteristics. • Pata is famous song. It has a dance and music itself. This tradition is celebrated outside the villages.
I	**I**	**Core-2**	**SNTH CC-2**	C2T: Austric Language Famili & Santali	The objective of this program is to introduce students to the language family as well as Austric language family.	• In the chapter of language family students know about the language family of the world. They also know the language family tree and the status of Santali language in the language family. • Students will know the origin and development of Santali language. • Students will know the Characteristics and peculiarity of Santali language. • After successful completion of this course students will gain knowledge about different kinds of neighbouring and sister languages.
	I	**GE-1**	**SNTH GE-1**	GE1T: History of Santali literature.	The objective of this program is to introduce students to the history of ancient, medieval modern Santali	• Students will know the general identity of Santali language. • Students will learn about Santaliorigin of Santali language and its character. • Students will gain knowledge about the Santali authors and books • Students will learn about the

					literature.	magazines and journals and its editors. • Students will also gain the knowledge about the role of missions and missionaries to Santali language and literature in the missionary age of Santali language.
II	**II**	**Core-3**	**SNTH CC-3**	C3T: Santali Folk literature-I	The objective of this program is to introduce students to the history of Santali folk literature with its genre.	• Students will gain knowledge about the origin and development of Santali folk literature. • Students will know about the different kind of folk tales and its kinds. • Students will gain the knowledge of proverbs, riddles and phrases of Santali literature. • After the completion of the course students will able to use the proverbs, riddles and phrases to the writing the creative literature.
II	**II**	**Core-4**	**SNTH CC-4**	C4T: History of Santali literature (Medieval period : 1845-1947)	The objective of this program is to introduce students to the history of medieval Santali literature.	• After successful completion of this course students will gain knowledge about origin of Santali creative literature. • Students will learn about the Anthropologist's, Missionaries and Travellers' contribution to Santali language and literature. • Students will also gain the knowledge of Santal rebellion

						and its impact to the Santali literature. • Students will know the kinds of Santali magazine and it's characteristics of the Medieval period. • After the completion of the course confidence level of the student will be very high about the grammar and vocabulary of Santali language and literature.
II	**II**	**GE-2**	**SNTH GE-2**	GE2T: Santali poetry literature, Folk song.	This course basically includes a general discussion of various kinds of ancient and medieval poetry literature as well as a discussion of various poets in the genre of modern poetic literature and folk songs.	• Students will gain a general knowledge of some of the classics of ancient and medieval poetry literature. • Students will gain knowledge about the contribution of several poets. • Students will know the Folk songs of Baha, Sahray, Karam, Dansay and Pata and they will know the meaning of the songs, it's rhythm etc.
II	**III**	**Core-5**	**SNTH CC-5**	C5T: Functional grammar of Santali language.	This course covers various aspects of Santali grammar as well as Dhowoni and Borno.	• Students will learn topics such as Parts of speech, Tense, Number and Gender. Besides this they will gain knowledge about different aspects of Sound and Script.

III	**III**	**Core-6**	**SNTH CC-6**	C6T:Santali Folk literature and Culture II	The objective of this programme is to introduce students to the definition, classification of folk literature. They also introduced with the Santali rhyme, culture, traditions and related customs.	• Santal tradition, customs, is a very important subject for students. In this stage students will be able recognizing the Santal culture, tradition, customs and rituals. Here they will also learn the definition and characteristics of the folk literature. • At this stage, the students will be introduced to the Santal marriage and customs connected therewith rituals connected with agriculture. • At this stage, the students will gain the knowledge about cultural contact and de-tribalisation, connected movements and re-tribalisation.
III	**III**	**Core-7**	**SNTH CC-7**	C7T:History of Santali Modern literature.	The objective of this programme is to introduce students to the history of modern Santali literature.	• After successful completion of this course students will gain knowledge about important author of Santali creative literature. • Along with the knowledge of important books, magazines and journals they will know the various awards and the award winner authors.
III	**III**	**SEC-1**	**SNTH SEC-1**	SEC-1:Art of Translation	This course covers various aspects of Santali grammar as well as translation theory.	• Students will learn the translation theory and the types of translation. Such as free

						translation, literature translation, functional translation, communicative translation and official translation as well. • Students will gain the knowledge of Transcreation and its uses to the cinemas and advertisement films. • After the completion of the course students will be confidence about the Audio-Visual translation. They will know how AVT is used in document film.
III	**IV**	**Core-8**	**SNTH CC-8**	C8T:Language and Santali Linguistics	The objective of this programme is to introduce students to the language and linguistics.	• Students will learn the definition and meaning of language, its characteristics and the languages of different creatures. • At the end of the course students will be know the knowledge of Phonology, Morphology, Syntax and Semantics.
III	**IV**	**Core-9**	**SNTH CC-9**	C9T: Comparative study : Tribal literature and others	The objective of this programme is to introduce students with the literature of sister languages of Santali and compare among them.	• At the end of this course, students will be able to identify characteristics of Santali and the other sister languages of Santali. • Students will learn the characteristics of non-sister languages of Santali. It means they will know about the Bengali, Hindi Odiya and Assamese languages which languages are spoken near by

						the Santal areas.
III	**IV**	**Core-10**	**SNTH CC-10**	C10T: Theory of literature.	This course covers various aspects of Theory of literature.	• At the end of this course students will be able to identify difference between different genres. • Students will gain the knowledge of Word Power. • Students will gain the knowledge of Juice, Rhetoric, Prosody, Epic and the entire genre of literature. • Students will learn about Classicism, Romanticism, Naturalism, Realism, Symbolism and Criticism.
Name of the Programme				**B.A. 4-Year (Honours) in Santali [Under Curriculum & Credit Framework for Undergraduate Programmes (CCFUP-2023 & NEP-2020)]**		
Year of Introduction				**2023-24**		
Year	**Semester**	**Course Type**	**Course Code**	**CoreCourse Title**	**ProgrammeSpecificOutcome**	**Course Outcome**

I	**I**	**Major-1**	**SNTMJ101**	History of Santali Ancient Literature (Adikal)	This course includes the history of Santali language and literature.	After completing this course, students will know the history of Santali language and literature. In this course they know folk songs, folk tales etc. In the course they may know the creation of earth and the human beings.
I	**I**	**SEC**	**SNTSEC01**	P : Translation & Transcreation	This course includes two important subjects like Santali translation and transcreation.	After successful completion of this course a student will know the translation from other language to Santali and vice-versa. Also they learn the transcreation and its uses in daily life as well films and other fields of literature.

I	**I**	**Minor (Disc-I)**	**SNTM101**	T : History of Santali language.	This course includes the origin of the Santali language and its different levels, Santali dialects, vernaculars, Santali vowels, consonants, causes and formulas of sound change, overtones, international phonetic alphabet, Santali vocabulary, causes and trends of semantic change etc.	After completing this course, students will know the know the history of the origin of the Santali nation. Learn about the different levels of Santali language, the period of that level, its linguistic features, and different literary patterns. You will know the Definition of various categories and categories of Santali vowels and consonants. Learn about various causes and trends of sound change and syllabic change. Be able to relate yourself with the words spoken in the current environment.
I	**II**	**Major-2**	**SNTHMJ102**	Santal Myth	Bintis, like Jomsim Binti, Chhatiyar Binti, Bapla Bindi, Bhandan Binti, Karam Binti and Patkar Binti	After successful completion of this course, a student will know about the religious practices of Santals and rituals. Apart from this, one can learn about the creation of earth and the creation of human being and other creators.
I	**II**	**SEC**	**SNTSEC02**	Translation theory and practice	This course includes the theory and practical of translation.	After successful completion of this course a student will be able to translate. Though they learned the translation in two ways that is in theory and practical, they will be done any kind of translation works.

I	**II**	**Minor (Disc-II)**	**SNTMI02**	Santali Folk song and Folktales	The subjects covered all Folk song and Folktales. There are huge amount of Folk songs and Folktales in Santal Community. All those	After successful completion of this course, a student will know about the religious practices with related Folk Songs and Folktales. A student also knows the various types folk songs and its situation of singing. By the help of Folktales a student can know knowledge of ancient people.

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

Programme Specific Outcome (PSO) and Course Outcome (CO) Department of Santali Government General Degree College, Salboni

Name of the Programme	**B.A. (General) in Santali [Under Choice Based Credit System]**
Year of Introduction	**2018-19**

Programme Outcome

- **PO 1:**The main objective of studying Santali in pass course at graduate level is to acquire general knowledge about Santali language and literature. Which will later help the students in their professional life.
- **PO 2:**Studying Santali means I can assume that his language and writing skills will be good. So if you have a desire to write, you can easily progress towards becoming a writer. Writing can be started with various newspapers, social media, stories and novels. In today's era, you can make your own page on social media and try to earn by slowly writing. This is a very good opportunity to earn working from home nowadays.
- **PO 3:**Proofreader jobs can be found in any publishing house with Santali reading.
- **PO 4:**Screenwriting jobs can be found in any Santali production house or media house.
- **PO 5:**Translation work can be found from books, writings in different languages into Santali. But in that case there should be knowledge about the language from which the translation will be done.
- **PO 6:**can be worked out, as linguists. There are many opportunities to work with Santali in this department. The history of Bengal gives an opportunity to work on the stratification of the Santali language etc.

- **PO 7:**If you have good language skills, you can get a job in advertising agencies very easily. If you have a talent for writing poetry, you can get a job as a tag line writer for an advertising agency. Apart from this, the demand of Santali language in all the news organizations of the present era is increasing continuously. But in this case it is very important to have a proper knowledge about the world of news.
- **PO 8:**One can work as a content writer, freelance content writer in any education firm or website design company, IT firm. The future of the content writing profession is very bright right now. Also, taking a course in digital marketing can increase job opportunities in a digital marketing firm.
- **PO 9:**Opportunity to sit for various governments job exams and get jobs, which can be done only after graduation in Bengal too. This time we did not see at a glance, what are the government job opportunities after reading about Santali?IAS/IPS exam can be conducted at All India level.State Police, WBCS these exams can be given and a major part covers Santali language and literature.Central State Group C, D posts can appear for the exam.If you have very good marks, you can sit the Indian Post Department exam. Bank, Municipality or any office for clerical post, school inspector etc. can also sit for the job exam and get a job if successful in the exam.
- **PO 10:**There are also various types of work in various events, presentations, recitals, radio jockeys, and digital media.

Programme Specific Outcome (PSO) and Course Outcome (CO)

Year	Semester	Course Type	Course Code	Core Course Title	Programme Specific Outcome	Course Outcome
I	**I**	**Core Course-1**	**SNTG DSC-1A**	DSC1AT: History of Santali Literature	The objective of this program is to introduce students to the history of ancient, medieval modern Santali literature. The objective of this programme is to introduce students to the important books, eminent authors and the language developers of missionary period	• Students will know the general identity of Santali language. • Students will learn about Santaliorigin of Santali language and its character. • Students will gain knowledge about the Santali authors and books • Students will learn about the magazines and journals and its editors. • Students will also gain the knowledge about the role of missions and missionaries to Santali language and literature

					too.	in the missionary age of Santali language.
I	**II**	**Core Course-2**	**SNTG DSC-1B**	DSC1BT: Santali poetry literature, Folk Song	This course basically includes a general discussion of various kinds of ancient and medieval poetry literature as well as a discussion of various poets in the genre of modern poetic literature and folk songs.	• Students will gain a general knowledge of some of the classics of ancient, medieval and modernpoetry literature. • Students will gain knowledge about the contribution of several poets. • Students will know the Folk songs of Baha, Sahray, Karam, Dansay and Pata and they will know the meaning of the songs, it's rhythm etc.
II	**III**	**Core Course-3**	**SNTG DSC-1C**	DSC1CT: Drama Literature	This course includes several Dramas readings by various drama authors including Sadhu Ranchand Murmu, Pandit Raghunath Murmu and Jamadar Kisku.	• Students will be able to understand how health is wealth in the play "Dare ge Dhon" by Pandit Raghunath Mrumu. • Through Jadunath Tudu's "Low Bir" drama, The students will be able to understand the hunting festival of Santal tribe. • By reading Rabilal Tudu's "Bir Birsa" play, students will be able to understand Bhagvan Birsa Munda's life and his movement. • By reading Kaliram Soren's "Sidhu Kanhu Hool" play, students will be able to understand the Santal hool

						leaded by Sidhu and Kanhu. • Students will understand the village life by reading the one act play 'Koche Karba', written by Solomon Murmu • Students will understand the creation by reading the one act play 'Sirjon', written by Dr. K. C. Tudu • By reading Badal Hembram's one act play 'Maya Sutam', the love and relation of a family.
II	**III**	**Skill Enhancement Course-1**	**SNTG SEC-1**	SEC1T: Art of translation	This course covers various aspects of Santali grammar as well as translation theory.	• Students will learn the translation theory and the types of translation. Such as free translation, literature translation, functional translation, communicative translation and official translation as well. • Students will gain the knowledge of Transcreation and its uses to the cinemas and advertisement films. • After the completion of the course students will be confidence about the Audio-Visual translation. They will know how AVT is used in document film.
II	**IV**	**Core Course-4**	**SNTG DSC-1D**	DSC1DT: Santali novel & short stories	The course includes the Novels and short stories. Readings of novels short stories by several writers.	• Through R. Carstare'snovel, the students will be able to understand the reason and result of Santal hul, which was

						happened in 1855-56. • Students will be able to understand the bonding of social relation in villages by the novel of Parimal Hembram’s “Kash Dungri”. • By reading Domon Hansda’s “Atu Orag” students will be able to know the village life and its tradtion. • By reading Bhogla Soren’s “Upal” students will be able to know the struggle of a girl in the society • By reading Madan Mohan Murmu’s “Matimai” students will be able to know the status of women in the society. • By reading Aditya Mitra ‘Santali’, Thakur Prasad Murmu, Durbin Soren and Gomosta Prasad Soren’s short stories various characters and different situations in the village life.
II	**IV**	**Skill Enhancement Course-2**	**SNTG SEC-2**	SEC2T: Folk and performing art	The objective of this programme is to introduce students to the folk and performing art and its culture and rituals.	• After successful completion of this course, students will be able to classify folk and performing art. • Students will know the history of folk and performing arts and its kinds. • Students will gain the

						knowledge of folk and performing art.
III	**V**	**Core Course-5**	**SNTG DSE-1A**	DSE-1AT:Functional grammar of Santali language and linguistics.	This course covers various aspects of Santali grammar as well as Dhowoni and Borno.	• Students will learn topics such as Parts of speech, Tense, Number and Gender. Besides this they will gain knowledge about different aspects of Sound and Script.
III	**V**	**Skill Enhancement Course-3**	**SNTG SEC-3**	SEC3T: Language in Advertisement.	The objective of this programme is to introduce students to the professional career with the help of language.	• After successful completion of this course students will know the uses of language in profession career like advertisement of various products.
III	**V**	**GE-1**	**SNTG GE-1**	GE1T:History of Santali literature	The objective of this program is to introduce students to the history of ancient, medieval modern Santali literature.	• Students will know the general identity of Santali language. • Students will learn about Santaliorigin of Santali language and its character. • Students will gain knowledge about the Santali authors and books • Students will learn about the magazines and journals and its editors. • Students will also gain the knowledge about the role of missions and missionaries to Santali language and literature in the missionary age of Santali language.
III	**VI**	**Core Course-6**	**SNTG DSE-1B**	DSE1BT:Santali folk literature.	The objective of this programme is to introduce students to the	• Santal tradition, customs, is a very important subject for

					definition, classification of folk literature.	students. In this stage students will be able recognizing the Santal culture, tradition, customs and rituals. Here they will also learn the definition and characteristics of the folk literature. • At this stage, the students will be introduced to the Santal marriage and customs connected therewith rituals connected with agriculture.
III	**VI**	**Skill Enhancement Course-4**	**SNTG SEC-4**	SEC4T:Writing skill	The objective of this programme is to introduce students to skilled in creative writing.	• At the end of this course students will know the documentation, report writing, making notes and letter writing to various aspects.
III	**VI**	**GE-2**	**SNTG GE-2**	GE2T:Santali folk literature.	The objective of this program is to introduce students to the history of Santali folk literature with its genre.	• Students will gain knowledge about the origin and development of Santali folk literature. • Students will know about the different kind of folk tales and its kinds. • Students will gain the knowledge of proverbs, riddles and phrases of Santali literature. • After the completion of the course students will able to use the proverbs, riddles and phrases to the writing the creative literature.

<table>
<tr><td colspan="4">Name of the Programme</td><td colspan="3">B.A. 3-Year (MDP) in Santali
[Under Curriculum & Credit Framework for Undergraduate Programmes (CCFUP-2023 & NEP-2020)]</td></tr>
<tr><td colspan="4">Year of Introduction</td><td colspan="3">2023-24</td></tr>
<tr><th>Year</th><th>Semester</th><th>Course Type</th><th>Course Code</th><th>CoreCourse Title</th><th>ProgrammeSpecificOutcome</th><th>Course Outcome</th></tr>
<tr><td>I</td><td>I</td><td>Major-1 (Disc.-A1)</td><td>SNTPMJ101</td><td>Historical background of Santali language and development.</td><td>This course includes the history of Santali language and literature and its development.</td><td>After completing this course, students will know the history and its development till now.</td></tr>
</table>

I	**I**	**SEC**	**SNTSEC01**	P : Translation & Transcreation	This course includes two important subjects like Santali translation and transcreation.	After successful completion of this course a student will know the translation from other language to Santali and vice-versa. Also they learn the transcreation and its uses in daily life as well films and other fields of literature.
I	**I**	**Minor (Disc-I)**	**SNTMI01/C01**	T : History of Santali language.	This course includes the origin of the Santali language and its different levels, Santali dialects, vernaculars, Santali vowels, consonants, causes and formulas of sound change, overtones, international phonetic alphabet, Santali vocabulary, causes and trends of semantic change etc.	After completing this course, students will know the know the history of the origin of the Santali nation. Learn about the different levels of Santali language, the period of that level, its linguistic features, and different literary patterns. You will know the Definition of various categories and categories of Santali vowels and consonants. Learn about various causes and trends of sound change and syllabic change. Be able to relate yourself with the words spoken in the current environment.
I	**II**	**Major-2 (Disc. – B1)**		Historical background of Santali language and development.	This course includes the history of Santali language and literature and its development.	After completing this course, students will know the history and its development till now.
I	**II**	**SEC**	**SNTSEC02**	Translation theory and practice	This course includes the theory and practical of translation.	After successful completion of this course a student will be able to translate. Though they learned the translation in two ways that is in

						theory and practical, they will be done any kind of translation works.
I	**II**	**Minor-2 (Disc.-C2)**	**SNTMI01/C01**	Santali Folk song and Folktales	The subjects covered all Folk song and Folktales. There are huge amount of Folk songs and Folktales in Santal Community. All those	After successful completion of this course, a student will know about the religious practices with related Folk Songs and Folktales. A student also knows the various types folk songs and its situation of singing. By the help of Folktales a student can know knowledge of ancient people.

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI
GOVERNMENT OF WEST BENGAL
Office of the Principal
P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516
Website: www.salbonigovtcollege.org :: E-mail: salboni_college

Honours in History

Under CBCS

(w.e.f. Academic Year 2018-2019)

Programme Specific Outcome (PSO)

The Programme specific outcomes of a History Honours course at the undergraduate level may include:

- Understand the concept of history and various historical interpretations which evolved over time.
- A comprehensive understanding of various perspectives on civilizations and key historical events.
- Develop critical thinking skills to analyse historical sources both literary and archaeological.
- Acquire the ability to interpret the socio-economic, political and cultural aspects of a historical phenomenon.
- Understand the various historiographical perspectives and debates regarding the forces of change and continuity in a social structure.
- Acquire the skills to evaluate and synthesize historical information from a variety of sources which is must for further research.
- Acquire the necessary skills to express the historical thought and knowledge effectively through writings and oral presentation.
- Cultivate the ability to identify and negate the distorted interpretation of a historical phenomenon.

- Prepare students for advanced studies in history or archaeology or museology and Public Administration or International Relations or in the field of Journalism and so on.
- Get job in Government Services like WBCS, IAS, IPS, IFS, etc.

Course Outcome (CO)
Under CBCS

HISHCC01: Greek and Roman Historian

Unit-1 Greek Historiography

Module I New form of inquiry (historia) in Greece in the sixth century B E

- Students will gain insights into the concept of History and its origins.
- Different perspectives on the evolution of historical thinking will be explored.

Module II Herodotus and his Histories

- Various approaches to historical writing will be examined through the lens of Herodotus.

Module III Thucydides: the founder of scientific history writing

- An understanding of scientific history writing will be developed.
- Students will engage in a comparative study of Greek historians, focusing on Thucydides.

Module IV Next generation of Greek historians

- Diverse viewpoints on Greek historians will be explored.

Unit -II Roman Historiography

Module I Development of Roman historiographical tradition
- Students will gain comprehensive knowledge of various facets within Roman historiography.

Module II Imperial historians

- The origins of Imperial history will be explored, providing students

with insights into its inception.
- A profound understanding of Roman history and its prominent historians will be acquired.

Module III Historical methods in ancient Rome

- Students will delve into the diverse methods employed in the art of history writing during the ancient Roman era.

HISHCC02: Early Historic India (proto history to 6th century B.C)

Unit-I

Module- I Understanding early India

- Attaining a profound understanding of the concept of Bharatavarsha is a key objective for students in this department.
- Exploring various theories and interpretations related to the Indian past will be an integral part of the learning process.
- Cultivating extensive knowledge about literary and archaeological sources of ancient Indian history.

Module-II Neolithic to Chalcolithic settlements

- Ensuring students are well-informed about the various stages of early civilization is a primary objective of this module.
- Comprehensive learning will cover different aspects of the Harappan civilization, including its formation and downfall.

Module-III The Aryans in India: Vedic Age

- Students will learn the concept of 'Aryan' and its historiography in this module.
- Political development, culture, and rituals of the Vedic age will be an integral part of the learning experience.

Module-IV North India in sixth century BCE

- They will learn the formation of kingdom, clan and oligarchy
- They will get brief knowledge about emergence of Magadha as an empire.

Unit II

Module I Ideas and institutions in early India

- A significant focus in the learning process will involve the exploration of the ancient social structure and conditions of women within that framework.
- Students will acquire the knowledge regarding the roots of casteism in the ancient past.

Module II Cults, doctrines, and metaphysics

- The focal point of the module is to give students an awareness of various cults and their doctrines in this module.

Module III Aspects of the economy in the age of Buddha

- Assisting students in understanding economic changes of that period.
- The module specifically explores the mechanisms that led to the occurrence of the second urbanization.

Module IV The cultural milieu

- This module concentrates on ancient science, technology, language, and literature which facilitates students' understanding of the cultural scenario of the period.

HISHCC03: Mauryan and Gupta Empire

- Providing students with a concise history of the Magadhan Empire, its formation and downfall.
- Exploring the post-Maurya developments in politics and society is a key concern of the curriculum.
- The module focuses on a brief history of the Gupta Empire, delving into their politics and culture.

HISHCC04: Political History of Early Medieval India (600 AD to 1200 AD)

- Students will have a focus on the sources that illuminate the early Medieval history of India.

- Gaining a concise knowledge of the history of regional culture and South India is a specific focus.
- They will also learn about the rise and decline of feudalism and the impact of feudalism on Indian polity.
- Students will acquire knowledge about the political changes took place in early medieval India.
- They will also be taught about the growth and expansion of Chola dynasty in peninsular India.

HISHCC05: Delhi Sultanate

- A brief history of the socio-political, economic, and cultural history of the Sultanate will be provided in this module.
- Students will also get to know about the sources that contribute to the history of the Delhi Sultanate.
- The emergence of regional states as significant political powers during this period will be a focal point of curriculum.
- They will also be taught about the religion and culture aspect of said period.

HISHCC06: The Feudal Society

- Acquiring an understanding of the fundamental characteristics of a Feudal Society is the focal point of the paper.
- Students will be taught the origins and socio-economic condition of Feudal Society in Europe.
- Students will receive instruction on the dynamics of cultural changes within a Feudal Society.

HISHCC07: Akbar and the Making of Mughal India

- Lectures will be delivered on the historiographical sources of Mughal India.
- The curriculum will cover the origin and formation of Mughal India.
- Learning about the rural socio-economic structure of Mughal India is an integral part of the instructional content.
- The religion and cultural dimensions in Mughal India are also formed a key part of this paper.

HISHCC08: Renaissance and Reformation

- The students will gain knowledge about the concept of Renaissance and Reformation.

- Socio-economic Background of the Renaissance and Reformation will be taught in this module.
- They will be taught the background, essence and impact of the renaissance & reformation on European politics and culture.
- They will get a brief knowledge on secular culture and scientific development of that crucial period.

HISHCC09: The French Revolution & Napoleon Bonaparte

- Delve into the historiography of the French Revolution is a focus of this paper.
- Students will be taught the socio-economic background that led to the path of the Revolution.
- They will gain an understanding of the ascent of Napoleon Bonaparte and the establishment of his Empire.
- Repercussions of the revolution beyond the borders of France will be another focus point in this curriculum.

HISHCC10: 19th Century Revolutions in Europe

- Understanding of post-Napoleon global politics is the main concern of this module.
- Students will explore the notion of the emergence of nationalism in world politics during the course.
- They will get information about the socio-economic transformation in 19^{th} century Europe.

HISHCC11: Select Themes in the Colonial Impact on Indian Economy and Society

- The students will be given lectures on colonial ideology and institutions.
- They will gain insight into the colonial policies aimed at exploiting the Indian economy.
- They will explore the themes of Reformism and Revivalism within Hindu culture and Islamic reform movements in India.

HISHCC12: Peasant and Tribal Uprisings in Colonial India in the 19th Century

- Lectures will be delivered on the early colonial rule, land revenue settlements and changes in existing production relations in colonial society.
- Tribal and peasant movement developed in early colonial period is the focal point of the first half of the paper.
- Students will also learn the peasant and tribal movements in late 19th century which grows from exploitative colonial economic policies.
- Paper also deals with the historiography on the revolutionary potential of Indian peasant movements.

HISHCC13: International Relations after the Second World War

- The students will acquire knowledge of diverse perspectives in International Relations during the course.
- They will develop an appreciation for India's position as a non-aligned country.
- This module explores the different stages of the Cold War and its subsequent consequences.
- Students will understand the new challenges of the new world order since the decline of the USSR.

HISHCC14: Modern Nationalism in India

- The emergence of Nationalism in India and its historiography will be discussed in this module.
- Concise understanding of Gandhian Mass Movements will be received by the students.
- The Roots of Communalism and the Communal Award from where demand for Pakistan originates will be taught to the students.
- The topic of Partition and its aftermath will be covered.

HISHDSE-1: Modern Transformation of China (1839-1949)

- Students will learn about the traditional Chinese society and its ideological base.
- Modern Transformation of China in the 19^{th} century will be the focal point of this paper.
- Students will get to know the history of the rise of communists republic in China.

HISHDSE-2: Modern Transformation of Japan

- Modern Transformation of China in the 19th century will be the focal point of this paper.
- Students will be given lectures on the Pre-Mejii Japan, Mejii Restoration, popular democratic movements.
- Emergence of Japan as an imperial power will also be taught in this module.
- The topic of Japan and two World Wars will be covered briefly.

HISHDSE-3: War and Diplomacy, 1914-1945

- The department's students will delve into the subject of War and Diplomacy from 1914 to 1945.
- The students will be acquainted with the ramifications of unsuccessful diplomacy and democracy through the reading of the history of 1st WW and the history of inter-war period.
- The origin and historiography of the 2nd WW and the war time politics in Europe will be covers in brief.

HISHDSE-4: Pre-colonial South-East Asia

- Students will explore the history of Pre-colonial South East Asia.
- They will gain an understanding of the interconnectedness between Indian civilization and South-East Asian culture.
- Various political formation, economic diversities and different religious and cultural traditions will be taught in this curriculum.

HISHSEC-1: Art appreciation an Introduction to Indian Art

- Students will get the comprehensive overview of Indian Art and architecture.
- Rich tradition of ancient, medieval architecture, sculpture and paintings will be at the core of classroom lectures.
- They will develop an appreciation for the aesthetic qualities of modern art and its connection to nationalism in Bengal.
- The tradition of folk art in India will also be taught in this module.

HISHSEC-2: The Making of Indian Foreign Policy

- Students will acquire knowledge Indian Foreign Policy after independence.
- Maintaining relation with big powers like USA, USSR, China and with neighbouring countries like Pakistan, Bangladesh, Nepal, Bhutan etc. will be taught in classroom.
- They will come to appreciate India's pivotal role as a non-aligned country in international relations.
- Students will gain knowledge about the concept of third world and globalisation.

HISHGE-1: Theories of the Modern State

- Students will be introduced to the origins of the nation state and many fundamental concepts like sovereignty, autonomy, community, civil society etc.
- They will appreciate the notions of liberty, equality and justice in the realm of modernisation.
- They will get to know many famous philosophers like Bodin, Hobbes, Hegel, Locke, Bentham, J.S. Mill and so on.

HISHGE-2: Science and Empire

- Students will understand the role of the spread of modern science facilitated by colonial powers in the exploitation of colonies.
- They will explore sociological perspectives on modern science within the colonial context.
- The contributions of indigenous scientists to the advancement of national science will be on the focus in studying this module.
- They will gain knowledge about the response of nationalist leaders like Gandhiji and Nehru to the spread of colonial science.

HISHGE-3: Some Perspectives on Women’s Rights in India

- Students will gain knowledge about the concept of Human rights and the relation of human rights to women.
- Students will gain an appreciation for the challenges faced by women in their struggle to secure rights throughout the world.
- They will get to know various laws written in our constitution for protecting women’s rights in India.
- They will get aware the about various acts protecting women from the day-to-day exploitation in a patriarchal society.

- Students should have construct their own opinion on potential further actions to advance women's rights.

HISHGE-4: Gender & Education in India

- Students will be taught the history of women’s education in the Ancient and medieval times.
- They will understand the historical context and motivations behind the establishment of girls' schools and women's colleges since the 19^{th} century.
- The roles of influential figures such as Bethune, Vidyasagar, and Rokeya Sakhawat in promoting women's education will be appreciated by the students.
- They will get to know the contours of female literacy in post-independent India.
- They will become aware of the various limitations and obstacles hindering women's education and explore strategies to overcome them.

Major (Honours) in History

4-Year Undergraduate Programme

(w.e.f. Academic Year 2023-2024)

Under CCFUP,(2023) & NEP,(2020)

Programme Specific Outcome (PSO)

The Programme specific outcomes of a History Honours course at the undergraduate level may include:

- Understand the concept of history and various historical interpretations which evolved over time.
- A comprehensive understanding of various perspectives on civilizations and key historical events.
- Develop critical thinking skills to analyse historical sources both literary and archaeological.
- Acquire the ability to interpret the socio-economic, political and cultural aspects of a historical phenomenon.
- Understand the various historiographical perspectives and debates regarding the forces of change and continuity in a social structure.
- Acquire the skills to evaluate and synthesize historical information from a variety of sources which is must for further research.
- Acquire the necessary skills to express the historical thought and knowledge effectively through writings and oral presentation.
- Cultivate the ability to identify and negate the distorted interpretation of a historical phenomenon.
- Prepare students for advanced studies in history or archaeology or museology and Public Administration or International Relations or in the field of Journalism and so on.
- Get job in Government Services like WBCS, IAS, IPS, IFS, etc.

Course Outcome (CO)

Under CCFUP,(2023) & NEP,(2020)

HISHMJ101, T: Ancient India from the Earliest Times to 600 BCE

Unit-I

Module- I Understanding early India

- Attaining a profound understanding of the concept of Bharatavarsha is a key objective for students in this department.
- Exploring various theories and interpretations related to the Indian past will be an integral part of the learning process.
- Cultivating extensive knowledge about literary and archaeological sources of ancient Indian history.

Module-II Neolithic to Chalcolithic settlements

- Ensuring students are well-informed about the various stages of early civilization is a primary objective of this module.
- Comprehensive learning will cover different aspects of the Harappan civilization, including its formation and downfall.

Module-III The Aryans in India: Vedic Age

- Students will learn the concept of 'Aryan' and its historiography in this module.
- Political development, culture, and rituals of the Vedic age will be an integral part of the learning experience.

Module-IV North India in sixth century BCE

- They will learn the formation of kingdom, clan and oligarchy
- They will get brief knowledge about emergence of Magadha as an empire.

Unit II

Module I Ideas and institutions in early India

- A significant focus in the learning process will involve the exploration of the ancient social structure and conditions of women within that framework.
- Students will acquire the knowledge regarding the roots of casteism in the ancient past.

Module II Cults, doctrines, and metaphysics

- The focal point of the module is to give students an awareness of various cults and their doctrines in this module.

Module III Aspects of the economy in the age of Buddha

- Assisting students in understanding economic changes of that period.
- The module specifically explores the mechanisms that led to the occurrence of the second urbanization.

Module IV The cultural milieu

- This module concentrates on ancient science, technology, language, and literature which facilitates students' understanding of the cultural scenario of the period.

HISSEC01, P: **Art appreciation an Introduction to Indian Art**

- Students will get the comprehensive overview of Indian Art and architecture.
- Rich tradition of ancient, medieval architecture, sculpture and paintings will be at the core of classroom lectures.
- They will develop an appreciation for the aesthetic qualities of modern art and its connection to nationalism in Bengal.
- The tradition of folk art in India will also be taught in this module.

HISMI01, T: Ancient India

- Students of history will acquire knowledge regarding the primitive life and cultural status of the people of ancient India.
- They can gather knowledge about the society, culture, religion and political history of ancient India as well.
- They will learn about the origin of the Indian empire, trade and urbanizations of ancient civilizations.
- Students will get knowledge about the history of the Palaeolithic, Neolithic and Chalcolithic cultures in pre-Harappan period.
- They will learn about the formation, expansion and decline of Mauryan Empire. The polity, economy and socio-cultural life that period.
- They can develop an appreciation for the high culture of ancient India's classical age
- Understanding India's status as a multi-religious country prior to Islam's arrival in the Subcontinent in one of the focuses of this module.

HISHMJ102, T: Social Formation and Cultural Patter of Ancient World

- The course will demonstrate a comprehensive understanding of the evolution of humankind from the Palaeolithic to the Mesolithic periods, analysing key developments in technology, social organization, and cultural practices.
- Students can evaluate the transition from hunting and gathering to settled societies based on agriculture and animal husbandry.
- They will come to know the socio-economic, political, and religious aspects of a chosen Bronze Age civilization (such as Egypt, Mesopotamia, China, or the Eastern Mediterranean).
- Critically assess the role of nomadic groups in Central and West Asia, including their interactions with settled societies and the impact of the Iron Age on technological advancements and cultural exchange is one the focuses of the module.
- Students will have a vast knowledge about the institution of slavery in ancient Greece.
- A significant focus Compare and contrast the political systems, societal values, and cultural achievements of Athens and Sparta within the context of the polis (city-state) in ancient Greece.

HISSEC02, P: Archives and Museums in India

- Students will understand evolution and significance of museums and archives, with a focus on India, tracing their historical development from ancient times to contemporary practices, and evaluating their role in preserving cultural heritage and historical memory.
- The course will demonstrate proficiency in the management of museum and archival collections.
- They can gather knowledge about the design effective museum presentations and exhibitions.
- Students will also know to analyse the role of museums and archives in society, particularly in education and communication through outreach activities.

HISMI02, T: Medieval India

- Students will study the political, social, and economic history of the Sultanate and Mughal periods in India.
- They will gain an appreciation for the rich Persianate culture of the medieval era.
- The course will involve analysing the economic and socio-cultural aspects of pre-modern states that thrived on agricultural prosperity.
- Students will also learn to recognize both the areas of conflict and the points of cultural convergence between Indian and Perso-Islamic cultures.

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI
GOVERNMENT OF WEST BENGAL
Office of the Principal
P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516
Website: www.salbonigovtcollege.org :: E-mail: salboni_college

B.A. General in history

Under CBCS

(w.e.f. Academic Year 2018-2019)

Programme Specific Outcome (PSO)

The Programme specific outcomes of a History General course at the undergraduate level may include:

- At a general level, our courses are structured with the objective of giving requisite information about different aspects of the civilization to students.
- Teaching them the methods of analysing information, researching, framing arguments, and debating historical details
- Cultivating an understanding of how the present is linked to the past
- Equipping students with skills to comprehend and interpret the present through historical knowledge
- It is expected that on completion of the course students would have to acquire the skills of critical thinking, rational enquiry, effective communication.
- To pursue his/her higher studies in journalism, public relation. Study for D.EL. ED, B. ED, M.A, MBA.
- Participation in various competitive government job exams like Primary School Service, Secondary School Service, PSC, WBCS, UPSC (IAS, IPS, IFS) etc.

Course Outcome (CO)
Under CBCS

DSC-1AT: (CC-1) Ancient India

- Students of history will acquire knowledge regarding the primitive life and cultural status of the people of ancient India.
- They can gather knowledge about the society, culture, religion and political history of ancient India as well.
- They will learn about the origin of the Indian empire, trade and urbanizations of ancient civilizations.
- Students will get knowledge about the history of the Palaeolithic, Neolithic and Chalcolithic cultures in pre-Harappan period.
- They will learn about the formation, expansion and decline of Mauryan Empire. The polity, economy and socio-cultural life that period.
- They can develop an appreciation for the high culture of ancient India's classical age
- Understanding India's status as a multi-religious country prior to Islam's arrival in the Subcontinent in one of the focuses of this module.

DSC-1BT: (CC-2) Medieval India

- Students will study the political, social, and economic history of the Sultanate and Mughal periods in India.
- They will gain an appreciation for the rich Persianate culture of the medieval era.
- The course will involve analysing the economic and socio-cultural aspects of pre-modern states that thrived on agricultural prosperity.
- Students will also learn to recognize both the areas of conflict and the points of cultural convergence between Indian and Perso-Islamic cultures.

DSC-1CT: (CC-3) Select themes in the colonial impact on Indian Economy and society

- The students will be given lectures on colonial ideology and institutions.
- They will gain insight into the colonial policies aimed at exploiting the Indian economy.

- They will explore the themes of Reformism and Revivalism within Hindu culture and Islamic reform movements in India.
- Assess the issues of landed elite, and those of struggling peasants, tribals and artisans during the Company Raj.

DSC-1DT(CC-4) Modern Nationalism in India

- The emergence of Nationalism in India and its historiography will be discussed in this module.
- Concise understanding of Gandhian Mass Movements will be received by the students.
- The Roots of Communalism and the Communal Award from where demand for Pakistan originates will be taught to the students.
- The topic of Partition and its aftermath will be covered.

DSE-1AT: Renaissance and Reformation

- The students will gain knowledge about the concept of Renaissance and Reformation.
- Socio-economic Background of the Renaissance and Reformation will be taught in this module.
- They will be taught the background, essence and impact of the renaissance & reformation on European politics and culture.
- They will get a brief knowledge on secular culture and scientific development of that crucial period.

DSE-1BT: Modern Europe

- Delve into the historiography of the French Revolution is a focus of this paper.
- Students will be taught the socio-economic background that led to the path of the Revolution.
- They will gain an understanding of the ascent of Napoleon Bonaparte and the establishment of his Empire.
- Repercussions of the revolution beyond the borders of France will be another focus point in this curriculum.
- Delineate diverse patterns of industrialization in Europe and assess the social impact of capitalist industrialization.
- Students will explore the notion of the emergence of nationalism in world politics during the course.
- They will get information about the socio-economic transformation in 19th century Europe.

SEC-1: The Making of Indian Foreign Policy

- Students will acquire knowledge Indian Foreign Policy after independence.
- Maintaining relation with big powers like USA, USSR, China and with neighbouring countries like Pakistan, Bangladesh, Nepal, Bhutan etc. will be taught in classroom.
- They will come to appreciate India's pivotal role as a non-aligned country in international relations.
- Students will gain knowledge about the concept of third world and globalisation.

SEC-2: Literature and History: Bengal

- Understanding the interconnectedness of History and Literature
- Exploring significant Bengali novels influencing 19th and 20th centuries society and politics
- Appreciating diverse perspectives on nationalism and internationalism
- Students have learned History & Literature of Bengal, Power & patriotism writings of Bankim Babu’s Ananda math, Tagore’s Ghare Baire, Sarat Chandra’s Pather Dabi and Satinath Bhaduri’s Dhorai Charit Manas etc from this paper.

SEC-3: Colonial Science in India: Institutions and Practices

- Students will understand the role of the spread of modern science facilitated by colonial powers in the exploitation of colonies.
- They will explore sociological perspectives on modern science within the colonial context.
- The contributions of indigenous scientists to the advancement of national science will be on the focus in studying this module.
- They will gain knowledge about the response of nationalist leaders like Gandhiji and Nehru to the spread of colonial science.

SEC-4: Art Appreciation an Introduction to Indian Art

- Students will get the comprehensive overview of Indian Art and architecture.

- Rich tradition of ancient, medieval architecture, sculpture and paintings will be at the core of classroom lectures.
- They will develop an appreciation for the aesthetic qualities of modern art and its connection to nationalism in Bengal.
- The tradition of folk art in India will also be taught in this module

GE-1T: Science and Empire

- Students will understand the role of the spread of modern science facilitated by colonial powers in the exploitation of colonies.
- They will explore sociological perspectives on modern science within the colonial context.
- The contributions of indigenous scientists to the advancement of national science will be on the focus in studying this module.
- They will gain knowledge about the response of nationalist leaders like Gandhiji and Nehru to the spread of colonial science.

GE-2T: Gender & Education in India

- Students will be taught the history of women's education in the Ancient and medieval times.
- They will understand the historical context and motivations behind the establishment of girls' schools and women's colleges since the 19th century.
- The roles of influential figures such as Bethune, Vidyasagar, and Rokeya Sakhawat in promoting women's education will be appreciated by the students.
- They will get to know the contours of female literacy in post-independent India.
- They will become aware of the various limitations and obstacles hindering women's education and explore strategies to overcome them.

Bachelor of Arts with History (Multidisciplinary Studies)

3-Year Undergraduate Programme

(w.e.f. Academic Year 2023-2024)

Under CCFUP, (2023) & NEP, (2020)

Programme Specific Outcome (PSO)

- At a general level, our courses are structured with the objective of giving requisite information about different aspects of the civilization to students.
- Teaching them the methods of analysing information, researching, framing arguments, and debating historical details
- Cultivating an understanding of how the present is linked to the past
- Equipping students with skills to comprehend and interpret the present through historical knowledge
- It is expected that on completion of the course students would have to acquire the skills of critical thinking, rational enquiry, effective communication.
- To pursue his/her higher studies in journalism, public relation. Study for D.EL. ED, B. ED, M.A, MBA.
- Participation in various competitive government job exams like Primary School Service, Secondary School Service, PSC, WBCS, UPSC (IAS, IPS, IFS) etc.

Course Outcome (CO)
Under CCFUP, (2023) & NEP, (2020)

Major (Disc.-A1) HISPMJ101, T: Ancient India Up to C. 1200 CE

- Students of history will acquire knowledge regarding the primitive life and cultural status of the people of ancient India.
- They can gather knowledge about the society, culture, religion and political history of ancient India as well.
- They will learn about the origin of the Indian empire, trade and urbanizations of ancient civilizations.
- Students will get knowledge about the history of the Palaeolithic, Neolithic and Chalcolithic cultures in pre-Harappan period.
- They will learn about the formation, expansion and decline of Mauryan Empire. The polity, economy and socio-cultural life that period.
- They can develop an appreciation for the high culture of ancient India's classical age
- Understanding India's status as a multi-religious country prior to Islam's arrival in the Subcontinent in one of the focuses of this module.

SEC01, P: **Art appreciation an Introduction to Indian Art**

- Students will get the comprehensive overview of Indian Art and architecture.
- Rich tradition of ancient, medieval architecture, sculpture and paintings will be at the core of classroom lectures.
- They will develop an appreciation for the aesthetic qualities of modern art and its connection to nationalism in Bengal.
- The tradition of folk art in India will also be taught in this module.

Minor (Disc.-C1) HIS MI01/C1, T: Ancient India

- Students of history will acquire knowledge regarding the primitive life and cultural status of the people of ancient India.

- They can gather knowledge about the society, culture, religion and political history of ancient India as well.
- They will learn about the origin of the Indian empire, trade and urbanizations of ancient civilizations.
- Students will get knowledge about the history of the Palaeolithic, Neolithic and Chalcolithic cultures in pre-Harappan period.
- They will learn about the formation, expansion and decline of Mauryan Empire. The polity, economy and socio-cultural life that period.
- They can develop an appreciation for the high culture of ancient India's classical age
- Understanding India's status as a multi-religious country prior to Islam's arrival in the Subcontinent in one of the focuses of this module.

Major (Disc.-B1), T: Ancient India Up to C. 1200 CE

- Students of history will acquire knowledge regarding the primitive life and cultural status of the people of ancient India.
- They can gather knowledge about the society, culture, religion and political history of ancient India as well.
- They will learn about the origin of the Indian empire, trade and urbanizations of ancient civilizations.
- Students will get knowledge about the history of the Palaeolithic, Neolithic and Chalcolithic cultures in pre-Harappan period.
- They will learn about the formation, expansion and decline of Mauryan Empire. The polity, economy and socio-cultural life that period.
- They can develop an appreciation for the high culture of ancient India's classical age
- Understanding India's status as a multi-religious country prior to Islam's arrival in the Subcontinent in one of the focuses of this module.

SEC02, P: Archives and Museums in India

- **Students will understand evolution and significance of museums and archives, with a focus on India,** tracing their historical development from ancient times to contemporary practices, and evaluating their role in preserving cultural heritage and historical memory.
- The course will demonstrate proficiency in the management of museum and archival collections.

- They can gather knowledge about the design effective museum presentations and exhibitions.
- **Students will also know to analyse the role of museums and archives in society**, particularly in education and communication through outreach activities.

Minor (Disc.-C2) HIS MI02/C2, T: Medieval India

- Students will study the political, social, and economic history of the Sultanate and Mughal periods in India.
- They will gain an appreciation for the rich Persianate culture of the medieval era.
- The course will involve analysing the economic and socio-cultural aspects of pre-modern states that thrived on agricultural prosperity.
- Students will also learn to recognize both the areas of conflict and the points of cultural convergence between Indian and Perso-Islamic cultures.

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

Office of the Principal

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

DEPARTMENT OF SOCIOLOGY
PSO & CO(Hons)

PROGRAM SPECIFIC OUTCOME(PSO)

For B.A. HONOURS IN SOCIOLOGY

The B.A. Honours Programme in Sociology is designed to initiate students holistically to the nuances of the discipline of Sociology. On successful completion of the entire programme a student should develop the following faculties:

- Critical and analytical thinking about society and social issues. Sociological knowledge and skills would provide students the ability to perceive their own society objectively. Vivid sociological understanding of all social phenomena of social structures, processes and institutions conceptually as well as in their varied forms across societies.

- In-depth learning about social causes and consequences of common human behaviour and experiences. Students can use this knowledge across multiple sectors, from politics to social welfare. Help in becoming active and informed citizens.

- Better understanding of real-life situation. Students are able to deal with their everyday realities better by applying sociological theories and methodologies to those.

- Since students have to go beyond classroom learning and engage in fieldwork activities, they inculcate good communication skills and social interaction power.

- Engagement in research-based learning thrusts the ability to formulate effective and convincing oral and written arguments.

- Through learning about facets of diverse cultures, social inequalities, population composition, population policies of India students are instilled with a sense of ethical and social responsibility.

- Developing skills that are both theoretical as well as practical thereby facilitating students' success in varied career fields in both government as well as private sectors.

COURSE OUTCOME(CO)

FOR 3-YEAR B.A. (HONOURS) IN SOCIOLOGY
Under C.B.C.S. (w.e.f. Session 2018-19)

COURSE TYPE	COURSE TITLE	COURSE OUTCOME
Core-1	C1T *Introduction to Sociology - I*	• The course introduces the subject and intend to develop a sociological way of thinking. • Students will gain knowledge about the emergence of Sociology as an independent subject of enquiry. • The basic concepts of Sociology, social institutions and social processes are dealt with. • It will also help to understand culture and its impact on the society and nature of changes.
Core-2	C2T *Sociology of India I*	• This paper is designed to have deep understanding into the core of Indian society. • The students will be able to understand the different concepts and institutions of Indian Society such as caste, tribe, village, kinship and religion. • The students will get a broad idea about the colonial discourse, Nationalist discourse, sub-altern critique.
Core-3	C3T *Introduction to Sociology -II*	• This course aims to provide the classical theoretical premises of the discipline. • It delves with the plurality of perspectives that have emerged to study society in general. • Includes general arguments of perspectives like functionalism, conflict, structuralist, feminist and others. • The contribution of noted thinkers in the development of these is dealt with. • The critical analysis of such perspectives is also engaged with.
Core-4	C4T *Sociology of India - II*	• The course attempts to introduce advanced sociological understanding of Indian society. • Introduces the Indological and Ethnographic approaches to studying Indian society.

		- Gandhi and Ambedkar's debate is dealt with. - Contemporary issues of resistance and mobilization in India is provided. Different movements like women's, peasant and others are dealt in detail. - Deal with challenges to the integrity of Indian society in the form of communalism, secularism and others.
Core - 5	C5T *Political Sociology*	- The course will help the students to understand the importance of studying politics and the relationship between politics and society. - It will also help the students to understand the major theoretical debates and concepts in Political Sociology. - Political relationships through the notions of power, governance, state and society are engaged with. - The course will help to understand the everyday state and local structure of power and how to deal with it.
Core - 6	C6T *Sociology of Religion*	- The course is designed to develop a sociological sense of religion. - It addresses the social and religious aspects of religion, the various elements of religion and the techniques of religion. - Weber's specific understanding of religion is provided in detail. - Attempts to contextualize religion in primitive to modern social formations.
Core – 7	C7T *Sociology of Gender*	- Analyse how gender is constructed socially and culturally. - Critically examine historical and contemporary representations of gender. - Evaluate the impact of gender on various social institutions. - Develop critical awareness of gender inequality and its manifestations.
Core – 8	C8T *Economic Sociology*	After completion of the course, the student would be in a position to understand the meaning of new economic sociology, forms

		of exchange i.e. reciprocity and gift, system of production in hunting and gathering society, capitalism, socialism. • It will also help to understand how economics is interrelated with sociology and also how the society is affected by the processes of development and globalisation. • The students will be in a position to comprehend how the material conditions of life are produced and reproduced through social pressures, social cause and effect of various economic phenomena.
Core – 9	C9T *Sociology of Kinship*	• Course introduces the sociological engagement with kinship. • It internalizes the key terms and approaches to studying kinship. • Provides understanding of how kin relations are negotiated through family, household and marriage. • Deals with re-casting kinship in gender, new-age family structures and in new reproductive technologies.
Core – 10	C10T *Social Stratification*	• Grasp the core concepts of social stratification including social classes, social mobility, inequality, power and gender and prestige. • Explore major theoretical perspectives. • Identify and analyse various dimensions of inequality. • Critically understand how social institutions, cultural norms, and power dynamics contribute to the reproduction of inequality.
Core – 11	C11T *Sociological Thinkers- I*	• Introduces and describes the contribution of 3 classical sociological thinkers: Marx, Weber and Durkheim. • Understand the core tenets of Materialist Conception of History. • Define and analyse the fundamental features of the capitalist mode of production.

		• Critically analyse the motivations behind human behaviour. • Develop critical thinking skills through Durkheim's work.
Core – 12	C12T *Sociological Research Methods - I*	• Introduces the basics of social research method. • Outlines the logic of social research, its definitions and concepts. • Analyses the different methodological perspectives. • Deals with quantitative and qualitative data analysis methods.
Core – 13	C13T *Sociological Thinkers - II*	• Compare and contrast Parsons' perspective with other major sociological theories. • Critically analyse and compare different interpretations of Levi-Strauss' work. • Compare and contrast structuralism with other anthropological approaches. • Apply Goffman's concepts to analyse everyday social interactions. • Compare and contrast symbolic interactionism with other paradigms. • Apply Critical Theory frameworks to contemporary social and cultural phenomena. • Formulate independent and nuanced critiques of power, ideology, and domination.
Core – 14	C14T *Research Methods - II*	• Aims to equip with in-depth knowledge of how to conduct social research. • Detailed discussion on sampling, data collection methods of both quantitative and qualitative research. • Highlights the usage of statistics in social science research methodology. • Hands-on training on graphs and various statistical measures.
DSE-1	DSE1T *Agrarian Sociology*	• Define and explain key concepts in agrarian sociology. • Gain a historical perspective on agrarian societies.

		• Explore the diverse global context of agrarian issues. • Critically evaluate major theoretical perspectives in agrarian sociology. • Analyse the relationships between agriculture, society and the environment.
DSE-2	DSE2T *Sociology of Work*	• The course will help to understand the relationship with sociology and industrialisation. • It will help to understand the nature of work in terms of paid and unpaid nature of work. • The students will able to identify the complexities, disparities and inequalities in the area of work. • Holistic idea of the gendered nature of work and better understand the contemporary challenges, and the impact of globalization. • The course will help to understand the nature of work in terms of mechanization, contracting and outsourcing. • Develop familiarity with different trends of sociology of work and major theoretical concerns and problems.
DSE-3	DSE3T *Indian Sociological Traditions*	• Comprehensive understanding of Indian Sociological thinkers and their thought process which helped to frame the Indian Sociological tradition. • The contributions of prominent Indian Sociological thinkers are dealt in detail specifying their distinct theories and concepts.
DSE-4	DSE4T *Project: Fieldwork and Dissertation*	• The course objective requires students to do field work on any topic of their choice and prepare a dissertation by using any method as prescribed in the syllabus. • Students have to collect primary data on his/her research topic and analyse the data to draw conclusions. So, qualitative and quantitative analytical skills are enhanced.

SEC-1	SEC1T *Framing Questionnaire and Conducting Interview*	• Attempts to enumerate the skill of framing appropriate questionnaires for sociological research. • Types and format of questionnaires are provided. • The nuances of conducting interview from preparing interview schedule to recording, processing and interpreting data are dealt with.
SEC-2	SEC2T *Handling Data: Coding and Tabulation*	• Designed to develop the skill set required for the data processing step in social research. • Deals with the procedure of data coding. • Discusses the method of content analysis. • Presents the uses and preparation of tabulation sheets, tables and graphs.
GE-1	GE1T *Indian Society: Images and Realities*	• Provides a comprehensive view of the Indian society through its institutions and processes. • Various distinct forms of Indian society are dealt to describe its specificity. • Critical ideas on caste and gender are disseminated.
GE-2	GE2T *Gender and Violence*	• Develop critical thinking skills around gender and violence. • Engage in informed discussions about gender equality and violence prevention. • Develop personal and professional awareness about gender and violence.
GE-3	GE3T *Sociology of Social Movements*	• This course will help the students to understand the meaning of social movements and why does a society resist or promote social change through movements. • Clear understanding of different theories of social movements. • This will also help the students to understand the importance of ideology, role of leadership and the nature of participation in social movements.
GE-4	GE4T *Population and Society*	• Provides an over view of Social Demography.

		• Understand population studies from different perspective. • The key measures of population and various factors affecting it is dealt with. • Understanding population from gender and economic perspective. • Population policies and programmes in India are discussed.

FOR B.A. (HONOURS) MAJOR IN SOCIOLOGY, 4-YEAR UG PROGRAMME
Based on CCFUP, 2023 & NEP, 2020 *(w.e.f. Academic Year 2023-24)*

COURSE TYPE & COURSE TITLE	COURSE CODE	COURSE OUTCOME
Major-1 *Introduction to Sociology-I (T)*	SOCHMJ101	• Familiarizes students with the discipline of sociology. • The course intends to develop a sociological way of thinking. • Students will gain knowledge about the emergence of Sociology as an independent subject of enquiry under various social contexts. • The basic concepts of Sociology, social institutions and social processes are dealt with. • Students will develop deep understanding of interaction and socialization.
Major-2 *Sociology of India – I(T)*	SOCHMJ102	• This paper is designed to have in-depth knowledge of the core of Indian society. • The students will be familiarised with the sociological understanding of different Indian institutions such as caste, agrarian class, industry and labour, tribe, village and family. • Students will develop fair understanding about the essential perspectives of colonial discourse, nationalist discourse and subaltern critique in the study of Indian society. • Students will be equipped with a holistic view of the components and nature of Indian society.

Minor SOC (Disc.-I) *Indian Society: Images and Realities (T)*	SOCMI01	• Students shall have a comprehensive view of the Indian society through its institutions and processes. • Various distinct forms of Indian society like village, caste, family and gender are dealt to describe Indian specificity • Critical ideas on the operations of caste and gender in India are disseminated.
Minor (Disc.-II) *Gender, Violence and Politics (T)*	SOCMI02	• Develop sharp analytical lens to identify and address gendered violence. • Students shall have distinct knowledge about the social perpetrators of violence. • The course shall equip students to understanding forms of violence and the different attempts of arresting it. • Develop personal and awareness about gender and violence •
SEC *Application of Statistics in Sociology: Using MS Excel & SPSS (P)*	SOCSEC01	• Introduces students to both the theoretical and practical use of statistics in sociology. • A comprehensive understanding of statistics in social sciences including basic concepts and their application. • Students would be equipped to perform statistical operations through application software of MS-Excel. • Students are exposed to handling data in computer by their own.
SEC *Framing Questionnaire and Conducting Interview (P)*	SOCSEC02	• Students will have complete knowledge about questionnaire framing and conducting interview for social research. • Types and format of questionnaires are provided. • The nuances of conducting interview from preparing interview schedule to recording, processing and interpreting data are dealt with. • Students shall be aware of the limitations of such data collection methods.

सत्यमेव जयते

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

Office of the Principal

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

DEPARTMENT OF SOCIOLOGY
PSO & CO(Gen)

PROGRAM SPECIFIC OUTCOME

For B.A. GENERAL IN SOCIOLOGY

The B.A. General Programme in Sociology is designed to introduce students to the concepts, theories and methods in Sociology. The primary aim is to sensitize students with the discipline. On successful completion of the programme a student will be provided with the following:

- An overall knowledge of the development of sociology and its distinctiveness as a social science discipline.

- Enriched concept of how the society operates, exists and continues. Along with these imbibe the sense of possible changes and developments.

- Basic knowledge of how to do sociological research.

- Sociological perception about the components of Indian society.

- Specialised sociological knowledge on certain areas like gender, social stratification, research methodology.

- Comprehensive expertise on social issues and critical thinking beneficial for appearing in competitive examinations related to governmental jobs.

COURSE OUTCOME(CO)

FOR 3-YEAR B.A. (GENERAL) IN SOCIOLOGY
Under C.B.C.S. (w.e.f. Session 2018-19)

COURSE TYPE	COURSE TITLE	COURSE OUTCOME
Core-1 DSC-1A	DSC1AT *Introduction to Sociology*	• The course will help the students to develop a sociological way of thinking. • Students will gain knowledge about the emergence of Sociology as an independent subject of enquiry • The basic concepts of Sociology, social institutions and social processes are dealt with. • The course will help to understand the relationship of sociology with other disciplines.
Core-3 DSC-1B	DSC1BT *Sociology of India*	• In this course the students will have a deep understanding into the core of Indian society. • The students will be able to understand the different concepts and institutions of Indian Society such as caste, tribe, village, kinship, religion. • Different narratives such as colonial discourse, Nationalist discourse, sub-altern critique are provided to enhance sociological knowledge of Indian society.
Core-5 DSC-1C	DSC1CT *Sociological Theories*	• Understand the core tenets of Materialist Conception of History • Define and analyse the fundamental features of the capitalist mode of production • Critically analyse the motivations behind human behaviour • Develop critical thinking skills through Durkheim's work
Core-7 DSC-1D	DSC1DT *Methods of Sociological Enquiry*	• Introduces the basics of social research method. • Outlines the logic of social research, its definitions and concepts • Analyses the different methodological perspectives

		• Deals with quantitative and qualitative data analysis methods
DSE-1A	DSE1T *Social Stratification*	• Critically evaluate different stratification systems • Explore major theoretical perspectives • Identify and analyse various dimensions of inequality • Examine the effects of social stratification on individuals and groups • Explore historical and contemporary trends in social mobility • Develop critical thinking skills around social inequality
DSE-1B	DSE2T *Gender and Sexuality*	• Explore the history of gender and sexuality • Analyse the intersection of gender and sexuality with other social identities • Evaluate major theoretical frameworks on gender and sexuality • Critically analyse representations of gender and sexuality in media and popular culture • Examine the legal and policy landscape surrounding gender and sexuality
SEC-1	SEC1T *Framing Questionnaire and Conducting Interview*	• Attempts to enumerate the skill of framing appropriate questionnaires for sociological research • Types and format of questionnaires are provided • The nuances of conducting interview from preparing interview schedule to recording, processing and interpreting data are dealt with.
SEC-2	SEC2T *Handling Data: Coding and Tabulation*	• Designed to develop the skill set required for the data processing step in social research. • Deals with the procedure of data coding • Discusses the method of content analysis • Presents the uses and preparation of tabulation sheets, tables and graphs

SEC-3	SEC3T *Gender Sensitization*	• Explore diverse perspectives on gender • Analyse the relationship between gender and other social inequalities • Analyse how gender, family, community, and the state are interconnected and shape each other. • Investigate real-world issues through the lens of gender, family, community, and the state. • Develop a comprehensive understanding of the legal framework for gender rights.
SEC-4	SEC4T *Project Report Writing*	• Enumerates the scope, reason and format of report writing • The stages in planning and eventual evaluation of the data are dealt with • The ethical issues involved in this stage of research is provided
GE-1	GE1T *Invitation to Sociology I*	• The course will help the students the understand the nature and scope of sociology as a discipline. • It deals with the interrelationship of sociology with other disciplines. • The students will also get familiar with different concepts such as culture, social groups, status, structure and function of the society.
GE-2	GE2T *Introduction to Sociology*	• This course will give clear understanding of the development of sociology. • Will help to relate it with other disciplines. • The course provides understanding of the basic concepts such as status, role, culture and others. • The students will understand the importance of socialization and means of social control for better understanding of the society as well as the individual behaviours.

FOR BACHELOR OF ARTS WITH SOCIOLOGY (MULTIDISCIPLINARY STUDIES), 3-YEAR UG PROGRAMME
Based on CCFUP, 2023 & NEP, 2020 *(w.e.f. Academic Year 2023-24)*

COURSE TYPE & COURSE TITLE	COURSE CODE	COURSE OUTCOME
Major-1 *Introduction to Sociology: T* (Disc.-A1/B1)	SOCPMJ101	• Familiarizes students with the discipline of sociology. • Students will gain knowledge about the emergence of Sociology and its relation with other social sciences. • The basic concepts of Sociology, social institutions and social processes are dealt with.
SEC *Application of Statistics in Sociology: Using MS Excel & SPSS (P)*	SEC01	• Introduces students to both the theoretical and practical use of statistics in sociology. • A comprehensive understanding of statistics in social sciences including basic concepts and their application. • Students would be equipped to perform statistical operations through application software of MS-Excel. • Students are exposed to handling data in computer by their own.
SEC *Framing Questionnaire and Conducting Interview (P)*	SEC02	• Students will have complete knowledge about questionnaire framing and conducting interview for social research. • Types and format of questionnaires are provided. • The nuances of conducting interview from preparing interview schedule to recording, processing and interpreting data are dealt with. • Students shall be aware of the limitations of such data collection methods.
Minor-1 (Disc.-C1) *Indian Society: Images and Realities (T)*	SOCMI01	• Students shall have a comprehensive view of the Indian society through its institutions and processes. • Various distinct forms of Indian society like village, caste, family and gender are dealt to describe Indian specificity • Critical ideas on the operations of caste and gender in India are disseminated.

Minor-2 (Disc.-C2) *Gender, Violence and Politics (T)*	SOCMI02	• Develop sharp analytical lens to identify and address gendered violence. • Students shall have distinct knowledge about the social perpetrators of violence. • The course shall equip students to understanding forms of violence and the different attempts of arresting it. • Develop personal and awareness about gender and violence •

Courses (SEC & Minor) of this programme are in common with 4-year B.A.(Honours) Major in Sociology under CCFUP, 2023 & NEP,2020

Government General Degree College Salboni

4-year B. A. Honours Major in Philosophy & 3-year B. A. Multi disciplinary studies with Philosophy (CCFUP)

Programme Specific Out comes (PSO)

Curriculum & Credit Framework for Undergraduate Programmes (CCFUP), 2023 & NEP, 2020.

The 4-year Undergraduate Program major in Philosophy and 3-years Undergraduate Multi disciplinary studies in Philosophy introduces students to Indian Philosophy, History of Western Philosophy and Ethics, Logic (Indian and Western), Philosophy of Religion, Analytical Philosophy, Social and Political Philosophy, Psychology and Philosophy of Mind, Philosophy of Human Rights, Gender Studies, and Value Education.

The course encourages an interest in learning philosophy with clarity while also examining philosophical concepts through philosophical contemplation and analysis. The course also promotes critical thinking. After successfully completing the three-year degree course, students are expected to achieve the following Programme Specific Outcomes.

Study and research: Read books, articles, and papers written by philosophers and scholars to gain an understanding of the current state of philosophical knowledge. Explore various branches of philosophy such as metaphysics, epistemology, ethics, logic, and aesthetics to grasp a broad overview.

Engage in philosophical discussions: Join philosophical discussion groups, forums, or debates to interact with others who are interested in similar topics. This can help you refine your thoughts, challenge your beliefs, and gain new insights from different perspectives.

Attend lectures and conferences: Participate in lectures and conferences organized by academic institutions, philosophical societies, or professional organizations. These events provide opportunities to listen to renowned philosophers presenting their research, engage in discussions, and network with fellow enthusiasts.

Take courses or pursue a degree: Consider enrolling in philosophy courses at a university or pursuing a formal degree in philosophy. This formal education will provide a structured path to systematically study philosophical problems, theories, and methodologies.

Engage with philosophical texts: Read classic philosophical works by renowned philosophers such as Plato, Aristotle, Descartes, Kant, Nietzsche, etc. These texts offer timeless insights and can serve as a foundation for understanding and analyzing present-day philosophical problems.

Reflect and contemplate: Dedicate time to introspection and personal reflection on philosophical questions and problems. This can involve meditation, journaling, or engaging in contemplative practices to develop one's own ideas and solutions.

Remember, philosophical problems often have multiple perspectives and interpretations, and there may not be definitive solutions. The goal is to critically examine these problems, understand existing knowledge, and contribute to the ongoing philosophical discourse.

Course Outcome (CO)

MJ-1: Indian Philosophy-1
Course Outcome (CO)

- Students will receive a thorough understanding of the essential principles, schools, and traditions of Indian philosophy, which include Vedic, Upanishadic, Buddhist, Jain, and classical systems such as Samkhya, Yoga, Nyaya, Vaisheshika, Mimamsa, and Vedanta.
- They will learn to engage critically with primary texts and philosophical arguments, as well as how to study and compare various philosophical perspectives.
- The course will help students understand the cultural and historical settings that influence Indian philosophical thought, as well as its relevance to current challenges.
- By the end of the course, students will be able to articulate and defend philosophical ideas within the Indian tradition, as well as apply philosophical reasoning to contemporary issues.

MJ-2: History of Western Philosophy – I
Course Outcome (CO)

- Students will get a thorough grasp of the important personalities, concepts, and movements in Western philosophy from pre-Socratic times to the Middle Ages.
- They will learn about the historical environment and intellectual trends that created Western philosophy.
- The course will help students learn to critically study philosophical literature, create coherent arguments, and participate in philosophical discussions.
- By studying the works of philosophers such as Socrates, Plato, Aristotle, Augustine, and Aquinas, students can trace the growth of philosophical concepts and their impact on modern thinking.

MI – 1: Ethics: Indian and Western
Course Outcome (CO)

- Students will receive a thorough understanding of ethical theories and moral philosophies from both Indian and Western viewpoints, allowing them to compare and contrast these frameworks effectively.

- They will gain an understanding of the cultural and historical settings that define ethical principles, as well as improve their critical thinking abilities by examining complicated ethical problems.
- Students will learn to apply these ideas to real-world circumstances by integrating knowledge from other disciplines and reflecting on their values and views.
- This will develop personal growth and ethical awareness.

MI-2: Western Logic

Course Outcome (CO)

- Students will get a complete comprehension of the ideas and concepts of Western logic, such as propositional and predicate logic.
- They will learn how to create and evaluate logical arguments, recognize logical fallacies, and use logical reasoning in a variety of academic and real-world settings.
- The course will help students improve their critical thinking and analytical skills, allowing them to approach problems systematically and provide cohesive answers.
- By learning symbolic logic, students will be better prepared to tackle more complex issues in philosophy, mathematics, computer science, and other disciplines.

SEC 1: Yoga for Stress Management

Course Outcome (CO)

- Students will get a solid understanding of yoga principles and techniques geared toward stress management. They will learn a variety of yoga postures, breathing exercises, and meditation techniques to relieve stress and improve general health.
- The course will teach students how to implement these approaches daily, promoting a healthier lifestyle and better mental health.
- In addition, students will learn how to recognize stressors and successfully manage stress through yoga-based therapies.
- Students will improve their physical flexibility, mental clarity, and emotional stability by participating in practical activities and learning theoretical concepts.

SEC 2: Environmental Issues in India

Course Outcome (CO)

- Students will gain a thorough awareness of India's primary environmental concerns, which include air and water pollution, deforestation, climate change, and waste management.
- They will gain insight into the socioeconomic and political elements that influence these environmental issues.
- Students will learn how to examine environmental data, assess the environmental impact of human activities, and evaluate the efficacy of present laws and regulations.
- Students will also learn about sustainable practices and technologies that can help solve environmental challenges.
- By the end of the course, students will be able to present informed solutions to environmental problems and advocate for sustainable development.

Programme Specific Out comes (PSO)

The three year Under Graduate course in Philosophy Honours initiates students, Indian Philosophy, History of Western Philosophy and Ethics, Logic (Indian and western), Philosophy of Religion, analytical Philosophy, Social and Political Philosophy, Psychology and Philosophy of mind, Philosophy of human rights, Gender studies and value education.

The course develops interests in learning philosophy with clarity and analyzing the philosophical concepts with philosophical reflection and analysis. The course also helps to develop critical thinking. After successfully completing the 3 year degree course the following Programme Specific Outcomes outcome are expected of the students:

Study and research: Read books, articles, and papers written by philosophers and scholars to gain an understanding of the current state of philosophical knowledge. Explore various branches of philosophy such as metaphysics, epistemology, ethics, logic, and aesthetics to grasp a broad overview.

Engage in philosophical discussions: Join philosophical discussion groups, forums, or debates to interact with others who are interested in similar topics. This can help you refine your thoughts, challenge your beliefs, and gain new insights from different perspectives.

Attend lectures and conferences: Participate in lectures and conferences organized by academic institutions, philosophical societies, or professional organizations. These events provide opportunities to listen to renowned philosophers presenting their research, engage in discussions, and network with fellow enthusiasts.

Take courses or pursue a degree: Consider enrolling in philosophy courses at a university or pursuing a formal degree in philosophy. This formal education will provide a structured path to systematically study philosophical problems, theories, and methodologies.

Engage with philosophical texts: Read classic philosophical works by renowned philosophers such as Plato, Aristotle, Descartes, Kant, Nietzsche, etc. These texts offer timeless insights and can serve as a foundation for understanding and analyzing present-day philosophical problems.

Reflect and contemplate: Dedicate time to introspection and personal reflection on philosophical questions and problems. This can involve meditation, journaling, or engaging in contemplative practices to develop one's own ideas and solutions.

Remember, philosophical problems often have multiple perspectives and interpretations, and there may not be definitive solutions. The goal is to critically examine these problems, understand existing knowledge, and contribute to the ongoing philosophical discourse.

Course Outcome (CO)

PHIHCC01: Outlines of Indian Philosophy-I

- The course aims to provide students with an understanding of the earning and salient features of Indian Philosophy,
- The distinction between orthodox and heterodox schools of thought, and the different ways of knowledge admitted by Indian Philosophy.
- It also focuses on the metaphysical and epistemological views of various Indian philosophical traditions, such as Carvaka, Jainism, Buddhism, Nyaya, and Vaisesika.
- It also delves into the theories of pramā, which involve questions related to valid cognition, criteria for testing validity, and instruments of valid cognition.
- Students are expected to gain a deep understanding of Indian philosophical thoughts, develop critical thinking skills.

PHIHCC02: History of Western Philosophy –I

- To explore and analyze the concept of reality and its various interpretations.
- To delve into the ideas of causality and teleology in metaphysics.
- To examine the relationship between mind and body, and the nature of human existence.
- To introduce students to different philosophical perspectives and encourage critical thinking.
- To encourage students to reflect on the implications of metaphysical concepts for their own lives and beliefs.

PHIHCC03: Outlines of Indian Philosophy – II

- Students will be able to assess the qualities of knowledge, standards that might place restrictions on our understanding, and traits that might distinguish knowledge from belief with the aid of this study.
- To comprehend, with a foundational understanding, the Sutrakaras' Indian philosophical ideas.
- To comprehend the relevance of Yoga, Samkhya, Mimansaka and Vedanta philosophy in today's world.
- Examining the topic of the nature of the self in Vedanta
- Students are expected to gain a deep understanding of Indian philosophical thoughts, develop critical thinking skills.

PHIHCCO4: History of Western Philosophy – II

- In this course, students will gain a comprehensive understanding of the key concepts and theories put forth by philosophers such as John Locke, Berkeley, David Hume, and Immanuel Kant.
- Students will delve into topics such as innate ideas, simple and complex ideas, substance, modes and relations, and the nature of knowledge and its limits.
- They will also explore the distinction between primary and secondary qualities, representative realism, and abstract ideas.

- Students will critically examine Locke's theory of Essest- Percipi and his distinction between primary and secondary qualities, as well as Berkeley's criticism of these ideas.
- Students will study Hume's views on knowledge, ideas, and judgments, as well as his theory of causation. They will also learn to distinguish between a priori and a posteriori judgments and explore the difference between analytic and synthetic judgments.
- Throughout the course, students will develop a critical understanding of the continuous development of Western thought, particularly the evolution of empiricism and its reconciliation in Kant's Criticism.
- They will also gain valuable insights into the complexities of knowledge, perception, and reality.

PHIHCC05: Philosophy of Mind

- The students are introduced to the definition, nature and scope of psychology.
- They become acquainted with its different methods like introspection and observation, Experimental.
- They will realise the meaning of perception and its Relation to sensation.
- They will be acquainted with Gestalt theory of perception, illusion and hallucination.
- They will have about three stages of mind: Conscious, Subconscious, and Unconscious.
- They will be acquainted with Freud's theory of dream.
- They will be acquainted with different Philosophical Theories of Mind.
- Emphasis is given on analyzing and clarifying the different theories of learning.
- They will learn about the types, factors and traits about Personality.

PHIHCC06: Social and Political Philosophy

- This particular course covers the primary concept social and political philosophy likes society, community, family, caste and class.
- The students become familiar with the theories regarding relation between individual and society, social change and progress.
- Students will get a brief concepts regarding society, community, culture, democracy in our country. All these concepts are necessary for developing social attitude in students.
- Understanding the basic concepts Like Secularism, Nationalism, Humanism, Equality, Liberty, sovereignty, and the relation between the individual and society.
- To introduce the social and political theories of Indian thinkers.
- To make understand the dynamics of Indian social reality and its conceptualization.
- This course is designed to develop interest among the students about the contemporary social issue and concern.

PHIHCC 07: Philosophy of Religion
- This course helps the students to understand the different religious traditions and their implications. - Discuss different religions view regarding karma, rebirth and liberation. Teachings Quran and Christianity, arguments for the existence of God. - The function of the philosophy of religion is to determine the significance and values of the human experience of religion. - This course will help students to develop an outlook of equality and a feeling of respect for religious 'Other' in their behaviour. - Understanding continental dialogues on Philosophical issues of mutual interest will encourage exploration in the field of art, morality, science and religion. Gather knowledge about the concept of religious pluralism and the concept of universal religion.

PHIHCC08: Western Logic –I
- This paper includes the primary concepts of logic and arguments-both deductive and Inductive. - Students may understand basic concepts of logic and their use in everyday life. - Students will be able to think critically and logically. - They develop reasoning skills and are able to identify and construct good arguments and correct derivations as a way of finding structure in language. - From this course students will get the knowledge about traditional and Aristotelian logic. - Identify premises and conclusions in both formal as well as informal proofs, and demonstrate an awareness of the limits of deductive forms as well as linguistic ambiguities. - Students will become adept at truth tables for testing the validity of arguments and statement-forms. It helps to develop a critical and logical mental attitude.

PHIHCC09: Western Logic –II
- Understanding to apply logical techniques to determine the validity of arguments as well as find out the inconsistencies. - Understanding the skills for applying decision procedures as well as the construction of Formal proofs of Validity through definite rules. - Students will understand the significance of the logic of necessity and possibility and will learn the debates around modalities in philosophy. - Having completed the course of Western Logic, students demonstrate proficiency in critical thinking and understanding of deductive and inductive reasoning and competence in the basic analytical methods of logic.

PHIHCC10: Epistemology and Metaphysics (Western)

- After successful completion of this course the students would be able to recognize the true characteristics of knowledge i.e. what is knowledge proper, how we know, what is the conditions of justification of knowledge etc
- Exploring such abstract notions enriches our insight. This intellectual activityis important to grasp subtle and complex subject matters.
- Students will be introduced to the basic issues in epistemology through original readings.
- The student can also explore the important philosophical theories like Realism, Idealism, Phenomenalism, Substance, Cause, Universal, other minds, Mind-body relation etc.
- Understanding a comprehensive view and a universal explanation of the nature of things GOD and the Evolution of the world with the method of thinking and knowing.

PHIHCC11: Nyaya Logic and Epistemology –I

- Indian Logic will offer the students a textual reading of the Sanskrit text-Tarkasamgraha, written by Navya Naiyayika Sri Annambhatta Acharya.
- To study the classical Problem of Indian Logic.
- To study the problems associated with the definition, nature, factors (pramā, prameya, pramāṇa etc.), and its process.
- To study the significance of classical Indian Logic.
- To explore philosophical accounts of Indian Old and New Logic.

PHIHCC12: Ethics (Indian)

- The study of Ethics helps a student to gain the ability so that they can make themselves to become a proper social being.
- This course intends to make students familiar with ethical approaches that have at their core principles with whose help actions can be adjudicated as right and wrong.
- The course will engage students in philosophical thinking about actions and their consequences, moral obligations and responsibility, character and duty and various other 'moral' concepts.
- Students get acquainted with Indian moral concepts like Dharma, Adharma, Liberation, Purusarthas and their inter-relations, Niskama and Sakama karma.
- Students will develop critical understanding about Indian Ethics. Indian Ethics consists of Ethics of Gita like Concepts of Karmayoga, Buddhist Ethics like Pancasila, Brahmaviharabhavna, Jaina Ethics like anubrata, mahabrata and also Mimamsa Ethics like nittya, naimittika karma and kamya karma.

PHIHCC13: Nyaya Logic and Epistemology –II

- The outcome of the course is to understand the sources of knowledge and also the theory of hermeneutical understanding of Indian Epistemology.
- To acquire the right knowledge and overcome the fallacies by using Nyaya Logic.

- Tarksaṁgraha of Annaṁbhaṭṭa - on Perception, Inference, and Verbal testimony.
- To search the definition of valid cognition, criteria for testing the proposed validity, instruments of valid cognition, and their respective accounts.

PHIHCC14: Ethics (Western)

- Moral issues and problems are all around us and continually emerge from the ways we live our lives as individuals within a society and within an increasingly interconnected global community.
- Students can be familiar with ethical values such as right and wrong, virtue or vice, good or bad.
- Western Ethics discusses about object of moral judgement and also about the Moral Theories of Plato and Aristotle.
- Understanding the basic value and importance of living with the knowledge of 'ought' and 'is' statements.
- Western Ethics also consists of Standards of Morality like Hedonism, Deontological Ethics and also of Theories of Punishment.

PHIHDSE01: Philosophy of Language (Indian)

- Students will have knowledge about the philosophy of language.
- They will understand the various meanings and aspects of sentences and words.

PHIHDSE 02: Ethics (Applied ethics)

- Introduces students to a form of applied ethics that is of vital importance in the current environmental scenario.
- Students will get to know the nature and scope of applied ethics.
- Awareness of present issues related to human life, society and the environment with their ethical implications.
- It develops the capacity to grasp some practical problems & issues and find out their solutions in the socio-moral context.

PHIHDSE 03: The Problems of Philosophy-- Bertrand Russell

- Students will analyze Bertrand Russell's ideas regarding the problems and fundamental issues of Philosophy.
- This course helps the students to understand the detailed knowledge about the views of Bertrand Russell, a Contemporary Western philosopher, from both epistemological and metaphysical perspectives through his book The Problems of Philosophy.

PHIHDSE 04: M.K. Gandhi

- Students will be able to appreciate the Gandhian notions of truth, nonviolence, swaraj and God.
- Students will learn the Importance of truth and non-violence in human life.
- Students will get inspiration from a perfect role model whose thoughts are still relevant and act as a guiding force for leading a peaceful life.

PHIHSEC 01: Philosophy of Human Rights

- Students will come to understand the meaning and nature of Human Rights.
- They will be able to trace its Origins and historical developments during Ancient period, Modern period and Contemporary period.
- They will learn about the idea of natural law and natural rights as propounded by Thomas Hobbes and John Locke.
- They will be able to analyse the reactions from Jeremy Bentham, Edmund Burke and Thomas Paine to natural law traditions.
- They will come understand the meaning of Natural Right, Fundamental Right and Human Rights.
- They will learn about the Preamble, Fundamental Rights and Duties as enshrined in the Indian Constitution.

PHIHSEC 02: Value Education

- Students will learn different contexts of values – individual, Social, Cultural, Moral, Global and Spiritual.
- They will learn the aims, objectives, and necessity of Peace Education.
- They will be able to appreciate the value of education and peace education as sustaining forces for world civilization

PHIHSEC 03: Man and Environment

- Students will learn about the Upanishadic and post-Upanishadic views on nature.
- They will learn Rabindranath Tagore’s views on the environment and nature.
- They will grow respect for nature.
- They will appreciate the intrinsic value of nature.
- They will learn about deep ecology and its third-world critique.
- They will learn about eco-feminism.

PHIHGE 01: Ethics: Indian and Western

- Students will understand the fundamental philosophical basis of Hinduism.
- They will learn about the Buddhist ethics.
- They will be taught about moral and non-moral actions and the object of Moral Judgement.
- They will be acquainted with Teleological Ethics and have an understanding of Mill and Bentham’s Utilitarianism.

- They will be acquainted with Deontological Ethics and taught about Kant's Moral Theory.

PHIHGE02: Philosophy of Mind

- The students are introduced to the definition, nature and scope of psychology.
- They become acquainted with its different methods like introspection and observation, Experimental.
- They will realise the meaning of perception and its Relation to sensation.
- They will be acquainted with Gestalt theory of perception, illusion and hallucination.
- They will have about three stages of mind: Conscious, Subconscious, and Unconscious.
- They will be acquainted with Freud's theory of dream.
- They will be acquainted with different Philosophical Theories of Mind.
- Emphasis is given on analyzing and clarifying the different theories of learning,
- They will learn about the types, factors and traits about Personality

PHIHGE03: Theory of Inference in Nyāya

- Students will learn about Nyāya Theory of Knowledge.
- They will have an understanding of inferential knowledge and its classification.

PHIHGE 04: Termination of Life & Ethics

- Students will be taught on practical ethics and bioethics regarding Termination of Life.
- They will form their views on Euthanasia and Abortion.

Government General Degree College Salboni
B. A. General in Philosophy

Programme Specific Out comes (PSO)

After the completion of the UG General programme in Philosophy, students will be able to

- Examine and critically assess the thought of a specific figure in the history of philosophy from antiquity to the present, identifying important periods, movements, and philosophies.
- To gain an understanding of the present state of knowledge in a specific topic and to seek solutions to contemporary philosophical challenges.
- To have an in-depth understanding of the main issues and problems in metaphysics, epistemology, logic and ethics.
- To have analytical and critical thinking skills.
- To understand the nature of mind, matter, language, knowledge and reality.

- To think logically by developing skills in explaining, critically examining and responding to Philosophical theories, issues and claims.

Course Outcome (CO)

DSC-1A: Indian Philosophy

- The course aims to provide students with an understanding of the earning and salient features of Indian Philosophy,
- The distinction between orthodox and heterodox schools of thought, and the different ways of knowledge admitted by Indian Philosophy.
- It also focuses on the metaphysical and epistemological views of various Indian philosophical traditions, such as Carvaka, Jainism, Buddhism, Nyaya, and Vaisesika.
- It also delves into the theories of pramā, which involve questions related to valid cognition, criteria for testing validity, and instruments of valid cognition.
- Students are expected to gain a deep understanding of Indian philosophical thoughts, develop critical thinking skills.

DSC-1B: Western Philosophy

- To explore and analyze the concept of reality and its various interpretations.
- To delve into the ideas of causality and teleology in metaphysics.
- To examine the relationship between mind and body, and the nature of human existence.
- To introduce students to different philosophical perspectives and encourage critical thinking.
- To encourage students to reflect on the implications of metaphysical concepts for their own lives and beliefs.

DSC-1C: Logic

- This paper includes the primary concepts of logic and arguments-both deductive and Inductive.
- Students may understand basic concepts of logic and their use in everyday life.
- Students will be able to think critically and logically.
- They develop reasoning skills and are able to identify and construct good arguments and correct derivations as a way of finding structure in language.
- From this course students will get the knowledge about traditional and Aristotelian logic.

- Identify premises and conclusions in both formal as well as informal proofs, and demonstrate an awareness of the limits of deductive forms as well as linguistic ambiguities.
- Students will become adept at truth tables for testing the validity of arguments and statement-forms. It helps to develop a critical and logical mental attitude.

SEC-1: Philosophy of Human Rights

- Students will learn about the definition and nature of human rights.
- They will be able to trace its origins and historical advancements across the ancient, modern, and contemporary periods.
- Students will learn about Thomas Hobbes and John Locke's theories on natural law and rights.
- Students will be able to analyze their acts using Jeremy Bentham, Edmund Burke, and Thomas Paine's natural law traditions.
- They will learn the definitions of Natural Rights, Fundamental Rights, and Human Rights.
- They will study the Preamble, Fundamental Rights, and Duties as written in the Indian Constitution.
- They will learn about contemporary perspectives on human rights.

DSC-1D: Contemporary Indian Philosophy

- Students will become acquainted with Rabindranath Tagore's philosophy.
- Students will learn about the Finite, Infinite, and Finite-Infinite aspects of man, as well as Rabindranath Tagore's views on religion and the problem of evil. They will grasp Tagore's concepts of surplus in man.
- Students will become acquainted with Sri Aurobindo's philosophy, including his thoughts regarding the nature of reality, human evolution, the various stages of human evolution, and integral yoga.Students will learn about S. Radhakrishnan's philosophy, including his theories on the nature of man, religious experience, and intuitive perception.
- Students will learn about Md. Iqbal's concepts of self-nature, world-nature, and divine nature.
- Students will understand Gandhi's principles of truth, nonviolence, trusteeship, and God. They will understand the importance of truth and nonviolence in human life. They will be inspired by a superb role model whose ideas are still relevant and can serve as a guiding force for living a calm life.

SEC-2: Philosophical Analysis

- After successful completion of this core course, the students would be able to understand the role of language in philosophy. A study of philosophical language gives us the knowledge of language and reality and they will able to understand that how the vagueness of language create philosophical problems

DSE-1: Philosophy of Religion

- This course helps the students to understand the different religious traditions and their implications.
- Discuss different religions view regarding karma, rebirth and liberation. Teachings Quran and Christianity, arguments for the existence of God.
- The function of the philosophy of religion is to determine the significance and values of the human experience of religion.
- This course will help students to develop an outlook of equality and a feeling of respect for religious 'Other' in their behaviour.
- Understanding continental dialogues on Philosophical issues of mutual interest will encourage exploration in the field of art, morality, science and religion. Gather knowledge about the concept of religious pluralism and the concept of universal religion.

SEC- 3: Value Education

- Students will learn the definition, features, significance, and aims of value education.
- Students will learn to understand values in various situations, including individual, social, cultural, moral, global, and spiritual.
- They will understand the value of peace and education.
- They will learn to view Peace and Value Education from a global perspective.

DSE-2: Tarkasaṁgraha with Dīpikā

- Students will learn about the seven substances described in the Tarksaṁgraha of Annaṁbhaṭṭa: Drabya, Guna, Karma, Samanya, Vishesha, Samabaya, and Abhaba.

GE-1: Indian Philosophy

- The course aims to provide students with an understanding of the earning and salient features of Indian Philosophy,
- The distinction between orthodox and heterodox schools of thought, and the different ways of knowledge admitted by Indian Philosophy.
- It also focuses on the metaphysical and epistemological views of various Indian philosophical traditions, such as Carvaka, Jainism, Buddhism, Nyaya, and Vaisesika.
- It also delves into the theories of pramā, which involve questions related to valid cognition, criteria for testing validity, and instruments of valid cognition.

- Students are expected to gain a deep understanding of Indian philosophical thoughts, develop critical thinking skills.

SEC -4: Logical Reasoning and Application

- The main objectives of logical reasoning, legal language, its nature and functions, and inductive and deductive reasoning in law are the thrust areas of study. It has both theoretical and practical content. It helps to develop reasoning ability and an analytic outlook towards various life situations.

GE-2: Philosophy of Mind

- The students are introduced to the definition, nature and scope of psychology.
- They become acquainted with its different methods like introspection and observation, Experimental.
- They will realise the meaning of perception and its Relation to sensation.
- They will be acquainted with Gestalt theory of perception, illusion and hallucination.
- They will have about three stages of mind: Conscious, Subconscious, and Unconscious.
- They will be acquainted with Freud's theory of dream.
- They will be acquainted with different Philosophical Theories of Mind.
- Emphasis is given on analyzing and clarifying the different theories of learning.
- They will learn about the types, factors and traits about Personality.

GOVERNMENT GENERAL DEGREE COLLEGE SALBONI

GOVERNMENT OF WEST BENGAL

Office of the Principal

P. O. BHIMPUR DIST. PASCHIM MEDINIPUR PIN 721516

Website: www.salbonigovtcollege.org :: E-mail: salboni_college@mail.vidyasagar.ac.in

Course Outcomes (CO)

B.A. Political Science Honours

Course Code	Course Title	Course Outcome
PLSH CC-1	Understanding Political Theory	This course introduces the students to the idea of political theory, its history and approaches, and an assessment of its critical and contemporary trends and is designed to reconcile political theory and practice through reflections on the ideas and practices related to democracy.
PLSH CC-2	Constitutional Government and Democracy in India	This course acquaints students with the constitutional design of state structures and institutions, and their actual working over time. It further encourages a study of state institutions in their mutual interaction, and in interaction with the larger extra-constitutional environment.
PLSH CC-3	Political Theory-Concepts and Debates	This course helps the student familiarize with the basic normative concept of political theory. Each concept is related to a crucial political issue that requires analysis with the aid of our conceptual understanding. This exercise is designed to encourage critical and reflective analysis and interpretation of social practices through the relevant conceptual toolkit. It further introduces the students to the important debates in the subject.
PLSH CC-4	Political Process in India	This course maps the working of ‘modern’ institutions, premised on the existence of an individuated society, in a context marked by communitarian solidarities, and their mutual transformation thereby. It also familiarizes students with the working of the Indian state, paying attention to the contradictory dynamics of modern state power.
		This is a foundational course in comparative politics. The purpose is to familiarize students with the basic concepts and approaches to the study of comparative politics. More

PLSH CC-5	Introduction to Comparative Government and Politics	specifically the course will focus on examining politics in a historical framework while engaging with various themes of comparative analysis in developed and developing countries.
PLSH CC-6	Perspectives of Public Administration	The course provides an introduction to the discipline of public administration. This paper encompasses public administration in its historical context with an emphasis on the various classical and contemporary administrative theories. The course also explores some of the recent trends, including feminism and ecological conservation and how the call for greater democratization is restructuring public administration. The course will also attempt to provide the students a comprehensive understanding on contemporary administrative developments.
PLSH CC-7	Perspectives on International Relations and World History	This paper seeks equip students with the basic intellectual tools for understanding International Relations. It introduces students to some of the most important theoretical approaches for studying international relations. The course begins by historical contextualizing the evolution of the international state system; then the students introduces to different theories in International Relations. It provides a fairly comprehensive overview of the major political developments and events starting from the twentieth century. Students are expected to learn about the key milestones in world history and equip them with the tools to understand and analyze the same from different perspectives. A key objective of the course is to make students aware of the Euro-centricism of International Relations by highlighting certain specific perspectives from the Global South.
PLSH CC-8	Political Process and Institutions in Comparative Perspective	In this course students will be trained in the application of comparative methods to the study of politics. The course is comparative in both what we study and how we study. In the process the course aims to introduce undergraduate to some of the range of issues, literature, and methods that cover comparative political arena.

PLSH CC-9	Public Policy and Administration in India	The paper seeks to provide an introduction to the interface between public policy and administration in India. The essence of public policy lies in its effectiveness in translating the governing philosophy into programs and policies and making it a part of the community living. It deals with issues of decentralization, financial management, citizens and administration and social welfare from a non-western perspective.
PLSH CC-10	Global Politics	This course introduces students to the key debates on the meaning and nature of globalization by addressing its political, economic, social, cultural and technological dimensions. It imparts an understanding of the working of the world economy, while analyzing the changing nature of relationship between the state and trans-national actors and networks. The course also offers insights into key contemporary global issues.
PLSH CC-11	Classical Political Philosophy	From this course students know about Plato on Philosophy and Politics, Theory of Forms, Justice, Philosopher King/Queen, Communism; Critique of Democracy; Women and Guardianship, Censorship, Aristotle on Virtue, Citizenship, Justice, State and Household-Classification of government; man as zoon politikon, Machiavelli on Virtue, Religion, Republicanism, morality and statecraft; vice and virtue, Hobbes on Human Nature, State of Nature, Social Contract; Leviathan; atomistic individuals, Lock on Laws of Nature, Natural Rights; right to dissent; justification of property, Rousseau on State of Nature, Social Contract and General Will.
PLSH CC-12	Indian Political Thought-I	This course introduces the specific elements of Indian political Thought spanning over two millennia. The course as a whole is meant to provide a sense of the broad streams of Indian thought while encouraging a specific knowledge of individual thinkers and texts. Selected extracts from some original texts are also given to discuss in class.
	Modern Political	Philosophy and politics are closely intertwined. We explore this convergence by identifying four main tendencies here. Students will be exposed to the manner in which the questions of politics have been posed in terms that have

PLSH CC-13	Philosophy	implications for larger questions of thought and existence.
PLSH CC-14	Indian Political Thought-II	Based on the study of individual thinkers, the course introduces a wide span of thinkers and themes that defines the modernity of Indian Political Thought. The objective is to Study Genera themes that have been produced by thinkers from varied social and temporal contexts. Selected extracts from original texts are also given to discuss the class. The list of the essential Readings are meant for teacher as well as the more interested students.
PLSH DSE-1	Development Process and Social Movements in Contemporary India	It gives the full- phase's knowledge regarding Indian social structure and its relation to development process and different social movement in India
PLSH DSE-2	United Nations and Global Conflicts	Student will able to learn about endeavors to look into all changes and challenges, along with a comprehensive examination of the structures, functions and activities of the United Nations. The critical appraisal also attempts to throw light on the various reform efforts within and outside the UN.
PLSH DSE-3	Women, Power and Politics	This paper deals with Feminist theorizing of the sex/gender distinction, Biologism versus social Constructivism, Understanding Patriarchy and Feminism, Liberal, Socialist, Marxist, Radical Feminism, New Feminist Schools/Traditions, Traditional Historiography and Feminist critiques, Social Reform Movement and position of women in India, History of Women's struggle in India, Family in Contemporary India, etc.
PLSH DSE-4	Human Rights in a Comparative Perspectives	This paper deals with Understanding Human Rights: Three Generation of Rights, Institutionalization: Universal Declaration of Human Rights, Rights in National Constitutions: South Africa and India, Torture: USA and India, Surveillance and Censorship: china and India, Terrorism and Insecurity of Minorities: USA and India, Caste and Race: South Africa and India, Gender and Violence: India and Pakistan, Adivasis/Aboriginals and the Land Question: Australia and India.
		This course aims to acquaint students with the structure and manner of functioning of the legal system in India, such as Legal system in India,

PLSH SEC-1	Democratic Awareness with Legal Literacy	Systems of courts/tribunals and their jurisdiction in India- criminal and civil courts, Writ jurisdiction, specialized courts such as Juvenile courts, Mahila courts and Tribunals, role of police and executive in criminal law administration, alternative dispute mechanisms such as Lok Adalats, non-formal mechanisms, understanding of the laws applicable in India, Constitution, fundamental rights, fundamental duties, other constitutional rights and their manner of enforcement, with emphasis on public interest litigation and the expansion of certain rights under Article 21 of the Constitution, Laws relating to criminal jurisdiction- provision relating to filling an FIR, arrest, bail search and seizer and some understanding of the questions of evidence and procedure in Cr. P.C. and related laws, important offences under the Indian Penal Code, offences against women, juvenile justice, prevention of atrocities on Schedule Castes and Schedule Tribes, Concept like Burden of proof, Presumption of Innocence, Principles of Natural Justice, Fair comment under Contempt laws, Personal Laws in India: Pluralism and Democracy, Laws relating to contact, property and tenancy laws, Laws relating to dowry, sexual harassment and violence against women, Laws related to consumer rights, Laws related to cyber crimes, Anti-terrorist laws: implications for security and human rights, Critical understanding of the Functioning of the Legal System, Legal Services Authorities Act and right to legal aid, ADR systems.
PLSH SEC-2	Legislative Practices and Procedures	To acquaint the student broadly with the legislative process in India at various levels, introduce them to the requirements of peoples' representatives and provide elementary skills to be part of a legislative support team and expose them to real life legislative work. These will be, to understand complex policy issues, draft new legislation, track and analyze ongoing bills, make speeches and floor statements, write articles and press releases, attend legislative meetings, conduct meetings with various stakeholders, monitor media and public developments, manage constituent relations and handle inter-office communications

PLSH GE-1	Feminism: Theory and Practice	This paper deals with Feminist theorizing of the sex/gender distinction, Biologism versus social Constructivism, Understanding Patriarchy and Feminism, Liberal, Socialist, Marxist, Radical Feminism, New Feminist Schools/Traditions, Traditional Historiography and Feminist critiques, Social Reform Movement and position of women in India, History of Women's struggle in India, Family in Contemporary India- patrilineal and matrilineal practices, Gender Relations in the family, Patterns of Consumption: Intra Household Divisions, Entitlements and bargaining, Property Rights, Understanding Women's Work and Labour.
PLSH GE-2	Governance: Issues and Challenges	From this paper students will know about Role of State in the era of Globalization, State, Market and Civil Society, Human-Environment Interaction, Green Governance: Sustainable Human Development, Public Service Guarantee Acts, Election Governance, Citizen Charter and Right Information, Corporate Social Responsibility.
PLSH GE-3	Gandhi and the Contemporary World	From this paper students will know about Gandhi on Modern Civilization and Modern Industrialization based on Large and Heavy Industries and Alternative Modernity; critique of development, Gandhian Thought: Theory and Action: Satyagraha, Peasant Satyagraha: Kheda and the idea of Trusteeship, Sarvodaya, Untouchability, and Dalit Emancipation, Women's Development and on Women's Movement, Peace and Preservation of Nature.
PLSH GE-4	United Nations and Global Conflicts	Student will able to learn about endeavors to look into all changes and challenges, along with a comprehensive examination of the structures, functions and activities of the United Nations. The critical appraisal also attempts to throw light on the various reform efforts within and outside the UN.

CCFUP – NEP Introduced Honours Courses (2023-24)

Course Code	Course Title	Course Outcome
MJ-1	Understanding Political Theory	Learning is necessary for being a useful member of society. The first step towards learning is having a theoretical understanding of the subject matter. This

		course is specifically dedicated for this purpose.
SEC 1	Panchayati Raj Management System	The course will enable the student to map the activities of the PRIs- development agencies and planning committees, workings of the Panchayati Raj Bureaucracy, gain insights into the implementation of various programmes and political linkages.
MJ-2	Constitutional Government in India	This course will prepare students for academic jobs, legal professions, administrativeservices, media and various civil society organizations.
SEC 2	Media and Politics	The course will explore the interdependent and symbiotic relationship between media and politics. Students will be able to understand the themes of propaganda, fake news, neutrality, corporatization and moral panic along with making a sense of media theories, and its impact on democratic politics and formation of public opinion.

Course Outcomes (CO)

B.A. Political Science General

Course Code	Course Title	Course Outcome
PLSG DSC-1A	Introduction to Political Theory	From this paper students will know about Politics, Political theory and what is its relevance, Democracy, Liberty, Equality, Justice, Rights, Gender, Citizenship, Civil Society and State and different debates on Political Theory.
PLSG DSC-1B	Indian Government and Politics	This paper based on making of the Indian Constitution by the Constitutional Advisor, the Drafting Committee and finally the Constituent assembly, discussion about Preamble, Fundamental Rights, Directive Principles of

		State Policy, Federalism, Union Government, Executive, Legislature, Judiciary, State Government, Public Services and Public Service Commission.
PLSG DSC-1C	Comparative Government and Politics	From this paper students will know about Nature and Scope of Comparative Government and Politics, Euro-centricism, Capitalism, Globalization, Socialism, Colonialism and a comparative study of constitutional developments and political economy in the following countries: Britain, Brazil and China.
PLSG DSC-1D	Introduction to International Relations	This paper deals with International Relations: Level and Analysis, History and IR, Classical Realism and Neo-Realism, Liberalism and Neo-Liberalism, Marxist Approaches, Feminist Perspectives, World War I, Bolshevik Revolution, Rise of Fascism-Nazism, World War II, Cold War, Emergence of Third World, Collapse of USSR and the End of Cold War, Post Cold War Development and Emergence of Other Power Centers of Power, India as an Emerging Power, Indian Foreign Policy.
PLSG DSE-1A	Themes in Comparative Political Theory	The present study covers the various themes in the Contemporary Political Theory. Issues such as citizenship, rights, inequality, liberty, democracy, state, swaraj, social justice, patriarchy emerging from the writings of thinkers as diverse as Aristotle to Nehru and Narayan form the crux of the present study.
PLSG DSE-1B	Administration and Public Policy: Concepts and Theories	The paper seeks to introduce the interface between public policy and administration in India. The essence of public policy lies in its effectiveness in translating the governing philosophy into programs and policies and making it a part of the community living. It deals with issues of decentralization, financial management, citizens and social welfare from a non-western perspective.
PLSG SEC-1	Legislative Support	This course will enhance the knowledge of the students on the legislative process of the country. The purpose of the course is also to enhance the skills of the students and to broaden their understanding of the different tiers of governance in India.
PLSG SEC-2	Public Opinion and Survey Research	This course will introduce the students to the debates, principles and practices of public opinion polling in the context of democracies, with special reference to India. It will familiarize the students with how to conceptualize and measure public opinion

		using quantitative methods, with particular attention being paid to developing basic skill pertaining to the collection, analysis and utilization of quantitative data, such as definition and characteristics of public opinion, conceptions and characteristics, debates about its role in a democratic political system, uses for opinion poll, concept about sampling, interviewing, Questionnaire, introduction to quantitative data analysis, Basic concept about co-relational research, causation and prediction, descriptive and Inferential Statistics.
PLSG SEC-3	Democratic Awareness with Legal Literacy	The student should be aware of the institutions that comprise the legal system - the courts, police, jails and the system of criminal justice administration. Have a brief knowledge of the Constitution and laws of India, an understanding of the formal and alternate dispute redressal mechanisms that exist in India, public interest litigation. Have some working knowledge of how to affirm one's rights and be aware of one's duties within the legal framework; and the opportunities and challenges posed by the legal system for different sections of persons.
PLSG SEC-4	Conflict and Peace Building	The course encourages the use of new information technologies and innovative ways of understanding these issues by teaching students skills of managing and resolving conflicts and building peace through techniques such as role-play, simulations, street theatre, cinema and music on the one hand and by undertaking field visits, interacting with different segments of the civil society including those affected by conflicts as well as diplomats, journalists and experts, on the other.
PLSG GE-1	Reading Gandhi	From this paper students will know about Gandhi on Modern Civilization and Modern Industrialization based on Large and Heavy Industries and Alternative Modernity; critique of development, Gandhian Thought: Theory and Action: Satyagraha, Peasant Satyagraha: Kheda and the idea of Trusteeship, Sarvodaya, Untouchability, and Dalit Emancipation, Women’s Development and on Women’s Movement, Peace and Preservation of Nature.
		Student will able to learn about endeavors to look into all changes and challenges, along with a comprehensive examination of the structures,

PLSG GE-2	United Nations and Global Conflicts	functions and activities of the United Nations. The critical appraisal also attempts to throw light on the various reform efforts within and outside the UN.

CCFUP – NEP Introduced MDP Courses (2023-24)

Course Code	Course Title	Course Outcome
MI – 1	Nationalism and Anti-colonial Movements in India	This course intends to equip students with knowledge on different types and phases of Nationalist/Anti-colonial struggle in India. This will prepare the students for various jobs in academia, administration, legal profession and the media.
MI-2	Gender Studies	This course will prepare students for academic jobs, legal professions, media, and civil- societyorganizations and various administrative jobs and sensitization of gender related issues.

Course Outcome (CO) – UG PHYSICS (Hons.) (CBCS)

SEMESTER - I

CC-1: Mathematical Physics

C1-T: Mathematical Physics:

1. Calculus Basics:

- Students will effectively discuss mathematical concepts in group settings.
- They will write detailed solutions using appropriate mathematical language.
- They'll recognize the utility of calculus in various mathematical and interdisciplinary fields.
- They'll generate solutions to unfamiliar problems using calculus techniques.

2. Vector Calculus:

- Students will understand core concepts in multivariable analysis, including space curves, gradients, multiple integrals, and vector fields.
- They'll comprehend divergence, curl, and flux, along with the theorems of Green and Stokes, and the divergence theorem.
- They'll apply multivariable analysis techniques to solve mathematical models and deduce results.
- Students will solve optimization problems, including those with constraints.

3. Orthogonal Curvilinear Coordinates:

- Students will write detailed solutions using orthogonal curvilinear coordinates.
- Students will identify the divergence of the gradient.
- Students will recognize curl and Laplacian in Cartesian coordinates.

4. Probability:

- Students will identify random variables and probability distribution functions.
- Students will write detailed explanations of probability distribution functions such as binomial, Gaussian, and Poisson distributions.

5. Dirac Delta Function:

- Students will define the Dirac Delta function.
- Students will understand its use as a localization operator.
- Students will develop the ability to employ the Delta function formally in mathematical contexts.
- Students will view two-dimensional and three-dimensional problems as interrelated concepts rather than independent ones.

C1-P: Mathematical Physics Lab:

- Students will understand and perform arithmetic operations in both binary and decimal number systems.

- They will understand the representation of floating-point numbers and perform computations with them.
- They will implement algorithms for various numerical tasks, such as sorting, searching, and solving equations.
- They will implement sequence, selection, and repetition constructs in programming languages to solve computational problems.
- Differentiate between single and double precision arithmetic and understand their implications on numerical computations.
- Recognize the importance of using dimensionless variables in equations to simplify analysis and ensure generality.
- They will implement iterative methods such as Bisection, Newton-Raphson, Secant, Euler, modified Euler, and Runge-Kutta for solving algebraic equations, transcendental equations, and ordinary differential equations.
- They will understand the sources and effects of truncation and round-off errors in numerical computations and compute absolute and relative errors to assess the accuracy of numerical solutions.
- They will able to plot functions and data using tools like gnuplot, including polar and parametric plots.
- Modify the appearance of graphs, create surface and contour plots, and export plots for further analysis.
- They will understand fundamental programming concepts such as constants, variables, data types, operators, expressions, and modules.
- They will implement input/output statements, loops (for and while), conditional statements (if-elif-else), and compound statements.
- They will able to calculate the sum, average, largest element, and its location in a list of numbers.
- Sort numbers in ascending and descending order using algorithms like binary search.
- They will able to compute the area of a circle, area of a square, volume of a sphere, and the value of π.
- They will able to solve algebraic and transcendental equations using Bisection, Newton-Raphson, and Secant methods.
- Perform interpolation using Newton-Gregory forward and backward difference formulae, and estimate error in linear interpolation.
- Perform numerical differentiation and integration using forward/backward difference formulae, Trapezoidal rule, Simpson's rule, and Monte Carlo method.
- They will able to solve first-order ODEs using Euler's method, modified Euler's method, and Runge-Kutta (RK) second and fourth-order methods.

CC2: Mechanics

C2-T: Mechanics:

1. Fundamentals of Dynamics:

- Student will understand reference frames and inertial frames, and Newton's Laws of Motion.
- They will learn Galilean transformations and Galilean invariance.
- Study momentum of variable-mass systems, such as rocket motion.
- Calculate the motion of a projectile in a uniform gravitational field.

- They will understand dynamics of a system of particles, including the center of mass and conservation of momentum principles.

2. Work and Energy:

- Student will learn about the Work-Energy Theorem and kinetic energy.
- Differentiate between conservative and non-conservative forces, and understand potential energy.
- Determine stable and unstable equilibrium conditions.
- Calculate elastic potential energy and the force as the gradient of potential energy.
- Explore the relationship between work, potential energy, and the conservation of energy.

3. Collisions:

- They will understand elastic and inelastic collisions between particles.
- Analyze collisions in both center of mass and laboratory frames.

4. Rotational Dynamics:

- Study angular momentum of particles and systems of particles.
- Calculate torque and understand the principle of conservation of angular momentum.
- They will learn about rotation about a fixed axis, moment of inertia, and kinetic energy of rotation.
- They will understand motion involving both translation and rotation.

5. Elasticity:

- They will learn about the relation between elastic constants and twisting torque on cylinders or wires.

6. Fluid Motion:

- Study the kinematics of moving fluids, including Poiseuille's Equation for the flow of liquid through a capillary.

7. Gravitation and Central Force Motion:

- They will understand the law of gravitation and gravitational potential energy.
- Solve problems related to gravitation.

8. Oscillations:

- They will learn about simple harmonic oscillations, including the differential equation of SHM and its solution.
- Calculate kinetic energy, potential energy, and total energy of oscillating systems.
- Study damped oscillations, forced oscillations, and resonance phenomena.

9. Non-Inertial Systems:

- They will learn about non-inertial frames, fictitious forces, and uniformly rotating frames.
- They will understand laws of physics in rotating coordinate systems.
- They will able to solve problems related to relativity.

C2-P: Mechanics Lab:

Program outcomes for each experiment:

1. Measurements of Length with Vernier Caliper, Screw Gauge, and Travelling Microscope:

- Student will understand and perform accurate measurements using vernier calipers, screw gauges, and travelling microscopes.
- They will learn how to read and interpret measurements with precision.

2. Study of Random Errors in Observations:

- Student will be able to identify and analyze random errors in experimental measurements.
- Student will learn techniques to minimize and account for random errors in data collection.

3. Determination of Building Height using a Sextant:

- Student will be able to apply principles of trigonometry and angular measurements to determine the height of a building using a sextant.
- Student will understand the concepts of angles of elevation and depression.

4. Study of Motion of a Spring:

- Student will be able to determine the spring constant, gravitational acceleration (g), and modulus of rigidity of a spring.
- Student will be able to apply principles of Hooke's Law and simple harmonic motion.

5. Determination of Moment of Inertia of a Flywheel:

- Student will be able to measure and calculate the moment of inertia of a flywheel using experimental methods.
- Student will understand the concept of rotational inertia and its significance.

6. Determination of g and Velocity for a Freely Falling Body using Digital Timing Technique:

- Student will use digital timing techniques to accurately measure the time of fall of a freely falling body.
- They will be able to calculate the gravitational acceleration (g) and velocity of the falling body.

7. Determination of Coefficient of Viscosity of Water by Capillary Flow Method (Poiseuille's Method):

- Student will be able to measure the flow rate of water through a capillary tube and calculate the coefficient of viscosity using Poiseuille's method.
- They will understand the relationship between viscosity, flow rate, and pressure gradient.

8. Determination of Young's Modulus of a Wire by Optical Lever Method:

- They will measure the elongation of a wire under tension using the optical lever method.
- They will calculate Young's modulus of the wire from the measured values.

9. Determination of Modulus of Rigidity of a Wire by Maxwell's Needle:

- Determine the modulus of rigidity of a wire by measuring its torsional deflection using Maxwell's needle.
- Understand the principles of torsional motion and shear modulus.

10. Determination of Elastic Constants of a Wire by Searle's Method:

- Measure the elastic constants of a wire using Searle's method, which involves applying known loads and measuring the corresponding extensions.
- Understand the relationship between stress, strain, and elastic constants.

11. Determination of g using Bar Pendulum:

- Measure the period of oscillation of a bar pendulum and calculate the gravitational acceleration (g).
- Student will understand the principles of simple harmonic motion and gravitational force.

12. Determination of g using Kater's Pendulum:

- Measure the period of oscillation of a Kater's pendulum and calculate the gravitational acceleration (g).
- Student will understand the principles of compound pendulum motion and gravitational force.

GE-1: Elements of Modern Physics

GE1-T: Elements of Modern Physics:

1. Planck's Quantum:

- Student will understand Planck's constant and the concept of light as a collection of photons.
- Explain the photoelectric effect and Compton scattering.
- They will understand the concept of matter waves and De Broglie wavelength.
- Explain the Davisson-Germer experiment demonstrating electron diffraction.

2. Problems with Rutherford Model:

- They will understand the instability of atoms and the observation of discrete atomic spectra.
- Explain Bohr's quantization rule and atomic stability.
- Calculate energy levels for hydrogen-like atoms and their spectra.

3. Position Measurement:

- Student will understand the gamma-ray microscope thought experiment.
- Explain wave-particle duality and the Heisenberg uncertainty principle.
- Estimate the minimum energy of a confined particle using uncertainty principles.
- They will understand the energy-time uncertainty principle.

4. Two-Slit Interference Experiment:

- Perform the two-slit interference experiment with photons, atoms, and particles.
- They will understand the linear superposition principle.
- Solve the Schrödinger equation for non-relativistic particles.

- They will understand the momentum and energy operators.
- They will understand stationary states and the physical interpretation of wavefunctions.
- Calculate probabilities, normalization, and probability current densities in one dimension.

5. One-Dimensional Infinitely Rigid Box:

- Calculate energy eigenvalues and eigenfunctions, and understand normalization.
- They will understand quantum mechanical scattering and tunneling across different potential barriers.

6. Size and Structure of Atomic Nucleus:

- Explain the impossibility of an electron being in the nucleus due to the uncertainty principle.
- They will understand the nature of the nuclear force and analyze the NZ graph.
- Calculate semi-empirical mass formulas and binding energy.

7. Radioactivity:

- They will understand the stability of the nucleus and the law of radioactive decay.
- Calculate mean life and half-life.
- Explain decay processes, energy release, and gamma-ray emission.
- They will understand Pauli's prediction of neutrinos.

8. Fission and Fusion:

- Explain mass deficit, relativity, and energy generation.
- They will understand the nature of fission and emission of neutrons.
- Explain the operation of a nuclear reactor and fusion reactions.

GE1-P: Elements of Modern Physics Lab:

The program outcomes for each practical experiment:

1. Determination of Boltzmann Constant using PN Diode V-I Characteristic:

- Student will understand the V-I characteristic of a PN diode.
- Analyze the data to determine the Boltzmann constant.
- Gain practical experience in experimental techniques for semiconductor characterization.

2. Determination of Work Function of Filament Material in a Vacuum Diode:

- Student will understand the concept of work function in vacuum diodes.
- Perform experiments to determine the work function of the filament material.
- Learn about the photoelectric effect and the emission of electrons from a heated filament.

3. Determination of Ionization Potential of Mercury:

- Perform experiments to determine the ionization potential of mercury.
- They will understand the process of ionization and the energy required to remove electrons from mercury atoms.

4. Determination of Planck’s Constant using LEDs:

- Perform experiments using LEDs of different colors to determine Planck's constant.
- They will understand the relationship between energy and frequency of light.
- Analyze the experimental data to calculate Planck's constant.

5. Determination of Wavelength of H-alpha Emission Line of Hydrogen Atom:

- Perform experiments to measure the wavelength of the H-alpha emission line.
- They will understand the spectral lines of hydrogen atoms and their significance in atomic spectroscopy.

6. Study of Absorption Lines in the Rotational Spectrum of Iodine Vapor:

- Perform experiments to observe absorption lines in the rotational spectrum of iodine vapor.
- They will understand the principles of molecular spectroscopy and rotational transitions.

7. Study of Diffraction Patterns using Single and Double Slits:

- Perform experiments to study diffraction patterns using laser light.
- Measure intensity variations using a photosensor and compare with an incoherent source (sodium lamp).
- They will understand the principles of diffraction and interference.

8. Study of Photoelectric Effect:

- Measure the photo current versus intensity and wavelength of light.
- Determine the maximum energy of photoelectrons versus the frequency of light.
- They will understand the principles of the photoelectric effect and its applications in quantum mechanics.

9. Determination of e/m Ratio:

- Perform experiments using magnetic focusing or a bar magnet to determine the e/m ratio.
- They will understand the principles of charged particle motion in magnetic fields.

10. Determination of the Charge of an Electron using Millikan Oil Drop Apparatus:

- Set up the Millikan oil drop apparatus and perform experiments to determine the charge of an electron.
- They will understand the principles of electrostatics and the behavior of charged oil droplets in an electric field.

SEMESTER - II

CC-3: Electricity and Magnetism

C3-T: Electricity and Magnetism:

1. Electric Field and Electric Potential:

- Student will understand electric field lines, flux, and Gauss' Law applications.

- Analyze the conservative nature of electrostatic fields and Laplace's/Poisson equations.
- Calculate electrostatic potential and energy, and apply the uniqueness theorem.
- They will understand capacitance concepts and apply the method of images to practical scenarios.

2. Dielectric Properties of Matter:

- Student will understand electric field in matter and polarization phenomena.
- Analyze dielectric properties such as electrical susceptibility and dielectric constant.
- Apply Gauss' Law in dielectrics and understand the displacement vector.

3. Magnetic Field:

- Define magnetic field B and analyze its properties.
- Apply Biot-Savart's Law and Ampere's Circuital Law to various scenarios.
- Understand magnetic forces, dipoles, and the properties of magnetic materials.

4. Magnetic Properties of Matter:

- Analyze magnetization vector, magnetic intensity, and susceptibility.
- They will understand the relationship between B, H, and M, and phenomena like ferromagnetism and hysteresis.

5. Electromagnetic Induction:

- Apply Faraday's and Lenz's Laws to analyze electromagnetic induction.
- They will understand inductance concepts, mutual inductance, and the reciprocity theorem.
- Calculate energy stored in magnetic fields and understand Maxwell's Equations.

6. Electrical Circuits and network theorems:

- Apply Kirchhoff's laws to analyze AC circuits and understand complex reactance.
- Analyze series and parallel LCR circuits and their characteristics.
- Apply network theorems such as Thevenin theorem, Norton theorem, and Superposition theorem in DC circuits.

C3-P: Electricity and Magnetism Lab:

The outcomes of the practical:

1. Series RC Circuit Characteristics:

- Student will understand the behavior of a series RC circuit.
- Analyze the charging and discharging processes of the capacitor.
- Determine time constants and voltage across components.

2. Unknown Low Resistance Measurement using Potentiometer:

- Student will understand the principle of potentiometry.
- Measure unknown resistance by comparing potential differences.

3. Unknown Low Resistance Measurement using Carey Foster's Bridge:

- Student will understand the working principle of Carey Foster's Bridge.
- Measure unknown resistance by balancing bridge arms.

4. Resistance of Galvanometer using Thomson's Method:

- They will understand Thomson's method for measuring small resistances.
- Determine the resistance of the galvanometer accurately.

5. Measurement of Field Strength B in a Solenoid:

- Measure the magnetic field strength and its variation along a solenoid.
- Determine the gradient of the magnetic field.

6. Verification of Thevenin and Norton Theorems:

- They will understand and verify Thevenin's and Norton's theorems experimentally.
- Apply these theorems to simplify complex circuits.

7. Verification of Superposition and Maximum Power Transfer Theorems:

- They will understand and verify the superposition and maximum power transfer theorems.
- Apply these theorems to analyze circuits and optimize power transfer.

8. Self-Inductance Determination using Anderson's Bridge:

- They will understand Anderson's bridge and its application in measuring self-inductance.
- Determine the self-inductance of a coil accurately.

9. Response Curve Analysis of Series LCR Circuit:

- Study the response curve of a series LCR circuit.
- Determine resonant frequency, impedance at resonance, quality factor, and bandwidth.

10. Response Curve Analysis of Parallel LCR Circuit:

- Study the response curve of a parallel LCR circuit.
- Determine anti-resonant frequency and quality factor.

CC-4: Waves and Optics

C4-T: Waves and Optics:

1. Superposition of Collinear Harmonic Oscillations:

- Student will understand the linearity and superposition principle.
- Analyze the superposition of two collinear oscillations with equal and different frequencies.
- Study the superposition of N collinear harmonic oscillations with equal and different phase differences and frequency differences.

2. Superposition of Two Perpendicular Harmonic Oscillations:

- Student will understand graphical and analytical methods.
- Analyze Lissajous figures with equal and unequal frequencies and their applications.

3. Wave Motion:

- Student will understand plane and spherical waves, longitudinal and transverse waves.
- Analyze the wave equation, particle and wave velocities, pressure of a longitudinal wave, and energy transport.
- Study the velocity of waves in different mediums and Newton's formula for the velocity of sound.

4. Superposition of Two Harmonic Waves:

- Analyze standing waves in a string with fixed and free ends.
- Student will understand phase and group velocities, changes with respect to position and time, and energy transfer in vibrating strings.

5. Wave Optics:

- Student will understand the electromagnetic nature of light, wavefront properties, and Huygens principle.
- Analyze interference phenomena including Young's double-slit experiment, Lloyd's mirror, and interference in thin films.

6. Interferometer:

- Student will understand Michelson interferometer and its applications in determining wavelength, wavelength difference, refractive index, and visibility of fringes.
- Study Fabry-Perot interferometer.

7. Diffraction and Holography:

- Student will understand Kirchhoff's integral theorem and Fresnel-Kirchhoff's integral formula.
- Analyze Fraunhofer and Fresnel diffraction patterns, resolving power of telescopes and gratings.
- Study the principles of holography, recording and reconstruction methods, and holographic interference.

C4-P: Waves and Optics Lab:

The outcomes of practicals:

1. Melde's Experiment:

- Student will understand the concept of standing waves and their relation to frequency.
- Verify the relationship between frequency, wavelength, and tension in a stretched string.

2. Motion of Coupled Oscillators:

- Study the behavior of coupled oscillators and their motion.
- Analyze the interaction between oscillators and the resulting dynamics.

3. Lissajous Figures:

- Student will understand the graphical representation of harmonic motion using Lissajous figures.
- Analyze the relationship between frequencies and phase differences in oscillatory systems.

4. Schuster's Focusing and Prism Angle Determination:

- Familiarize with Schuster's focusing method and its application in determining angles.
- Student will understand the principles of prism angle determination.

5. Refractive Index Determination using Sodium Source:

- Determine the refractive index of a material using sodium light and the prism.
- Apply principles of refraction and Snell's law to experimental observations.

6. Dispersive Power Determination using Mercury Source:

- Determine the dispersive power and Cauchy constants of a material using mercury light.
- Analyze the spectral dispersion and properties of different wavelengths.

7. Wavelength Determination using Michelson's Interferometer:

- Determine the wavelength of sodium light using Michelson's interferometer.
- Student will understand the interference patterns and principles of interferometry.

8. Wavelength Determination using Fresnel Biprism:

- Student will uetermine the wavelength of sodium light using a Fresnel biprism.
- Student will understand the interference patterns and principles of Fresnel diffraction.

9. Wavelength Determination using Newton's Rings:

- Determine the wavelength of sodium light using Newton's rings.
- Analyze the interference fringes produced by thin films and relate them to wavelength.

10. Thickness Determination using Interference Fringes:

- Determine the thickness of a thin paper using the width of interference fringes produced by a wedge-shaped film.
- Apply principles of interference and diffraction to measure thickness.

11. Wavelength Determination using Plane Diffraction Grating:

- Determine the wavelengths of sodium and mercury light using a plane diffraction grating.
- Analyze the dispersion and resolving power of the diffraction grating.

GE2: Thermal Physics and Statistical Mechanics

GE2-T: Thermal Physics and Statistical Mechanics:

1. Zeroth Law and Temperature:

- Student will understand the concept of thermal equilibrium and its relation to temperature.
- Apply the Zeroth Law of Thermodynamics to establish temperature scales.

2. First Law of Thermodynamics:

- Comprehend the conservation of energy principle in thermodynamic processes.
- Analyze the conversion of heat into work and vice versa in various processes.
- Calculate internal energy changes and work done during different thermodynamic processes.

3. Second Law of Thermodynamics:

- Student will understand entropy as a measure of system disorder and irreversibility.
- Apply the second law to analyze heat engine efficiency and entropy changes in reversible and irreversible processes.
- Interpret entropy-temperature diagrams and the concept of unattainability of absolute zero.

4. Thermodynamic Potentials:

- Student will learn about different thermodynamic potentials such as enthalpy, Gibbs free energy, Helmholtz free energy, and internal energy.
- Understand Maxwell's relations and their applications in various thermodynamic processes.

5. Kinetic Theory of Gases:

- Derive Maxwell's distribution of velocities and understand its experimental verification.
- Analyze mean free path, transport phenomena, and the law of equipartition of energy's applications to specific heat of gases.

6. Theory of Radiation:

- Student will understand blackbody radiation and spectral distribution.
- Derive Planck's law and other radiation laws such as Wien's distribution law, Rayleigh-Jeans Law, and Stefan-Boltzmann Law.

7. Statistical Mechanics:

- Learn about phase space, macrostates, and microstates.
- Student will understand entropy and thermodynamic probability in statistical mechanics.
- Study Maxwell-Boltzmann, Fermi-Dirac, and Bose-Einstein distribution laws and their applications to different systems.

GE2-P: Thermal Physics and Statistical Mechanics:

1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.

- Student will understand the concept of mechanical equivalent of heat.
- Learn the experimental method using Callender and Barne's constant flow method to determine J.

2. Measurement of Planck's constant using black body radiation.

- Student will gain knowledge about Planck's constant and its significance in quantum mechanics.
- Student will understand the experimental setup involving black body radiation to measure Planck's constant.

3. To determine Stefan's Constant.

- Understand the Stefan-Boltzmann law and its significance in radiative heat transfer.
- Perform experiments to determine Stefan's constant and learn its applications.

4. To determine the coefficient of thermal conductivity of Cu by Searle's Apparatus.

- Student will learn about thermal conductivity and its importance in heat transfer.
- Conduct experiments using Searle's Apparatus to determine the coefficient of thermal conductivity of copper.

5. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.

- Student will learn about thermal conductivity and its importance in heat transfer.
- Conduct experiments using Angstrom's Method to determine the coefficient of thermal conductivity of copper.

6. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.

- Student will understand methods like Lee and Charlton's disc method to determine the coefficient of thermal conductivity of bad conductors.

7. To determine the temperature co-efficient of resistance by Platinum resistance thermometer.

- Student will learn about the temperature dependence of resistance.
- Use Platinum resistance thermometer to determine the temperature coefficient of resistance.

8. To study the variation of thermo emf across two junctions of a thermocouple with temperature.

- Student will understand the principle of thermocouples and thermo-electric effects.
- Study the variation of thermo emf across junctions with temperature.

9. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system

- Student will learn to record and analyze the cooling temperature of a hot object over time using a thermocouple and data acquisition system.

10. To calibrate Resistance Temperature Device (RTD) using Null Method/Off Balance Bridge.

- Student will understand the principle of RTD and its applications in temperature measurement.
- Student will learn calibration techniques using the Null Method/Off-Balance Bridge.

SEMESTER - III

CC-5: Mathematical Physics-II

C5-T: Mathematical Physics-II:

1. Fourier Series:

- Explanation of periodic functions and the orthogonality of sine and cosine functions.

- Statement of Dirichlet Conditions for the convergence of Fourier series.
- Expansion of periodic functions into a series of sine and cosine functions, with determination of Fourier coefficients.
- Utilization of complex representation for Fourier series.
- Expansion of functions with arbitrary periods and over intervals.
- Fourier expansions of even and odd functions and their applications.
- Summation of infinite series and term-by-term differentiation and integration of Fourier series.
- Application of Parseval's Identity.

2. Frobenius Method and Special Functions:

- Identification and importance of singular points in second-order linear differential equations.
- Application of the Frobenius method to solve differential equations.
- Exploration of Legendre, Bessel, Hermite, and Laguerre Differential Equations.
- Properties of Legendre Polynomials, including Rodrigues Formula, Generating Function, and Orthogonality.
- Understanding recurrence relations and expansion of functions in a series of Legendre Polynomials.
- Characteristics of Bessel Functions of the First Kind, including generating functions, recurrence relations, zeros, and orthogonality.

3. Some Special Integrals:

- Discussion of Beta and Gamma Functions and their relation.
- Expression of integrals in terms of Gamma Functions.
- Introduction to the Error Function (Probability Integral).

4. Variational Calculus in Physics:

- Understanding functionals and their basic principles.
- Extremization of action in mechanics and the Lagrangian formulation.
- Derivation of Euler's equations of motion for simple systems such as harmonic oscillators, pendulums, and coupled oscillators.
- Exploration of cyclic coordinates, symmetries, and conservation laws.
- Introduction to Legendre transformations and the Hamiltonian formulation of mechanics.
- Understanding canonical equations of motion and their applications.

5. Partial Differential Equations:

- Solutions to partial differential equations using separation of variables.
- Applications of Laplace's Equation in problems of rectangular, cylindrical, and spherical symmetry.
- Solution of the wave equation for vibrational modes of stretched strings, rectangular, and circular membranes.
- Discussion of the diffusion equation and its applications.

C5-P: Mathematical Physics-II Lab:

1. Introduction to NumPy:

- Creating arrays in NumPy and performing array operations.
- Demonstrating array item selection, slicing, and reshaping.
- Utilizing basic linear algebra functions from the `linalg` submodule for matrix operations.

2. Introduction to Matplotlib for Online Graph Plotting:

- Using Matplotlib to plot numerical data and results online, providing visual representations of computed values.

3. Introduction to SciPy:

- Applying SciPy for optimization tasks and solving differential equations numerically.

4. Curve Fitting and Least Square Fit:

- Implementing curve fitting techniques and least square fit algorithms to fit data points to mathematical models.
- Assessing goodness of fit metrics and calculating standard deviation for the fitted curve.

5. Applications of Ohm's and Hooke's Laws:

- Implementing Ohm's law to calculate resistance (R) in electrical circuits.
- Applying Hooke's law to determine the spring constant of a mechanical system.

6. Solution of Linear Systems of Equations:

- Implementing the Gauss elimination method and Gauss-Seidel method to solve linear systems of equations.
- Performing matrix operations such as diagonalization, calculating matrix inverses, and solving eigenvalue-eigenvector problems.

7. Application in Electric Circuits and Spring-Mass Systems:

- Solving mesh equations in electric circuits, particularly those with three meshes.
- Solving equations governing coupled spring-mass systems involving multiple masses.

8. Generation and Plotting of Special Functions

- Developing user-defined functions to generate special mathematical functions.
- Generating and plotting Legendre Polynomials and Bessel functions using NumPy and Matplotlib for visualization purposes.

CC-6: Thermal Physics

C6-T: Thermal Physics:

1. Introduction to Thermodynamics

Zeroth and First Law of Thermodynamics:

- Explanation of extensive and intensive thermodynamic variables.
- Understanding thermodynamic equilibrium and its significance.
- Discussion of the Zeroth Law of Thermodynamics and its relation to temperature.

- Introduction to the concept of work and heat in thermodynamics.
- Understanding state functions and their role in thermodynamics.
- Statement of the First Law of Thermodynamics and its differential form.
- Application of the First Law to various processes, including isothermal and adiabatic processes.
- Examination of the general relation between specific heat capacities, C_P and C_V.
- Calculation of work done during different thermodynamic processes.
- Analysis of compressibility and expansion coefficients.

Second Law of Thermodynamics:

- Differentiation between reversible and irreversible processes with practical examples.
- Exploration of the conversion of work into heat and heat into work.
- Introduction to heat engines and their efficiency.
- Explanation of Carnot's cycle, Carnot engine, and its efficiency.
- Discussion of refrigerators and the coefficient of performance.
- Statements of Kelvin-Planck and Clausius regarding the Second Law of Thermodynamics and their equivalence.
- Application of Carnot's theorem.

Entropy:

- Understanding the concept of entropy and its significance in thermodynamics.
- Explanation of Clausius theorem and inequality.
- Application of the Second Law of Thermodynamics in terms of entropy.
- Calculation of entropy changes in reversible and irreversible processes.
- Examination of entropy changes in the universe.
- Utilization of temperature-entropy diagrams for cycles.
- Introduction to the Third Law of Thermodynamics and the concept of absolute zero.

2. Thermodynamic Potentials:

Internal Energy, Enthalpy, Helmholtz Free Energy, Gibbs Free Energy:

- Definitions and properties of each thermodynamic potential.
- Explanation of their significance and applications in thermodynamics.
- Understanding the variations of these potentials under different conditions.
- Applications of these potentials in various thermodynamic processes and systems.
- Discussion of surface films and the variation of surface tension with temperature.

First and Second Order Phase Transitions:

- Explanation of first and second-order phase transitions with practical examples.
- Understanding the characteristics and behavior of these transitions.
- Application of Clausius-Clapeyron equation and Ehrenfest equations in the analysis of phase transitions.
- Discussion of cooling due to adiabatic demagnetization.

3. Maxwell's Thermodynamic Relations:

Derivations and Applications of Maxwell's Relations:

- Derivation and explanation of Maxwell's relations.
- Understanding the significance and applications of these relations in thermodynamics.
- Practical applications of Maxwell's relations in various thermodynamic scenarios.

Specific Applications of Maxwell's Relations:

- Utilization of Maxwell's relations to derive specific thermodynamic quantities and relationships, such as the Clausius-Clapeyron equation, values of Cp-Cv, TdS equations, Joule-Kelvin coefficient for ideal and Van der Waal gases, energy equations, and changes in temperature during adiabatic processes.

4. Kinetic Theory of Gases:

Distribution of Velocities:

- Understanding the Maxwell-Boltzmann distribution and its significance in describing the distribution of velocities in an ideal gas.
- Experimental verification of the Maxwell-Boltzmann distribution.
- Calculation of mean, root mean square (RMS), and most probable speeds of gas molecules.
- Discussion of degrees of freedom and their impact on the distribution of velocities.
- Explanation of Doppler broadening of spectral lines and its connection to the motion of gas molecules.
- Discussion of Stern's experiment and its role in understanding the Doppler effect in gas spectra.

Specific Heats of Gases:

- Understanding the specific heats of gases and their relation to the kinetic theory of gases.
- Discussion of the Law of Equipartition of Energy and its implication on specific heats.

Molecular Collisions:

- Explanation of mean free path and collision probability in gases.
- Estimation of mean free path based on molecular properties and gas conditions.
- Discussion of viscosity, thermal conductivity, and diffusion in ideal gases.
- Explanation of Brownian motion and its significance in understanding diffusion.

Real Gases:

- Understanding deviations from the ideal gas equation and the behavior of real gases.
- Discussion of the Virial equation and its use in describing real gas behavior.
- Explanation of the Van der Waals equation and its significance in describing real gas behavior.
- Discussion of critical constants and the law of corresponding states.

C6-P: Thermal Physics Lab:

1. **Mechanical Equivalent of Heat (Callender and Barne's constant flow method):**

- Calculation of J based on the experimental data obtained from the constant flow method.

2. **Coefficient of Thermal Conductivity of Cu (Searle's Apparatus):**

   - Calculation of the coefficient of thermal conductivity of copper based on the experimental setup and data collected.

3. **Coefficient of Thermal Conductivity of Cu (Angstrom's Method):**

   - Calculation of the coefficient of thermal conductivity of copper based on the experimental setup and data collected.

4. **Coefficient of Thermal Conductivity of a Bad Conductor (Lee and Charlton's disc method):**

   - Calculation of the coefficient of thermal conductivity of the bad conductor based on the experimental setup and data collected.

5. **Temperature Coefficient of Resistance (Platinum Resistance Thermometer - PRT):**

   - Calculation of the temperature coefficient of resistance based on the data obtained from the PRT experiment.

6. **Study of the variation of thermo-electromotive force (emf) of a thermocouple with the temperature difference of its two junctions:**

   - Analysis of the variation of thermo-emf of the thermocouple and determination of its characteristics based on the experimental data.

7. Calibration of a thermocouple to measure temperature within a specified range using (1) null method, (2) direct measurement using op-amp difference amplifier.

- Determination of neutral temperature.
- Calibration of the thermocouple using both methods and determination of the neutral temperature based on the experimental data collected.

CC-7: Digital Systems and Applications

C7-T: Digital Systems and Applications:

- From this course students should learn about basic digital electronics starting from binary algebra to digital register and counter. Digital register and counter are basic hardware devices of computer memory.

C7-P: Digital Systems and Applications Lab:

1. CRO Measurements:

- Students will learn to use a Cathode Ray Oscilloscope (CRO) to measure voltage amplitudes and time periods of periodic waveforms.
- They will understand the principles of waveform visualization and measurement techniques using CRO.

2. Diode and Transistor Testing:

- Students will become proficient in using a Multimeter to test diodes and transistors for proper functionality.
- They will learn to identify forward and reverse bias conditions in diodes and determine transistor characteristics such as base-emitter junction voltage drop and transistor gain.

3. Transistor-Based Switch (NOT Gate):

- Students will design a transistor-based switch circuit to demonstrate the NOT gate functionality.
- They will understand the principles of transistor operation and logic gate implementation.

4. Gate Verification and Design:

- Students will verify the logic functionality of AND, OR, NOT, and XOR gates using NAND gates.
- They will design these basic logic gates using only NAND gate configurations.

5. Combinational Logic System Design:

- Students will design a combinational logic system based on a specified Truth Table.
- They will implement logic gates to realize the desired logic functions as per the given Truth Table.

6. Boolean Expression to Logic Circuit Conversion:

- Students will learn to convert Boolean expressions into logic circuit diagrams.
- They will use logic gate Integrated Circuits (ICs) to implement the converted logic circuits.

7. Logic Circuit Minimization:

- Students will learn methods to minimize a given logic circuit, reducing the number of logic gates required for implementation.
- They will apply techniques such as Karnaugh maps or Boolean algebra to simplify logic expressions.

8. Adder Circuits:

- Students will design and implement Half Adder, Full Adder, and 4-bit binary Adder circuits.
- They will understand the principles of binary addition and circuit design for arithmetic operations.

9. Subtractor Circuits:

- Students will design Half Subtractor, Full Subtractor, and Adder-Subtractor circuits using Full Adder Integrated Circuits (ICs).
- They will learn subtraction logic and the integration of adder and subtractor circuits.

10. Flip-Flop Circuits:

- Students will build various Flip-Flop circuits including RS, Clocked RS, D-type, and JK Flip-Flops using NAND gates.
- They will understand the behavior and applications of different types of Flip-Flops.

11. JK Master-Slave Flip-Flop:

- Students will design and implement a JK Master-Slave Flip-Flop circuit using Flip-Flop Integrated Circuits (ICs).
- They will comprehend the sequential operation and memory functionality of master-slave Flip-Flops.

12. 4-bit Counter Design:

- Students will build a 4-bit Counter circuit using D-type or JK Flip-Flop ICs and study its timing diagram.
- They will understand the operation of counters and timing sequences in digital circuits.

13. 4-bit Shift Register:

- Students will design a 4-bit Shift Register circuit in serial and parallel configurations using D-type or JK Flip-Flop ICs.
- They will learn about data shifting and parallel/serial data transfer concepts.

14. Astable Multivibrator Design:

- Students will design an astable multivibrator circuit using a 555 Timer IC based on given specifications.
- They will understand the principles of astable multivibrator operation and timing control using the 555 Timer.

15. Monostable Multivibrator Design:

- Students will design a monostable multivibrator circuit using a 555 Timer IC according to specified requirements.
- They will grasp the functionality of monostable multivibrators and their applications in pulse generation.

SEC-1: Electrical Circuits and Network Skills

SEC1-T: Electrical Circuits and Network Skills:

1. Understanding Basic Electricity Principles:

- Students will understand the concepts of voltage, current, resistance, and power, and their interrelationships through Ohm's law.
- Students will learn to analyze electrical circuits in series, parallel, and series-parallel combinations.
- Students will be able to differentiate between AC and DC electricity and comprehend the principles governing them.
- Students will familiarize themselves with using multimeters, voltmeters, and ammeters for electrical measurements.

2. Understanding Electrical Circuits:

- Students will understand the main elements of electric circuits and how they combine to form complex systems.
- Students will learn the rules to analyze DC sourced electrical circuits, including calculating current and voltage drops across circuit elements.
- Students will grasp the concepts of single-phase and three-phase alternating current sources and learn to analyze AC sourced circuits, including understanding real, imaginary, and complex power components, as well as power factor.
- Students will explore methods to save energy and reduce costs in electrical systems.

3. Electrical Drawing and Symbols:

- Students will learn to interpret electrical symbols and blueprints, including reading schematics and ladder diagrams.
- Students will understand power and control circuits and develop the ability to track connections, identify current flow, and analyze voltage drops in circuit schematics.

4. Generators and Transformers:

- Students will comprehend the operation of DC power sources, AC/DC generators, and transformers.
- Students will understand inductance, capacitance, and impedance in electrical systems.

5. Electric Motors:

- Students will learn about single-phase, three-phase, and DC motors, including their basic design and interfacing with power sources for control.
- Students will be able to calculate speed and power requirements for AC motors.

6. Solid-State Devices:

- Students will understand the behavior of resistors, inductors, capacitors, diodes, and rectifiers in electrical circuits.
- Students will learn about series and shunt configurations of components and their responses to DC or AC sources.

7. Electrical Protection:

- Students will learn about various protection devices such as relays, fuses, circuit breakers, and overload devices.
- Students will understand the importance of grounding, isolation, phase reversal, and surge protection in electrical systems.

8. Electrical Wiring:

- Students will become familiar with different types of conductors, cables, and wiring configurations like star and delta connections.
- Students will learn about voltage drop and losses in cables and conductors and how to measure current, voltage, and power in DC and AC circuits.
- Students will understand the principles of insulation and safety measures in electrical installations, including cable management techniques like conduit and cable trays.

GE3: Solid State Physics

GE3-T: Solid State Physics:

1. Crystal Structures

- Students shall understand the distinction between amorphous and crystalline materials.
- Students shall be able to classify materials based on their structural order and analyze the properties associated with each type.
- Students shall understand lattice translation vectors and their role in defining the periodicity of crystalline structures and also be able to calculate lattice translation vectors for different crystal lattices.
- Familiarity with lattices that include a basis, consisting of central and non-central elements.
- Understanding how the presence of a basis affects the symmetry and properties of crystal structures.

Unit Cell and Miller Indices and Reciprocal Lattice:

- Students grow a clear understanding the concept of the unit cell as the basic repeating structural unit in a crystal lattice.
- Students shall be able to identify and characterize different types of unit cells, such as simple cubic, body-centered cubic, and face-centered cubic.
- Students can understand the Miller indices as a notation system used to describe crystallographic planes and directions.
- Ability to determine Miller indices for crystallographic planes and directions in various crystal structures.
- Familiarity with the concept of the reciprocal lattice and its importance in the analysis of crystal structures.
- Understanding the reciprocal lattice as the Fourier transform of the direct lattice.

Types of Lattices:

- Students build a clear concept about the different types of crystal lattices, including primitive, body-centered, face-centered, and hexagonal lattices.
- Ability to identify and characterize these lattice types based on their unit cell structures.

Brillouin Zones, Diffraction of X-rays by Crystals and Bragg’s Law:

- Students shall develop a clear idea of Brillouin zones as the fundamental cells in reciprocal space for describing the periodicity of crystal structures.
- Students shall be abile to calculate and interpret Brillouin zones for various crystal lattices.
- Understanding the principles of X-ray diffraction and its application to the analysis of crystal structures.
- Students shall be able to interpret X-ray diffraction patterns to determine the structure of crystalline materials.
- Students shall be familiar with Bragg's law as the fundamental relationship governing X-ray diffraction.
- Ability to apply Bragg's law to calculate the angles at which X-ray diffraction peaks occur.
- Students shall understand the factors influencing the intensity of X-ray diffraction peaks, including atomic and geometrical factors.

- Students shall grow ability to analyze the contribution of these factors to the overall diffraction pattern.

2. **Elementary Lattice Dynamics:**

Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains:

- Students shall understand the concept of lattice vibrations in crystalline solids.
- They shall grow ability to analyze the vibrational modes in linear monoatomic and diatomic chains.
- Students shall develop concept of acoustical and optical phonons as types of lattice vibrations in solids.
- They shall build ability to distinguish between the characteristics and behaviors of acoustical and optical phonons.
- Students shall understand the phonon spectrum as the distribution of phonon frequencies in a solid.
- Ability to qualitatively describe the phonon spectrum based on the material's crystal structure and vibrational modes.

Dulong and Petit's Law:

- Students shall make familiar with Dulong and Petit's law, which states that the molar specific heat of a crystal approaches a constant value at high temperatures.
- Students develop ability to explain the classical interpretation of Dulong and Petit's law and its limitations.

Einstein and Debye Theories of Specific Heat of Solids:

- Students shall develop a clear understanding about Einstein and Debye theories of specific heat in solids.
- Ability to describe how these theories account for the quantization of lattice vibrations and the behavior of phonons.
- Students develop a knowledge of the T^3 law, which describes the temperature dependence of the specific heat of solids at low temperatures.
- Students shall be able to apply the T^3 law to analyze the specific heat behavior of solids in the low-temperature regime.

3. **Magnetic Properties of Matter**

Dia-, Para-, Ferri-, and Ferromagnetic Materials:

- Students shall understand the classification of materials into diamagnetic, paramagnetic, ferri- and ferromagnetic categories based on their magnetic properties.
- Ability to identify and differentiate between these types of magnetic materials and analyze their behavior in external magnetic fields.

Classical Langevin Theory of Dia- and Paramagnetic Domains:

- Students shall develop knowledge of the classical Langevin theory as a model for describing the behavior of magnetic domains in diamagnetic and paramagnetic materials.
- Students shall be able to apply the Langevin theory to explain the alignment of magnetic moments in response to an external magnetic field.

Quantum Mechanical Treatment of Para magnetism and Curie's Law:

- Students shall understand the quantum mechanical principles underlying paramagnetic and also be able to describe the behavior of paramagnetic materials using quantum mechanical models, such as the Pauli paramagnetic of free electrons.
- Students will be familiar with Curie's law, which describes the temperature dependence of the magnetic susceptibility in paramagnetic materials.
- They shall build ability to apply Curie's law to analyze the magnetic properties of paramagnetic materials as a function of temperature.

Weiss's Theory of Ferromagnetism and Ferromagnetic Domains:

- Students shall understand Weiss's theory of ferromagnetism, which describes the alignment of atomic magnetic moments in ferromagnetic materials.
- They shall grow the ability to explain the formation and behavior of ferromagnetic domains within a ferromagnetic material using Weiss's theory.

Discussion of B-H Curve, Hysteresis and Energy Loss:

- Students shall develop a clear idea of the B-H curve, also known as the magnetization curve, which describes the relationship between magnetic field (H) and magnetization (B) in a magnetic material.
- They shall build ability to analyze and interpret B-H curves for different types of magnetic materials, including diamagnetic, paramagnetic, and ferromagnetic materials.
- Also they develop a clear understanding hysteresis as the phenomenon where the magnetization of a material lags behind changes in the applied magnetic field.
- Ability to analyze hysteresis loops and understand the energy loss associated with the reversal of magnetization in ferromagnetic materials.

4. **Dielectric Properties of Materials:**

- Students shall understand the concept of polarization in dielectric materials, including the alignment of electric dipoles in response to an external electric field.
- They can analyze the local electric field at an atom within a dielectric material and understand the concept of the depolarization field.
- They can define electric susceptibility and polarizability as measures of a material's response to an external electric field and are capable to apply the Clausius-Mossotti equation to quantitatively describe the relationship between polarization and the electric field in a dielectric material.
- They can explain the classical theory of electric polarizability and its limitations in describing the behavior of dielectric materials, particularly at high frequencies.
- Students shall understand the concepts of normal and anomalous dispersion in the context of wave propagation through a dispersive medium.
- They are capable to describe the Cauchy and Sellmeier relations as empirical equations relating the refractive index of a material to its wavelength.
- Students also apply the Langevin-Debye equation to describe the response of a polarizable medium to an oscillating electric field.
- They shall understand the concept of the complex dielectric constant and its role in describing the frequency-dependent behavior of dielectric materials and analyze optical phenomena such as refraction, reflection, and absorption in dielectric materials based on their complex dielectric constants.

5. **Ferro electric Properties of Materials:**

- Students can understand, define and explain the piezoelectric effect as the generation of an electric field in response to mechanical stress and vice versa, and understand its significance in transducers, sensors, and actuators.

- They can describe the pyroelectric effect as the generation of an electric field in response to changes in temperature and understand its applications in infrared detectors and sensors.
- Students can define the ferroelectric effect as the spontaneous polarization of a material in the absence of an external electric field, and understand its applications in memory devices, capacitors, and electro-optic devices.
- They can explain the electro-strictive effect as the strain induced by an electric field in a material.
- Students shall be able to apply the Curie-Weiss law to describe the temperature dependence of ferroelectric materials near their Curie temperature and can describe ferroelectric domains as regions within a ferroelectric material with different polarization orientations, and understand their role in determining the macroscopic properties of the material.
- They shall analyze the polarization-electric field (PE) hysteresis loop of ferroelectric materials and understand its implications for ferroelectric switching behavior and device performance.

6. Elementary band theory:

- Students shall understand the Kronig-Penny model and its application in describing the behavior of electrons in a periodic potential.
- Analyze band structures and explain the concept of band gaps in materials.
- Students shall be able to differentiate between conductors, semiconductors (both P-type and N-type), and insulators based on their band structures and conductivity properties.
- They can calculate the conductivity of semiconductors and understand the factors affecting mobility.
- Students shall be able to explain the Hall effect and its significance in determining the carrier concentration, mobility, and conductivity of materials.
- They can describe the measurement techniques for conductivity using the 4-probe method and determine the Hall coefficient experimentally. And also be able to interpret experimental results related to conductivity, Hall coefficient, and other material properties.

7. **Superconductivity:**

- Students shall understand the critical temperature and critical magnetic field in superconductors and understand the concept of the Meissner effect.
- They shall be able to differentiate between Type I and Type II superconductors and explain the behavior of superconductors using London's equation and penetration depth.
- Students can develop idea about the isotope effect and its implications on the superconducting transition temperature. And gain familiarity with the BCS theory and its key concepts without derivation, including Cooper pairs and the mechanism of superconductivity.

GE3-P: Solid State Physics Lab:

1. Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method)

- Gain proficiency in experimental techniques for measuring the susceptibility of paramagnetic solutions using Quinck's tube method.
- Enhancing their understanding of magnetic properties in solutions.

2. To measure the Magnetic susceptibility of Solids.

- Acquire practical skills in measuring the magnetic susceptibility of solids.
- Allowing them to characterize magnetic materials and interpret experimental data effectively.

3. To determine the Coupling Coefficient of a Piezoelectric crystal.

- Develop competence in determining the coupling coefficient of piezoelectric crystals.
- Enabling them to analyze and quantify piezoelectric effects in materials.

4. To measure the Dielectric Constant of a dielectric Materials with frequency.

- Learn experimental methods for measuring the dielectric constant of materials as a function of frequency.
- Facilitating a deeper understanding of frequency-dependent electrical behavior.

5. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR).

- Gain practical experience in determining the complex dielectric constant and plasma frequency of metals using surface plasmon resonance (SPR).
- Providing insights into optical properties of metal materials.

6. To determine the refractive index of a dielectric layer using SPR

- Shall be able of determining the refractive index of dielectric layers using SPR.
- Enhancing their ability to characterize thin film materials optically.

7. To study the PE Hysteresis loop of a Ferroelectric Crystal

- Study the polarization-electric field (PE) hysteresis loop of ferroelectric crystals.
- Allowing them to understand and analyze the switching behavior of ferroelectric materials.

8. To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis.

- Develop proficiency in drawing the BH curve of iron using a solenoid and determining energy loss from hysteresis.
- Providing insights into magnetic properties and energy losses in magnetic materials.

9. To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150 ^{o}C) and to determine its band gap.

- Acquire skills in measuring the resistivity of semiconductors, such as germanium, with temperature using the four-probe method.
- And determine their band gap, enhancing their understanding of semiconductor physics and material properties.

10. To determine the Hall coefficient of a semiconductor sample

- Learn techniques for determining the Hall coefficient of semiconductor samples.
- Allowing them to characterize the electrical properties of semiconductor materials accurately.

SEMESTER - IV

CC-8: Mathematical Physics III

C8-T: Mathematical Physics III:

1. Understanding Complex Numbers and Functions:

- Students will demonstrate a clear understanding of complex numbers, their graphical representation, and fundamental operations.
- They will grasp Euler's formula and De Moivre's theorem, and effectively apply them to manipulate complex numbers.
- Understanding roots of complex numbers and their geometric interpretation will be achieved.

2. Analytic Functions and Cauchy-Riemann Conditions:

- Students will comprehend the concept of analyticity and the Cauchy-Riemann conditions.
- They will be able to identify and analyze analytic functions and understand the significance of singular functions, poles, and branch points.

3. Integration of Complex Functions and Cauchy's Integral Theorem:

- Students will learn integration techniques for functions of complex variables, including Cauchy's inequality and integral formula.
- They will understand the application of these concepts in evaluating definite integrals in simply and multiply connected regions.

4. Laurent and Taylor Expansions, Residues, and Residue Theorem:

- Understanding Laurent and Taylor series expansions will be demonstrated.
- Students will grasp the concept of residues and the Residue Theorem, and apply them in solving complex integrals and evaluating contour integrals.

5. Integral Transforms, especially Fourier Transforms:

- Students will understand the Fourier Integral theorem and the Fourier transform.
- They will be proficient in finding Fourier transforms of various functions and interpreting the results.

6. Properties and Applications of Fourier Transforms:

- Proficiency in applying properties of Fourier transforms such as translation, change of scale, and convolution theorem will be demonstrated.
- Students will apply Fourier transforms to solve differential equations, particularly one-dimensional wave and diffusion/heat flow equations.

7. Understanding Matrices and Matrix Operations:

- Students will be able to perform addition, multiplication, and other operations on matrices.
- They will understand the properties of various types of matrices, such as diagonal, symmetric, Hermitian, etc., and their significance in applications.

8. Eigenvalues, Eigenvectors, and Matrix Diagonalization:

- Students will understand the concept of eigenvalues and eigenvectors and their applications, including matrix diagonalization.
- They will be able to solve coupled linear ordinary differential equations and comprehend functions of a matrix.

9. Application-Oriented Knowledge:

- Through practical examples and problem-solving exercises, students will develop the ability to apply concepts from complex analysis, integral transforms, and matrices to real-world problems in physics, engineering, and other fields.

10. Critical Thinking and Problem-Solving Skills:

- Students will develop critical thinking skills by analyzing and solving complex mathematical problems in the domains of complex analysis, integral transforms, and matrices.
- They will develop problem-solving skills by applying mathematical techniques to model and solve practical problems in various disciplines.

C8-P: Mathematical Physics III Lab:

1. Solving Differential Equations:

- Students will be able to apply Python programs to solve various types of differential equations, including ordinary and partial differential equations, using libraries such as SciPy or SymPy.

2. Solving Dirac Delta Function:

- Students will demonstrate proficiency in using Python to approximate and understand the properties of the Dirac delta function, a fundamental concept in mathematical physics, by implementing numerical approximations.

3. Calculating Error for Experimental Data:

- Students will be equipped to analyze experimental data by utilizing Python to calculate error metrics like mean square error (MSE) or standard deviation for each data point, aiding in the assessment of experimental accuracy and precision.

4. Manual Least Square Fitting and Confirmation:

- Students will learn to perform least square fitting manually without incorporating error weightage, followed by verifying their results through a computer program. This process will enhance their understanding of the least squares method and its application in curve fitting tasks.

CC-9: Elements of Modern Physics

C-9T: Elements of Modern Physics:

1. Understanding of Quantum Concepts in Light:

- Students will understand Planck's quantum theory and Planck's constant, conceptualizing light as a collection of photons.
- They will grasp the basics of Blackbody Radiation and the Quantum theory of Light.
- Mastery of the Photoelectric effect and Compton scattering phenomena.

2. Comprehension of Wave-Particle Duality:

- Students will comprehend De Broglie wavelength and matter waves, demonstrated through the Davisson-Germer experiment.
- Understanding of wave description of particles by wave packets, including group and phase velocities and their relation.
- Ability to explain the Two-Slit experiment with electrons, emphasizing probability, wave amplitude, and wave functions.

3. Understanding of Position Measurement and Uncertainty Principle:

- Students will explore the concept of position measurement through the gamma ray microscope thought experiment.
- They will understand wave-particle duality and the Heisenberg uncertainty principle, deriving uncertainty relations involving canonical pairs of variables from wave packets.
- Proficiency in estimating minimum energy of a confined particle and applying the energy-time uncertainty principle.

4. Application of Wave Interference and Schrödinger Equation:

- Students will analyze two-slit interference experiments with photons, atoms, and particles, understanding the linear superposition principle.
- Mastery of matter waves, wave amplitude, and the Schrödinger equation for non-relativistic particles.
- Understanding of momentum and energy operators, stationary states, and the physical interpretation of wave functions.

5. Understanding of Quantum Mechanical Systems:

- Students will comprehend one-dimensional infinitely rigid box systems, including energy eigenvalues and eigenfunctions, and their normalization.
- Exploration of quantum dot systems as examples of quantum mechanical systems.
- Proficiency in understanding quantum mechanical scattering and tunneling phenomena.

6. Knowledge of Nuclear Physics:

- Students will explore the size and structure of atomic nuclei, understanding their relation with atomic weight.
- Understanding of the nature of nuclear force, NZ graph, Liquid Drop model, semi-empirical mass formula, binding energy, and Nuclear Shell Model.

- Mastery of radioactivity, including stability of the nucleus, laws of radioactive decay, mean life, and half-life, as well as alpha and beta decay.

7. Understanding of Nuclear Processes and Laser Physics:

- Students will explore radioactivity, including gamma ray emission and electron-positron pair creation by gamma photons.
- Understanding of fission and fusion processes, including mass deficit, relativity, and energy generation.
- Proficiency in understanding laser physics, including Einstein's coefficients, metastable states, spontaneous and stimulated emissions, and optical pumping.

8. Application of Nuclear Reactors and Lasers:

- Exploration of nuclear reactors, including slow neutrons interacting with Uranium-235, and fusion reactions driving stellar energy.
- Mastery of basic lasing principles, including the operation of three-level and four-level lasers such as Ruby Laser and He-Ne Laser.

C-9P: Elements of Modern Physics Lab:

1. Measurement of Planck's constant using black body radiation and photo-detector:

- Students will understand the principles behind black body radiation and the photoelectric effect.
- They will be able to measure Planck's constant using experimental setups involving black body radiation and photo-detectors.

2. Photo-electric effect:

- Students will be able to analyze the relationship between photo current, intensity, and wavelength of light.
- They will understand the concept of maximum energy of photo-electrons versus the frequency of light.

3. Determining the work function of material of filament of directly heated vacuum diode:

- Students will learn to set up and perform experiments to determine the work function of materials using directly heated vacuum diodes.

4. Determination of Planck's constant using LEDs:

- Students will understand the emission spectrum of LEDs and their relation to Planck's constant.
- They will be able to determine Planck's constant using LEDs of different colors.

5. Measurement of the wavelength of H-alpha emission line of Hydrogen atom:

- Students will learn to set up and perform experiments to measure the wavelength of the H-alpha emission line of hydrogen using spectroscopy techniques.

6. Determination of the ionization potential of mercury:

- Students will understand the ionization process and its relation to the energy levels of atoms.

- They will be able to determine the ionization potential of mercury using appropriate experimental setups.

7. Identification of absorption lines in the rotational spectrum of Iodine vapor:

- Students will be able to set up experimental arrangements to observe absorption lines in the rotational spectrum of iodine vapor using spectroscopy techniques.

8. Determination of the value of e/m:

- Students will understand the principles of magnetic focusing or the use of bar magnets in determining the value of e/m for charged particles.
- They will be able to perform experiments to determine the value of e/m using these methods.

9. Setting up the Millikan oil drop apparatus and determining the charge of an electron:

- Students will learn to set up and calibrate the Millikan oil drop apparatus.
- They will be able to perform experiments to determine the charge of an electron using oil droplets.

10. Demonstration of the tunneling effect in a tunnel diode:

- Students will understand the principle of tunneling in semiconductor devices.
- They will be able to demonstrate the tunneling effect using the I-V characteristics of a tunnel diode.

11. Measurement of the wavelength of laser source using diffraction of single slit:

- Students will learn to set up and perform experiments to measure the wavelength of a laser source using single slit diffraction.

12. Measurement of the wavelength of laser source using diffraction of double slits:

- Students will understand the principles of interference and diffraction.
- They will be able to measure the wavelength of a laser source using double slit diffraction.

13. Determination of wavelength and angular spread of He-Ne laser using plane diffraction grating:

- Students will learn to set up and use a plane diffraction grating to analyze the wavelength and angular spread of a He-Ne laser.
- They will understand the principles of diffraction and spectral analysis.

CC-10: Analog Systems and Applications

C10-T: Analog Systems and Applications:

- From this course students should learn about basic analog electronics, starting from junction diode to Integrated circuit. Rectifier, Regulator, Transistor amplifier, switch, Operational Amplifier and Multi-vibrator are essential components of any electronic gadget. Students should learn the mechanism of action and its application.

C10-P: Analog Systems and Applications Lab:

1. Study of Diode Characteristics:

- Students will study the V-I characteristics of PN junction diodes and Light Emitting Diodes (LEDs).
- They will understand the behavior of diodes under different biasing conditions and the emission of light in LEDs.

2. Zener Diode Characteristics and Voltage Regulation:

- Students will investigate the V-I characteristics of Zener diodes and their applications as voltage regulators.
- They will learn about Zener breakdown and the stabilization of output voltage in voltage regulation circuits.

3. Solar Cell Characteristics and Efficiency:

- Students will analyze the V-I and power curves of solar cells.
- They will determine the maximum power point and efficiency of solar cells under different conditions.

4. Bipolar Junction Transistor (BJT) Characteristics:

- Students will study the characteristics of Bipolar Junction Transistors (BJTs) in Common Emitter (CE) configuration.
- They will understand the amplification properties and biasing requirements of BJT amplifiers.

5. BJT Biasing Configurations:

- Students will explore various biasing configurations of BJT for normal class A operation.
- They will understand the significance of biasing in transistor amplifier circuits.

6. Transistor Amplifier Design:

- Students will design a CE transistor amplifier with a specified gain using voltage divider biasing.
- They will learn to calculate component values for achieving the desired amplifier characteristics.

7. Frequency Response of Transistor Amplifier:

- Students will investigate the frequency response of voltage gain in RC-coupled transistor amplifiers.
- They will analyze how amplifier performance varies with frequency.

8. Wien Bridge Oscillator Design:

- Students will design a Wien bridge oscillator circuit to generate a specified frequency using an op-amp.
- They will understand the principles of oscillation and frequency control in oscillator circuits.

9. Phase Shift Oscillator Design:

- Students will design a phase shift oscillator with given specifications using a BJT.

- They will learn about phase shift networks and oscillator stability.

10. Colpitt's Oscillator:

- Students will study the operation of Colpitt's oscillator circuit.
- They will understand the principles of oscillation and frequency generation in Colpitt's oscillator.

11. Digital to Analog Converter (DAC) Design:

- Students will design a DAC circuit to convert digital signals into analog signals based on given specifications.
- They will understand the principles of digital-to-analog conversion and circuit implementation.

12. Analog to Digital Converter (ADC) IC Study:

- Students will study the operation and characteristics of Analog to Digital Converter (ADC) Integrated Circuits (ICs).
- They will learn about different types of ADCs and their applications.

13. Inverting Amplifier Design and Frequency Response:

- Students will design an inverting amplifier using Op-amp (741, 351) for a given DC voltage gain.
- They will study the frequency response of the amplifier and its behavior at different frequencies.

14. Non-Inverting Amplifier Design and Frequency Response:

- Students will design a non-inverting amplifier using Op-amp (741, 351) and analyze its frequency response.
- They will understand the gain and bandwidth characteristics of non-inverting amplifiers.

15. Zero-Crossing Detector and Comparator Study:

- Students will study the principles and applications of zero-crossing detectors and comparators.
- They will understand how these circuits are used in signal detection and conditioning.

16. Summing Amplifier Design:

- Students will design circuits to add two DC voltages using Op-amp in inverting and non-inverting modes.
- They will learn about voltage summation and amplifier configurations.

17. Precision Differential Amplifier Design:

- Students will design a precision differential amplifier with specified input and output specifications using Op-amp.
- They will understand the importance of common-mode rejection and accuracy in differential amplifier design.

18. Op-amp as Integrator:

- Students will investigate the use of an op-amp as an integrator circuit.

- They will understand the principles of integration and the applications of integrator circuits in signal processing.

19. Op-amp as Differentiator:

- Students will investigate the use of an op-amp as a differentiator circuit.
- They will understand the principles of differentiation and the applications of differentiator circuits in signal processing.

20. Simulation of Differential Equations:

- Students will design a circuit to simulate the solution of 1st or 2nd order differential equations using op-amp circuits.
- They will learn about analog computing techniques and the practical applications of differential equation solutions.

SEC-2: Renewable Energy and Energy Harvesting

SEC-2T: Renewable Energy and Energy Harvesting:

1. Understanding of Solar Energy Systems:

- Students will comprehend the importance of solar energy and its various applications.
- They will understand the principles behind solar pond, solar water heaters, flat plate collectors, solar distillation, solar cookers, solar greenhouses, and solar cells.
- Proficiency in storage techniques of solar energy and the operation of absorption air conditioning systems.

2. Knowledge of Photovoltaic (PV) Systems:

- Students will understand the need and characteristics of photovoltaic (PV) systems.
- They will be able to analyze PV models, equivalent circuits, and the operation of sun tracking systems.

3. Understanding of Wind Energy Harvesting:

- Students will grasp the fundamentals of wind energy and wind turbines.
- They will understand the different electrical machines used in wind turbines, power electronic interfaces, and grid interconnection topologies.

4. Comprehension of Ocean Energy Systems:

- Students will understand the potential of ocean energy compared to wind and solar energy.
- They will learn about wave characteristics and statistics, wave energy devices, tide characteristics, tide energy technologies, ocean thermal energy, osmotic power, and ocean biomass.

5. Knowledge of Geothermal Energy:

- Students will understand geothermal resources and technologies.
- They will be able to analyze the environmental impact of geothermal power sources.

6. Understanding of Hydro Energy Systems:

- Students will grasp the resources and technologies involved in hydropower.
- They will analyze the environmental impact of hydroelectric power sources.

7. Proficiency in Piezoelectric Energy Harvesting:

- Students will understand the physics and characteristics of the piezoelectric effect.
- They will be able to describe the materials and mathematical models associated with piezoelectricity.
- Proficiency in analyzing piezoelectric parameters, modeling piezoelectric generators, and their applications, including human power harvesting.

8. Knowledge of Electromagnetic Energy Harvesting:

- Students will comprehend the principles and mathematical models of linear generators.
- They will understand recent applications of electromagnetic energy harvesting.

9.Understanding of Carbon Capture Technologies:

- Students will understand the principles behind carbon capture technologies, including cells, batteries, and power consumption.
- They will analyze the environmental issues associated with renewable energy sources and evaluate their sustainability.

SEC-2P: Renewable Energy and Energy Harvesting Lab:

1. Training Modules on Renewable Energy:

- Students will understand the principles and applications of solar energy, wind energy, and other renewable energy sources.
- They will be able to demonstrate practical knowledge through interactive training modules.
- Proficiency in explaining the importance, operation, and applications of each renewable energy source.

2. Conversion of Vibration to Voltage using Piezoelectric Materials:

- Students will comprehend the concept of piezoelectricity and its application in energy harvesting.
- They will be able to demonstrate the conversion of mechanical vibration into electrical energy using piezoelectric materials.
- Understanding of the working principles and potential applications of piezoelectric energy harvesting systems.

3. Conversion of Thermal Energy into Voltage using Thermoelectric Modules:

- Students will understand the principles of thermoelectricity and its application in energy conversion.
- They will be able to demonstrate the conversion of heat energy into electrical energy using thermoelectric modules.
- Proficiency in explaining the working principles and efficiency of thermoelectric energy conversion systems.

GE-4: Electricity and Magnetism

GE-4T: Electricity and Magnetism:

1. Vector Analysis:

- Students will understand and apply vector algebra concepts, including scalar and vector products.
- They will comprehend the concepts of gradient, divergence, and curl and understand their significance in vector calculus.
- Proficiency in performing line, surface, and volume integrals of vector fields.
- Understanding of Gauss's divergence theorem and Stoke's theorem (statement only) in vector analysis.

2. Electrostatics:

- Students will understand electrostatic fields, electric flux, and Gauss's theorem of electrostatics.
- They will be able to apply Gauss's theorem to calculate electric fields due to various charge distributions.
- Proficiency in calculating electric potential and understanding its relationship with electric field.
- Understanding of dielectric materials, polarization, and Gauss's theorem in dielectrics.

3. Magnetism:

- Students will comprehend magnetostatics, including Biot-Savart's law and its applications.
- They will understand divergence and curl of magnetic fields, as well as magnetic vector potential.
- Proficiency in understanding magnetic properties of materials and different types of magnetic materials.

4. Electromagnetic Induction:

- Students will understand Faraday's laws of electromagnetic induction and Lenz's law.
- They will be able to calculate self and mutual inductance of coils and understand the energy stored in magnetic fields.

5. Maxwell's Equations and Electromagnetic Wave Propagation:

- Students will understand Maxwell's equations, including the equation of continuity of current and displacement current.
- They will comprehend the Poynting vector and energy density in electromagnetic fields.
- Proficiency in understanding electromagnetic wave propagation through vacuum and dielectric mediums, including the transverse nature of electromagnetic waves and polarization.

GE-4P: Electricity and Magnetism:

1. Using a Multimeter for Measurement:

- Students will be able to explain and demonstrate the use of a multimeter for measuring resistances, AC and DC voltages, and DC current.
- They will understand the procedure for checking electrical fuses using a multimeter.

2. Ballistic Galvanometer:

- Students will understand the principles behind a ballistic galvanometer and its applications.
- They will be able to measure charge and current sensitivity, as well as determine a high resistance using the leakage method.
- Proficiency in determining the self-inductance of a coil using Rayleigh's method.

3. De'Sauty's Bridge for Comparing Capacitances:

- Students will understand the working principle of De'Sauty's bridge.
- They will be able to compare capacitances using De'Sauty's bridge and understand its significance in practical applications.

4. Measurement of Field Strength B in a Solenoid:

- Students will understand the principles of magnetic fields and solenoids.
- They will be able to measure the field strength B and its variation in a solenoid, including determining dB/dx.

5. Characteristics of a Series RC Circuit:

- Students will comprehend the behavior of a series RC circuit.
- They will be able to study and analyze the characteristics of the circuit, including its time constants and response to varying inputs.

6. Series LCR Circuit:

- Students will understand the behavior of a series LCR circuit.
- They will be able to determine the resonant frequency and quality factor of the circuit.

7. Parallel LCR Circuit:

Students will understand the behavior of a parallel LCR circuit.

They will be able to determine the anti-resonant frequency and quality factor of the circuit.

8. Low Resistance Measurement using Carey Foster's Bridge:

- Students will comprehend the principles behind Carey Foster's bridge.
- They will be able to determine low resistance values using this bridge configuration.

9. Verification of Thevenin and Norton Theorems:

- Students will understand the principles of Thevenin and Norton theorems.
- They will be able to verify these theorems experimentally and understand their implications in circuit analysis.

10. Verification of Superposition and Maximum Power Transfer Theorems:

- Students will understand the principles of superposition and maximum power transfer theorems.
- They will be able to verify these theorems experimentally and understand their significance in circuit analysis and design.

SEMESTER - V

CC-11: Quantum Mechanics and Applications

C11-T: Quantum Mechanics and Applications:

1. Schrodinger equation:

Time dependent Schrodinger equation

- Understanding Time-Dependent Schrödinger Equation and Quantum State Dynamic.
- Ability to solve the time-dependent Schrödinger equation and analyze the dynamical evolution of quantum states.
- Interpretation of the time-dependent wave function in the context of quantum mechanics.

Properties of the Wave Function

- Familiarity with the properties of wave functions, such as continuity, differentiability, and square integrability.
- Understanding the physical significance of the wave function and its interpretation as a probability amplitude.

Interpretation of Wave Function Probability and Probability Current Densities in Three Dimensions

- Ability to interpret the wave function probability density and probability current densities in three-dimensional space.
- Understanding how these quantities relate to observable phenomena in quantum mechanics.

Conditions for Physical Acceptability of Wave Functions and Normalization

- Recognition of the conditions that wave functions must satisfy to be physically acceptable, including normalization and square integrability.
- Ability to normalize wave functions and ensure they represent physically meaningful states.

Linearity and Superposition Principle

- Understanding the principles of linearity and superposition in quantum mechanics.
- Ability to apply these principles to analyze composite quantum systems and understand their behavior.

Eigenvalues and Eigenfunctions

- Understanding the concept of eigenvalues and eigenvectors in the context of quantum operators.
- Ability to find eigenvalues and eigenfunctions of Hermitian operators, particularly in the context of quantum mechanics.

Operators: Position, Momentum, and Energy

- Familiarity with the position, momentum, and energy operators in quantum mechanics.
- Understanding the properties and mathematical representations of these operators.

Commutator of Position and Momentum Operators; Expectation Values

- Understanding the commutation relations between position and momentum operators.
- Ability to calculate expectation values of position and momentum for quantum states.

Wave Function of a Free Particle

- Ability to derive and analyze the wave function of a free particle using the Schrödinger equation.
- Understanding the properties and behavior of free particle wave functions.

Time-Independent Schrödinger Equation

- Understanding the time-independent Schrödinger equation and its relation to stationary states.
- Ability to solve for stationary states and energy eigenvalues for given potentials.

Expansion of Arbitrary Wave Function and General Solution of Time-Dependent Schrödinger Equation

- Ability to expand arbitrary wave functions as linear combinations of energy eigenfunctions.
- Understanding the general solution of the time-dependent Schrödinger equation in terms of stationary states.

Application to Spread of Gaussian Wave-Packet and Fourier Transforms

- Ability to apply quantum mechanics principles to analyze the spread of Gaussian wave packets.
- Understanding the relationship between wave functions in position and momentum space through Fourier transforms.

Position-Momentum Uncertainty Principle

- Understanding the uncertainty principle and its manifestation in position and momentum measurements.
- Ability to quantify the uncertainty in position and momentum for a given quantum state.

2. General discussion of bound states in an arbitrary potential:

Continuity of Wave Function and Boundary Conditions

- Mastery of the concept of wave function continuity and its implications in quantum mechanics.
- Ability to apply boundary conditions to quantum mechanical systems and analyze their effects on the behavior of wave functions.

Discrete Energy Levels

- Understanding how boundary conditions lead to the emergence of discrete energy levels in quantum systems.
- Ability to calculate and interpret the energy spectrum of quantum systems with discrete energy levels.

Application to One-Dimensional Square Well Potential

- Ability to analyze the quantum mechanics of particles in a one-dimensional square well potential.
- Understanding the behavior of wave functions and energy levels inside and outside the potential well.

The Simple Harmonic Oscillator

- Mastery of the quantum mechanics principles governing the simple harmonic oscillator.
- Ability to calculate energy levels and energy eigenfunctions using the Frobenius method and Hermite polynomials.

Energy Levels and Eigenfunctions using Frobenius Method

- Understanding the application of the Frobenius method to solve differential equations arising in quantum mechanics.
- Ability to apply the Frobenius method to find energy levels and eigenfunctions of quantum systems.

Hermite Polynomials

- Familiarity with Hermite polynomials and their significance in solving quantum mechanical problems, particularly for the harmonic oscillator.
- Ability to manipulate Hermite polynomials and utilize them in solving differential equations in quantum mechanics.

Ground State, Zero-Point Energy, and Uncertainty Principle

- Students will understand the concept of the ground state and its significance in quantum systems.
- Concept of the zero-point energy associated with the ground state of the harmonic oscillator.
- Students will be able to relate the uncertainty principle to the behavior of quantum systems, particularly the harmonic oscillator.

3. Quantum theory of hydrogen-like atoms

Time-Independent Schrödinger Equation in Spherical Polar Coordinates

- Mastery of the time-independent Schrödinger equation formulation in spherical polar coordinates.
- Ability to apply the spherical polar coordinate system to analyze quantum mechanical systems with spherical symmetry.

Separation of Variables for Second-Order Partial Differential Equations

- Understanding the mathematical technique of separating variables to solve second-order partial differential equations.

- Proficiency in applying the separation of variables method to solve the time-independent Schrödinger equation in spherical polar coordinates.

Angular Momentum Operator and Quantum Numbers

- Familiarity with the angular momentum operator and its properties in quantum mechanics.
- Ability to derive and interpret the quantum numbers associated with angular momentum, including the orbital angular momentum quantum number (l) and the magnetic quantum number (m).

Radial Wave Functions from Frobenius Method

- Students will be able to the Frobenius method for solving differential equations, particularly in the context of radial wave functions.
- Ability to derive radial wave functions for spherically symmetric potentials using the Frobenius method.
- Students will understand the relationship between radial wave functions and probability densities for different quantum states.
- Students will be ecficienct in predicting and interpreting the shapes of probability densities for ground and first excited states of spherically symmetric potentials.

Orbital Angular Momentum Quantum Numbers (l and m) and Shells (s, p, d, etc.)

- Students will be efficient in obtaining orbital angular momentum quantum numbers (l) and their significance in determining the spatial distribution of electron orbitals.
- Ability to relate orbital angular momentum quantum numbers to the electron shells (s, p, d, etc.) in atomic and molecular systems.

4. Atoms in Electric & Magnetic Fields:

Electron Angular Momentum, Space Quantization and Electron Spin and Spin

Angular Momentum

- Understanding the concept of electron angular momentum in quantum mechanics.
- Ability to calculate and interpret the magnitude and direction of electron angular momentum for given quantum states.
- Idea of the principle of space quantization in quantum mechanics.
- Ability to apply space quantization to analyze the quantized behavior of angular momentum in different spatial orientations.
- Familiarity with electron spin as an intrinsic property of particles.
- Understanding the concept of spin angular momentum and its mathematical representation in quantum mechanics.
- Understanding Larmor's theorem and its application to the behavior of spinning charged particles in electromagnetic fields.
- Ability to predict the precession of spin angular momentum under the influence of an external magnetic field.

Spin Magnetic Moment and Stern-Gerlach Experiment

- Students will capable of the concept of spin magnetic moment and its relationship to the spin angular momentum of particles.

- Ability to calculate and interpret the spin magnetic moment for electrons and other spin-1/2 particles.
- Familiarity with the Stern-Gerlach experiment and its significance in demonstrating the quantization of angular momentum and spin.
- Understanding the experimental results and their implications for the quantized nature of electron spin.

Electron Magnetic Moment and Magnetic Energy and Bohr Magneton

- Understanding the Zeeman effect and its manifestation in the splitting of spectral lines in the presence of a magnetic field.
- Ability to calculate the electron magnetic moment and magnetic energy associated with Zeeman splitting.
- Students shall be able to understand the gyromagnetic ratio and its significance in relating angular momentum to magnetic moment in quantum mechanics.
- Understanding the Bohr magneton as a fundamental unit of magnetic moment in atomic and molecular systems.

Normal and Anomalous Zeeman Effect and Paschen-Back and Stark Effect

(Qualitative Discussion only)

- Familiarity with the normal and anomalous Zeeman effects and their distinguishing characteristics.
- Ability to differentiate between the two types of Zeeman effects based on the behavior of spectral lines in external magnetic fields.
- Understanding the qualitative aspects of the Paschen-Back and Stark effects.
- Ability to discuss the influence of magnetic and electric fields on atomic spectra without delving into detailed mathematical analysis.

5. Many electron atoms

Pauli's Exclusion Principle

- Understanding Pauli's exclusion principle and its significance in quantum mechanics.
- Students will be abile to apply the exclusion principle to analyze the arrangement of electrons in atoms and molecules.

Symmetric and Antisymmetric Wave Functions

- Students will be capable of the concepts of symmetric and antisymmetric wave functions.
- Understanding their role in describing the behavior of identical particles in quantum mechanics.
- Students shall be able to correlate the electronic configurations of elements with their positions in the periodic table.

Fine Structure

- Students shall understand the fine structure of atomic spectra and its origin in relativistic effects and electron-electron interactions.
- Ability to analyze the splitting of spectral lines due to fine structure in atomic spectra.

Spin-Orbit Coupling and Spectral Notations for Atomic States

- Students shall built a clear idea of spin-orbit coupling and its role in atomic physics.
- Students shall understand how spin-orbit coupling arises from the interaction between electron spin and orbital angular momentum.
- Familiarity with spectral notations used to describe atomic states, including term symbols and spectroscopic notation.
- Ability to interpret and manipulate term symbols to characterize atomic energy levels.

Total Angular Momentum Vector Model and LS and JJ Couplings

- Understanding the vector model of total angular momentum and its application to atomic physics.
- Ability to calculate and interpret total angular momentum quantum numbers using the vector model.
- Ability of LS coupling and JJ coupling schemes used to describe spin-orbit coupling in atoms.
- Students shall be able to calculate the total angular momentum quantum numbers and term symbols for atoms using LS and JJ coupling.

Hund's Rule and Term Symbols

- Students will familiar with Hund's rule and its application to the filling of atomic orbitals.
- Students shall understand how Hund's rule determines the ground state electron configurations of atoms.
- Students shall understand the concept of term symbols and their notation for describing atomic energy levels.
- Ability to construct term symbols for atomic states based on the quantum numbers of electron configurations.

Spectra of Hydrogen and Alkali Atoms (e.g., Sodium)

- Students shall built ability to analyze the spectra of hydrogen and alkali atoms, such as sodium, based on their electronic configurations and term symbols.
- Students understood the spectral lines and transitions observed in the spectra of these atoms.

C11-P: Quantum Mechanics and Applications Lab:

1. Understand the mathematical formulation of the s-wave Schrödinger equation and its application to solving for the ground state and first excited state of the hydrogen atom.

- Obtain the energy eigenvalues for the ground state and first excited state of the hydrogen atom.
- Plot the corresponding wavefunctions and understand their physical significance.
- Gain insight into the quantum mechanical behavior of electrons in the hydrogen atom and their energy levels.

2. Apply the s-wave radial Schrödinger equation to solve for the ground state energy of an atom with a screened Coulomb potential.

- Calculate the ground state energy of the atom to an accuracy of three significant digits for different screening lengths (a).

- Plot the corresponding wave function and interpret the effects of screening on the atomic energy levels.
- Understand the influence of the screening potential on the binding energy of the atom.

3. Solve the s-wave radial Schrödinger equation for a particle in an anharmonic oscillator potential.

- Determine the ground state energy of the particle to an accuracy of three significant digits for different an-harmonicity parameters (b).
- Plot the corresponding wave function and analyze the effects of an-harmonicity on the particle's energy spectrum.
- Gain insight into the behavior of quantum systems in non-linear potentials.

4. Apply the s-wave radial Schrödinger equation to study the vibrations of a hydrogen molecule in a Morse potential.

- Calculate the lowest vibrational energy of the molecule to an accuracy of three significant digits.
- Plot the corresponding wavefunction and interpret the molecular vibrational modes.

Laboratory based experiments:

5. Study of Electron spin resonance- determine magnetic field as a function of the resonance frequency

- Students can gain a comprehensive understanding to acquire practical skills in setting up and calibrating an electron spin resonance spectrometer.
- Learn techniques for determining the magnetic field as a function of the resonance frequency, enabling the identification of magnetic species in materials.
- Analyze experimental data obtained from electron spin resonance measurements to extract relevant information about the material's magnetic properties.

6. Study of Zeeman effect: with external magnetic field; Hyperfine splitting

- Students can understand the Zeeman effect and Study the Zeeman effect with an external magnetic field and observe the splitting of spectral lines, enhancing understanding of atomic and molecular energy levels
- Analyze experimental data to determine the effects of magnetic fields on spectral lines and extract relevant information about the electronic and nuclear properties of atoms and molecules.

7. To show the tunneling effect in tunnel diode using I-V characteristics.

- Demonstrate the tunneling effect in tunnel diodes and understand the principles of tunneling in semiconductor devices and its significance in electronic applications.
- Acquire the knowledge to interpret the observed tunneling behavior in tunnel diodes and relate it to the underlying quantum mechanical phenomena.

8. Quantum efficiency of CCDs

- Understand the quantum efficiency of charge-coupled devices (CCDs) and its importance in imaging and detection applications.
- Learn experimental techniques for measuring the quantum efficiency of CCDs under various conditions. And analyze experimental data to determine the quantum efficiency of CCDs as a function of wavelength or incident light intensity.

CC-12: Solid State Physics

C12-T: Solid State Physics:

1. Crystal Structures:

- Students shall understand the distinction between amorphous and crystalline materials.
- Students shall be able to classify materials based on their structural order and analyze the properties associated with each type.
- Students shall understand lattice translation vectors and their role in defining the periodicity of crystalline structures and also be able to calculate lattice translation vectors for different crystal lattices.
- Familiarity with lattices that include a basis, consisting of central and non-central elements.
- Understanding how the presence of a basis affects the symmetry and properties of crystal structures.

Unit Cell and Miller Indices and Reciprocal Lattice

- Students grow a clear understanding the concept of the unit cell as the basic repeating structural unit in a crystal lattice.
- Students shall be able to identify and characterize different types of unit cells, such as simple cubic, body-centered cubic, and face-centered cubic.
- Students can understand the Miller indices as a notation system used to describe crystallographic planes and directions.
- Ability to determine Miller indices for crystallographic planes and directions in various crystal structures.
- Familiarity with the concept of the reciprocal lattice and its importance in the analysis of crystal structures.
- Understanding the reciprocal lattice as the Fourier transform of the direct lattice.

Types of Lattices

- Students build a clear concept about the different types of crystal lattices, including primitive, body-centered, face-centered, and hexagonal lattices.
- Ability to identify and characterize these lattice types based on their unit cell structures.

Brillouin Zones, Diffraction of X-rays by Crystals and Bragg’s Law

- Students shall develop a clear idea of Brillouin zones as the fundamental cells in reciprocal space for describing the periodicity of crystal structures.
- Students shall be abile to calculate and interpret Brillouin zones for various crystal lattices.
- Understanding the principles of X-ray diffraction and its application to the analysis of crystal structures.
- Students shall be able to interpret X-ray diffraction patterns to determine the structure of crystalline materials.
- Students shall be familiar with Bragg's law as the fundamental relationship governing X-ray diffraction.
- Ability to apply Bragg's law to calculate the angles at which X-ray diffraction peaks occur.
- Students shall understand the factors influencing the intensity of X-ray diffraction peaks, including atomic and geometrical factors.

- Students shall grow ability to analyze the contribution of these factors to the overall diffraction pattern.

2. Elementary Lattice Dynamics:

Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains

- Students shall understand the concept of lattice vibrations in crystalline solids.
- They shall grow ability to analyze the vibrational modes in linear monoatomic and diatomic chains.
- Students shall develop concept of acoustical and optical phonons as types of lattice vibrations in solids.
- They shall build ability to distinguish between the characteristics and behaviors of acoustical and optical phonons.
- Students shall understand the phonon spectrum as the distribution of phonon frequencies in a solid.
- Ability to qualitatively describe the phonon spectrum based on the material's crystal structure and vibrational modes.

Dulong and Petit's Law

- Students shall make familiar with Dulong and Petit's law, which states that the molar specific heat of a crystal approaches a constant value at high temperatures.
- Students develop ability to explain the classical interpretation of Dulong and Petit's law and its limitations.

Einstein and Debye Theories of Specific Heat of Solids

- Students shall develop a clear understanding about Einstein and Debye theories of specific heat in solids.
- Ability to describe how these theories account for the quantization of lattice vibrations and the behavior of phonons.
- Students develop a knowledge of the T^3 law, which describes the temperature dependence of the specific heat of solids at low temperatures.
- Students shall be able to apply the T^3 law to analyze the specific heat behavior of solids in the low-temperature regime.

3. Magnetic Properties of Matter:

Dia-, Para-, Ferri-, and Ferromagnetic Materials

- Students shall understand the classification of materials into diamagnetic, paramagnetic, ferri- and ferromagnetic categories based on their magnetic properties.
- Ability to identify and differentiate between these types of magnetic materials and analyze their behavior in external magnetic fields.

Classical Langevin Theory of Dia- and Paramagnetic Domains

- Students shall develop knowledge of the classical Langevin theory as a model for describing the behavior of magnetic domains in diamagnetic and paramagnetic materials.
- Students shall be able to apply the Langevin theory to explain the alignment of magnetic moments in response to an external magnetic field.

Quantum Mechanical Treatment of Para magnetism and Curie's Law

- Students shall understand the quantum mechanical principles underlying paramagnetic and also be able to describe the behavior of paramagnetic materials using quantum mechanical models, such as the Pauli paramagnetic of free electrons.
- Students will be familiar with Curie's law, which describes the temperature dependence of the magnetic susceptibility in paramagnetic materials.
- They shall build ability to apply Curie's law to analyze the magnetic properties of paramagnetic materials as a function of temperature.

Weiss’s Theory of Ferromagnetism and Ferromagnetic Domains

- Students shall understand Weiss's theory of ferromagnetism, which describes the alignment of atomic magnetic moments in ferromagnetic materials.
- They shall grow the ability to explain the formation and behavior of ferromagnetic domains within a ferromagnetic material using Weiss's theory.

Discussion of B-H Curve, Hysteresis and Energy Loss

- Students shall develop a clear idea of the B-H curve, also known as the magnetization curve, which describes the relationship between magnetic field (H) and magnetization (B) in a magnetic material.
- They shall build ability to analyze and interpret B-H curves for different types of magnetic materials, including diamagnetic, paramagnetic, and ferromagnetic materials.
- Also they develop a clear understanding hysteresis as the phenomenon where the magnetization of a material lags behind changes in the applied magnetic field.
- Ability to analyze hysteresis loops and understand the energy loss associated with the reversal of magnetization in ferromagnetic materials.

4. Dielectric Properties of Materials:

- Students shall understand the concept of polarization in dielectric materials, including the alignment of electric dipoles in response to an external electric field.
- They can analyze the local electric field at an atom within a dielectric material and understand the concept of the depolarization field.
- They can define electric susceptibility and polarizability as measures of a material's response to an external electric field and are capable to apply the Clausius-Mossotti equation to quantitatively describe the relationship between polarization and the electric field in a dielectric material.
- They can explain the classical theory of electric polarizability and its limitations in describing the behavior of dielectric materials, particularly at high frequencies.
- Students shall understand the concepts of normal and anomalous dispersion in the context of wave propagation through a dispersive medium.
- They are capable to describe the Cauchy and Sellmeier relations as empirical equations relating the refractive index of a material to its wavelength.
- Students also apply the Langevin-Debye equation to describe the response of a polarizable medium to an oscillating electric field.
- They shall understand the concept of the complex dielectric constant and its role in describing the frequency-dependent behavior of dielectric materials and analyze optical phenomena such as refraction, reflection, and absorption in dielectric materials based on their complex dielectric constants.

5. Ferro electric Properties of Materials:

- Students can understand, define and explain the piezoelectric effect as the generation of an electric field in response to mechanical stress and vice versa, and understand its significance in transducers, sensors, and actuators.
- They can describe the pyroelectric effect as the generation of an electric field in response to changes in temperature and understand its applications in infrared detectors and sensors.
- Students can define the ferroelectric effect as the spontaneous polarization of a material in the absence of an external electric field, and understand its applications in memory devices, capacitors, and electro-optic devices.
- They can explain the electro-strictive effect as the strain induced by an electric field in a material.
- Students shall be able to apply the Curie-Weiss law to describe the temperature dependence of ferroelectric materials near their Curie temperature and can describe ferroelectric domains as regions within a ferroelectric material with different polarization orientations, and understand their role in determining the macroscopic properties of the material.
- They shall analyze the polarization-electric field (PE) hysteresis loop of ferroelectric materials and understand its implications for ferroelectric switching behavior and device performance.

6. Elementary band theory:

- Students shall understand the Kronig-Penny model and its application in describing the behavior of electrons in a periodic potential.
- Analyze band structures and explain the concept of band gaps in materials.
- Students shall be able to differentiate between conductors, semiconductors (both P-type and N-type), and insulators based on their band structures and conductivity properties.
- They can calculate the conductivity of semiconductors and understand the factors affecting mobility.
- Students shall be able to explain the Hall effect and its significance in determining the carrier concentration, mobility, and conductivity of materials.
- They can describe the measurement techniques for conductivity using the 4-probe method and determine the Hall coefficient experimentally. And also be able to interpret experimental results related to conductivity, Hall coefficient, and other material properties.

7. Superconductivity:

- Students shall understand the critical temperature and critical magnetic field in superconductors and understand the concept of the Meissner effect.
- They shall be able to differentiate between Type I and Type II superconductors and explain the behavior of superconductors using London's equation and penetration depth.
- Students can develop idea about the isotope effect and its implications on the superconducting transition temperature. And gain familiarity with the BCS theory and its key concepts without derivation, including Cooper pairs and the mechanism of superconductivity.

C12-P: Solid State Physics Lab:

1. Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method)

- Gain proficiency in experimental techniques for measuring the susceptibility of paramagnetic solutions using Quinck's tube method.
- Enhancing their understanding of magnetic properties in solutions.

2. To measure the Magnetic susceptibility of Solids.

- Acquire practical skills in measuring the magnetic susceptibility of solids.
- Allowing them to characterize magnetic materials and interpret experimental data effectively.

3. To determine the Coupling Coefficient of a Piezoelectric crystal.

- Develop competence in determining the coupling coefficient of piezoelectric crystals.
- Enabling them to analyze and quantify piezoelectric effects in materials.

4. To measure the Dielectric Constant of a dielectric Materials with frequency

- Learn experimental methods for measuring the dielectric constant of materials as a function of frequency.
- Facilitating a deeper understanding of frequency-dependent electrical behavior.

5. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR)

- Gain practical experience in determining the complex dielectric constant and plasma frequency of metals using surface plasmon resonance (SPR).
- Providing insights into optical properties of metal materials.

6. To determine the refractive index of a dielectric layer using SPR

- Shall be able of determining the refractive index of dielectric layers using SPR.
- Enhancing their ability to characterize thin film materials optically.

7. To study the PE Hysteresis loop of a Ferroelectric Crystal

- Study the polarization-electric field (PE) hysteresis loop of ferroelectric crystals.
- Allowing them to understand and analyze the switching behavior of ferroelectric materials.

8. To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis.

- Develop proficiency in drawing the BH curve of iron using a solenoid and determining energy loss from hysteresis.
- Providing insights into magnetic properties and energy losses in magnetic materials.

9. To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150 ^{o}C) and to determine its band gap.

- Acquire skills in measuring the resistivity of semiconductors, such as germanium, with temperature using the four-probe method.
- And determine their band gap, enhancing their understanding of semiconductor physics and material properties.

10. To determine the Hall coefficient of a semiconductor sample

- Learn techniques for determining the Hall coefficient of semiconductor samples.
- Allowing them to characterize the electrical properties of semiconductor materials accurately.

DSE1: Classical Dynamics

DSE1-T: Classical Dynamics:

1. Classical Mechanics of Point Particles

- Students shall apply Newton's laws of motion to describe the motion of particles in various contexts, including the effects of external electric and magnetic fields.
- They are capable of analyze the motion of charged particles in uniform electric fields, magnetic fields, and crossed electric and magnetic fields.
- Students are able to calculate the gyro radius and gyro frequency of charged particles in magnetic fields and understand their significance in particle dynamics. And utilize generalized coordinates and velocities to describe the motion of particles in systems with multiple degrees of freedom.
- They can recall Lagrangian mechanics and its use in finding the equations of motion for complex systems.
- Students can understand Hamiltonian mechanics and its advantages in solving dynamical problems, particularly in systems with symmetries. And apply Hamiltonian formalism to derive the equations of motion for simple systems such as harmonic oscillators.
- They shall be capable solve Hamilton's equations for simple harmonic oscillations and interpret the solutions in terms of energy conservation.
- Students shall analyze the motion of particles in central force fields, including the conservation of angular momentum, energy and describe the concept of effective potential and its role in understanding the dynamics of central force problems.
- They shall be able to utilize the Laplace-Runge-Lenz vector to study the properties of orbits in central force fields and understand its implications for orbital dynamics.

2. Small Amplitude Oscillations

- Students can identify and analyze points of stable equilibrium in physical systems by determining the minima of potential energy and are capable to expand the potential energy function around a minimum using Taylor series approximation to characterize the behavior of the system near equilibrium points.
- They shall be able to describe and analyze small amplitude oscillations about the equilibrium points by considering the restoring force provided by the potential energy.
- Students can understand the concept of normal modes of oscillations and their significance in describing the collective motion of systems with multiple degrees of freedom.
- Students can apply the principles learned to specific examples, such as systems of N identical masses connected in a linear fashion by (N - 1) identical springs. And are capable to calculate the normal modes of oscillations for the given example system and interpret their physical significance.
- Students utilize mathematical techniques such as matrix diagonalization to find the Eigen modes and Eigen frequencies of oscillating systems. And analyze the behavior of systems undergoing small perturbations and determine whether they return to their equilibrium positions or exhibit stable oscillatory behavior.

3. Special Theory of Relativity

- Student understand the fundamental postulates of Special Theory of Relativity, including the principle of relativity and the constancy of the speed of light in all inertial frames.
- They shall be able to apply Lorentz transformations to describe the relativistic effects of time dilation and length contraction on space and time coordinates between inertial frames.

- They can Interpret Murkowski space-time diagrams and understand the concepts of the invariant interval, light cone, and world lines in the context of relativistic physics.
- They analyze relativistic effects such as time dilation, length contraction, and the twin paradox in various scenarios involving relative motion.
- Students can understand the definition and classify four-vectors into space-like, time-like, and light-like categories and understand their physical significance in space-time.
- They shall be capable of calculating four-velocity and four-acceleration vectors for particles in relativistic motion and interpret their implications on kinematics.
- They can apply the energy-momentum relation to derive four-momentum and understand its significance in relativistic dynamics and analyze the Doppler effect from a four-vector perspective and understand its relativistic corrections.
- Students develop the concept of four-force and discuss its conservation in relativistic systems and apply relativistic kinematics principles to the study of two-body decay processes of unstable particles and analyze their experimental signatures.

4. Fluid Dynamics

- Students shall understand the defination and understand the concepts of density (ρ) and pressure (P) in a fluid and their significance in describing fluid behavior and are capable of identifying an element of fluid and its velocity vector, and analyze the flow properties at a microscopic level.
- They shall be skilled enough to apply the continuity equation to describe mass conservation in fluid flow and understand its implications for fluid dynamics.
- They can differentiate between stream-lined motion and turbulent flow, and analyze the characteristics of laminar flow.
- They shall make a clear understanding of Poiseuille's equation and its application in describing the flow of a liquid through a pipe, including factors affecting fluid flow rate.
- Students shall interpret Navier-Stokes equations and their role in describing the motion of viscous fluids, including momentum conservation.
- They shall understand qualitative description of turbulence and identify situations where it occurs in fluid flow and calculate the Reynolds number to characterize the flow regime and predict the transition between laminar and turbulent flow.

DSE2: Nuclear and Particle Physics

DSE2-T: Nuclear and Particle Physics:

- In this course students should learn about basic nuclear physics to particle physics. It is one of the basic physics course with the application of quantum mechanics.

SEMESTER - VI

CC-13: Electromagnetic Theory

C-13T: Electromagnetic Theory:

1. Maxwell Equations and Displacement Current:

- Students will be able to explain Maxwell's equations and understand the significance of displacement current in electromagnetic theory.
- They will understand the concepts of vector and scalar potentials and gauge transformations, including Lorentz and Coulomb gauges.

2. Boundary Conditions and Wave Equations:

- Students will understand boundary conditions at interfaces between different media and be able to solve wave equations.
- They will learn about the propagation of plane waves in dielectric media and the Poynting theorem, including the concept of electromagnetic energy density.

3. EM Wave Propagation in Unbounded Media:

- Students will understand the propagation of electromagnetic waves through vacuum and isotropic dielectric media, including concepts such as refractive index and wave impedance.
- They will learn about wave propagation through conducting media and dilute plasma, including skin depth and plasma frequency.

4. EM Wave in Bounded Media:

- Students will be able to explain the reflection and refraction of plane waves at interfaces between dielectric media, applying laws such as Fresnel's formulae and Brewster's law.
- They will understand total internal reflection, evanescent waves, and metallic reflection.

5. Polarization of Electromagnetic Waves:

- Students will understand the concepts of linear, circular, and elliptical polarization, as well as polarization in anisotropic media and double refraction.
- They will be able to describe the production and detection of polarized light and the analysis of polarized light using instruments like Nicol prisms and quarter-wave plates.

6. Rotatory Polarization and Wave Guides:

- Students will understand rotatory polarization, optical rotation, and the theoretical and experimental aspects of Fresnel's theory of optical rotation.
- They will learn about planar optical wave guides, phase shift on total reflection, and the characteristics of guided waves, including field energy and power transmission.

7. Optical Fibres:

- Students will understand the numerical aperture and the concept of step and graded index fibers.
- They will learn about single and multiple mode fibers and their applications in optical communication, including concepts like dispersion and attenuation.

C-13P: Electromagnetic Theory Lab:

1. Verification of Malus Law:

- Students will understand and be able to explain Malus Law for plane polarized light.
- They will benefit from hands-on experimentation to verify the law, enhancing their understanding of polarization phenomena.

2. Specific Rotation Determination using Polarimeter:

- Students will understand the principle of specific rotation and its application in determining the concentration of optically active substances.
- They will learn how to operate a polarimeter and analyze the results to determine specific rotation values.

3. Analysis of Elliptically Polarized Light:

- Students will learn about elliptical polarization and its characteristics.
- They will benefit from using Babinet's compensator to analyze elliptically polarized light, enhancing their understanding of polarization optics.

4. Study of Radiation Pattern for Dipole Antenna:

- Students will understand the radiation pattern of a simple dipole antenna and its dependence on angle.
- They will learn experimental techniques to study the radiation pattern, aiding their understanding of antenna theory.

5. Measurement of Ultrasonic Wave Characteristics:

- Students will learn experimental techniques to measure the wavelength and velocity of ultrasonic waves.
- They will gain practical experience in using diffraction through ultrasonic gratings to analyze ultrasonic wave properties.

6. Study of Microwave Reflection and Refraction:

- Students will understand the reflection and refraction phenomena for microwaves.
- They will learn experimental techniques to study microwave reflection and refraction, aiding their understanding of electromagnetic wave behavior.

7. Polarization and Double Slit Interference in Microwaves:

- Students will understand polarization and its effects on interference phenomena.
- They will gain practical experience in studying polarization and double slit interference in microwaves, enhancing their understanding of wave optics.

8. Refractive Index Determination using Total Internal Reflection:

- Students will learn experimental techniques to determine the refractive index of liquids using total internal reflection.
- They will understand the principles behind Wollaston's air-film and Gaussian eyepiece setups for refractive index determination.

9. Polarization of Light by Reflection:

- Students will understand the concept of polarization by reflection.
- They will gain practical experience in determining the polarizing angle for an air-glass interface, enhancing their understanding of polarization phenomena.

10. Verification of Stefan's Law and Determination of Stefan's Constant:

- Students will understand Stefan's law of radiation and its significance in thermal radiation.

- They will learn experimental techniques to verify the law and determine Stefan's constant, aiding their understanding of thermal physics.

11. Determination of Boltzmann Constant using PN Junction Diode:

- Students will understand the relationship between voltage and current in a PN junction diode.
- They will gain practical experience in determining the Boltzmann constant using V-I characteristics, enhancing their understanding of semiconductor physics.

CC-14: Statistical Mechanics

C-14T: Statistical Mechanics:

1. Understanding of Macrostate & Microstate:

- Students will be able to explain the concepts of macrostate and microstate in statistical mechanics.
- They will understand the distinction between the two and their relevance in describing the behavior of systems.

2. Elementary Concept of Ensemble and Phase Space:

- Students will understand the concept of an ensemble and its role in statistical mechanics.
- They will grasp the idea of phase space and its significance in representing the possible states of a system.

3. Microcanonical Ensemble and Thermodynamic Probability:

- Students will be able to explain the microcanonical ensemble and its implications in statistical mechanics.
- They will understand thermodynamic probability and its connection to entropy.

4. Canonical Ensemble and Partition Function:

- Students will understand the canonical ensemble and its importance in statistical mechanics.
- They will grasp the concept of the partition function and its role in calculating thermodynamic properties.

5. Thermodynamic Functions of Ideal Gas and Sackur-Tetrode Equation:

- Students will be able to calculate thermodynamic functions of an ideal gas using statistical mechanics.
- They will understand the Sackur-Tetrode equation and its application to calculating entropy.

6. Classical Entropy Expression and Gibbs Paradox:

- Students will understand the classical expression for entropy and its limitations.
- They will learn about the Gibbs paradox and its implications in statistical mechanics.

7. Grand Canonical Ensemble and Chemical Potential:

- Students will understand the grand canonical ensemble and its significance in statistical mechanics.
- They will grasp the concept of chemical potential and its role in describing the behavior of systems in contact with a reservoir.

8. Properties of Thermal Radiation and Blackbody Radiation:

- Students will learn about the properties of thermal radiation and blackbody radiation.
- They will understand concepts such as Kirchhoff's law, Stefan-Boltzmann law, and radiation pressure.

9. Quantum Theory of Radiation and Planck's Law:

- Students will understand the quantum theory of radiation and Planck's law.
- They will learn about Planck's quantum postulates and how they lead to the derivation of various radiation laws.

10. Bose-Einstein Statistics and Bose-Einstein Condensation:

- Students will understand Bose-Einstein statistics and its application to systems of indistinguishable bosons.
- They will learn about Bose-Einstein condensation and its significance in quantum mechanics.

11. Fermi-Dirac Statistics and Fermi Gas:

- Students will understand Fermi-Dirac statistics and its application to systems of fermions.
- They will grasp the concept of Fermi energy and its implications in describing the behavior of electrons in metals.

C-14P: Statistical Mechanics Lab:

- In the laboratory course, the students get an opportunity to verify different laws and principles related to statistical mechanics using Python programming.
- Students will be able to explain and understand the local number density in equilibrium states, including average values and fluctuations, through computational analysis of particle systems under the Lennard-Jones potential.
- Students will gain insights into the transient behavior of the system, observing how it approaches equilibrium over time through computational simulations.
- By analyzing systems with varying total numbers of particles (N), students will explore the relationship between system size and the arrow of time, gaining insights into statistical mechanics principles.
- Through computational simulations, students will compute the velocity distribution of particles and compare it with the Maxwell velocity distribution, deepening their understanding of statistical mechanics concepts.
- Students will be able to compute and analyze the mean molecular speed and its dependence on particle mass, enhancing their understanding of kinetic theory and molecular dynamics.
- Through computing partition functions for systems with finite single-particle levels and non-interacting particles under different statistics, students will understand how $Z(\beta)$, average energy, energy fluctuation, and specific heat depend on temperature and the total number of particles.

- Students will compute and analyze ratios of occupation numbers for various states, gaining insights into the distribution of particles in different energy levels under different statistical ensembles.
- Through computational analysis, students will compare the behavior of physical quantities under Maxwell-Boltzmann, Fermi-Dirac, and Bose-Einstein statistics at large and small temperatures, deepening their understanding of statistical mechanics principles.
- Students will plot Planck's law for black body radiation and compare it with Rayleigh-Jeans law at high and low temperatures, gaining insights into the limitations of classical theories and the emergence of quantum mechanics.
- Through plotting specific heat using Dulong-Petit law, Einstein distribution function, and Debye distribution function for high and low temperatures, students will understand the behavior of specific heat in solids and compare different theoretical models.
- Students will plot various functions with energy at different temperatures, allowing them to analyze how physical quantities vary with temperature in different systems and gain a deeper understanding of thermal physics principles.

DSE-3: Nano Materials and Applications

DSE-3T: Nano Materials and Applications:

1. Understanding Nanoscale Systems:

- Students will be able to explain the significance of length scales in physics and understand various nanostructures including 1D, 2D, and 3D structures such as nanodots, thin films, nanowires, and nanorods.
- Students will comprehend the band structure and density of states of materials at the nanoscale, including the effects of quantum confinement on electronic properties.
- Through applications of the Schrödinger equation, students will understand the consequences of quantum confinement in nanostructures and its impact on carrier behavior.

2. Synthesis of Nanostructure Materials:

- Students will understand the top-down and bottom-up approaches for synthesizing nanostructures, including techniques such as photolithography, ball milling, gas-phase condensation, and various deposition methods.
- Students will learn about characterization techniques such as X-ray diffraction, optical microscopy, electron microscopy (SEM and TEM), atomic force microscopy (AFM), and scanning tunneling microscopy (STM) for analyzing nanostructures.

3. Optical Properties of Nanostructures:

- Students will understand the Coulomb interaction in nanostructures, the concept of dielectric constants, and charging effects.
- Through a quantitative treatment, students will learn about quasi-particles and excitons in direct and indirect bandgap semiconductor nanocrystals, as well as radiative processes such as absorption, emission, and luminescence.

4. Electron Transport in Nanostructures:

- Students will understand carrier transport phenomena in nanostructures, including Coulomb blockade effects, thermionic emission, tunneling, and hopping conductivity.
- Students will learn about the role of defects and impurities, including deep-level and surface defects, in electron transport.

5. Applications of Nanostructures:

- Students will understand the applications of nanoparticles, quantum dots, nanowires, and thin films in photonic devices such as LEDs and solar cells, as well as in nanomaterial devices like quantum dot heterostructure lasers and magnetic data storage.
- Students will learn about the applications of microelectromechanical systems (MEMS) and nano-electromechanical systems (NEMS) in various fields.

DSE-3P: Nano Materials and Applications Lab

1. Synthesis of Metal Nanoparticles:

- Students will understand the chemical route for synthesizing metal nanoparticles and the factors affecting the size and shape of nanoparticles.

2. Synthesis of Semiconductor Nanoparticles:

- Students will learn the methods for synthesizing semiconductor nanoparticles and the role of various parameters in controlling their properties.

3. Surface Plasmon Study:

- Using UV-Visible spectrophotometry, students will study the surface plasmon resonance phenomenon in metal nanoparticles, gaining insights into their optical properties.

4. XRD Analysis and Particle Size Estimation:

- Students will analyze the XRD patterns of nanomaterials to determine their crystal structure and estimate the particle size using appropriate techniques.

5. Effect of Size on Color:

- Through experimental observation, students will explore how the size of nanomaterials affects their color, providing insights into the optical properties of nanoparticles.

6. Composite Preparation:

- Students will learn the techniques for preparing composites of carbon nanotubes (CNTs) with other materials, understanding the principles behind composite formation and its potential applications.

7. Quantum Dot Growth:

- Through the thermal evaporation method, students will grow quantum dots and gain hands-on experience in nanomaterial synthesis and characterization.

8. Preparation of Ceramic Disc:

- Students will fabricate a ceramic disc of a compound using ball milling, pressing, and sintering techniques, followed by XRD analysis to study its crystal structure.

9. Thin Film Fabrication and Spectral Analysis:

- By spin coating or chemical deposition, students will fabricate thin films of nanoparticles and analyze their transmittance spectra in the UV-Visible region, understanding their optical properties.

10. Thin Film Capacitor Fabrication:

- Students will fabricate thin film capacitors and measure their capacitance as a function of temperature or frequency, gaining practical knowledge of thin film device fabrication and characterization.

11. PN Diode Fabrication and Characterization:

- Through the diffusion of aluminum over the surface of N-type silicon, students will fabricate PN diodes and study their V-I characteristics, gaining insights into semiconductor device fabrication and behavior.

DSE-4: Experimental Techniques

DSE-4T: Experimental Techniques:

1. Measurements:

- Students will understand the concepts of accuracy, precision, and significant figures in measurements, enabling them to quantify and communicate uncertainties in experimental results.
- They will learn about different types of errors in measurements, including gross, systematic, and random errors, and perform error and uncertainty analysis using statistical methods such as arithmetic mean, standard deviation, and chi-square analysis.
- By studying Gaussian distribution, students will gain insights into the probability distribution of measurement errors and their implications in data analysis and interpretation.

2. Signals and Systems:

- Students will explore the characteristics of periodic and aperiodic signals, understanding concepts such as impulse response, transfer function, and frequency response of systems.
- They will learn about fluctuations and noise in measurement systems, analyzing signal-to-noise ratio (S/N ratio), noise figure, and noise sources such as thermal noise, shot noise, and 1/f noise.

3. Shielding and Grounding:

- Students will comprehend methods of safety grounding and the principles of shielding to mitigate electromagnetic interference (EMI).
- They will understand energy coupling mechanisms and their implications in grounding and shielding strategies, ensuring the reliability and safety of measurement systems.

4. Transducers & Industrial Instrumentation:

- Students will explore the static and dynamic characteristics of measurement systems and understand the working principles, efficiency, and applications of various transducers.
- They will learn about temperature transducers, linear position transducers, inductance change transducers, radiation sensors, and their signal conditioning techniques, preparing them for practical applications in industrial instrumentation.

5. Digital Multimeter:

- Students will compare analog and digital instruments and understand the block diagram and principles of operation of a digital multimeter.
- They will learn about the measurement of current, voltage, and capacitance using a digital multimeter, considering factors such as accuracy and resolution in measurements.

6. Impedance Bridges and Q-meter:

- Students will study the block diagram and working principles of RLC bridges and Q-meters, gaining practical knowledge of impedance measurement techniques.
- They will understand the operation of digital LCR bridges, enabling them to perform precise measurements of resistance, inductance, and capacitance.

7. Vacuum Systems:

- Students will learn about the characteristics of vacuum, gas laws, and the importance of vacuum systems in various applications.
- They will explore the components and operation of vacuum systems, including mechanical pumps, diffusion pumps, turbo molecular pumps, and pressure gauges, developing skills in vacuum technology and instrumentation.

DSE-4P: Experimental Techniques Lab

1. Determine output characteristics of a LVDT & measure displacement using LVDT:

- Students will be able to explain the working principle of a LVDT and understand its output characteristics.
- They will gain practical experience in setting up and calibrating a LVDT to measure displacement accurately, enhancing their skills in sensor instrumentation.

2. Measurement of Strain using Strain Gauge:

- Students will understand the principle of strain measurement using strain gauges and the Wheatstone bridge configuration.
- They will learn to install, calibrate, and measure strain using strain gauges, providing hands-on experience in structural health monitoring and material testing.

3. Measurement of level using capacitive transducer:

- Students will comprehend the working principle of capacitive transducers for level measurement applications.
- They will be able to design and implement capacitive level measurement systems, gaining practical skills in industrial process control and instrumentation.

4. To study the characteristics of a Thermostat and determine its parameters:

- Students will study the operation of thermostats and analyze their characteristics such as hysteresis and switching behavior.
- They will learn to determine the parameters of a thermostat experimentally, enabling them to optimize its performance in temperature control systems.

5. Study of distance measurement using ultrasonic transducer:

- Students will explore the principles of ultrasonic distance measurement and understand the operation of ultrasonic transducers.
- They will gain practical experience in designing and calibrating ultrasonic distance measurement systems, preparing them for applications in robotics and automation.

6. Calibrate Semiconductor type temperature sensor:

- Students will learn to calibrate semiconductor temperature sensors such as AD590, LM35, or LM75.
- They will understand the calibration process and apply it to ensure accurate temperature measurement in various electronic devices and systems.

7. To measure the change in temperature using Resistance Temperature Device (RTD):

- Students will be able to measure temperature changes using Resistance Temperature Devices (RTDs) and understand their temperature-resistance characteristics.
- They will gain practical skills in temperature sensing and calibration, essential for temperature monitoring and control applications.

8. Create vacuum in a small chamber and measure pressure:

- Students will understand the principles of vacuum technology and the operation of mechanical pumps.
- They will gain hands-on experience in creating vacuum using a mechanical pump and measuring chamber pressure, essential for various research and industrial applications.

9. Comparison of noise pickup in cables:

- Students will compare the noise pickup in different types of cables and understand the importance of grounding in reducing electromagnetic interference.
- They will gain insights into cable selection and grounding techniques, improving the reliability of electrical systems.

10. Design and study the Sample and Hold Circuit:

- Students will design and analyze Sample and Hold circuits used in analog signal processing.
- They will understand the principles of sampling and holding analog signals, essential for data acquisition and signal processing applications.

11. Design and analyze Clippers and Clampers circuits:

- Students will design and analyze diode-based Clippers and Clampers circuits for waveform shaping.
- They will gain practical skills in signal processing and waveform manipulation, essential for electronic circuit design.

12. Plot the frequency response of a microphone:

- Students will understand the frequency response characteristics of microphones and their impact on audio signal capture.
- They will learn to measure and plot the frequency response of microphones, enhancing their understanding of audio engineering principles.

13. Measure Q of a coil using a Q-meter:

- Students will measure the quality factor (Q) of a coil using a Q-meter and understand its influence on circuit performance.
- They will gain practical experience in impedance measurements and circuit analysis, essential for RF and microwave engineering applications.

Course Outcomes (COs) of 4-Year B.Sc. Honours Major in Physics Under CCFUP-2023 & NEP-2020

SEMESTER - I

MJ-1: Foundation of Physics -1

MJ-1T: Foundation of Physics -1:

UNIT – I: Preliminary Math. Methods:

1. Vector Analysis:

- ✓ Students will understand the definition of vectors through rotational transformation of Cartesian axes.
- ✓ They will be able to distinguish between scalar, pseudoscalar, polar, and axial vectors.
- ✓ Students will grasp the fundamentals of vector algebra and learn key vector identities.
- ✓ They will comprehend the concepts of gradient, divergence, and curl of a vector field and their physical significance.
- ✓ Students will understand solenoidal and irrotational vectors, conservative vector fields, scalar potential, and vector potential.
- ✓ They will be able to apply identities involving gradient, divergence, and curl.

2. Vector Integration:

- ✓ Students will be able to perform line integrals and understand path independence and exact differentials.
- ✓ They will understand surface integrals and flux, and perform volume integrals.
- ✓ Students will comprehend the Gauss divergence theorem and its application to the continuity equation.
- ✓ They will be able to apply Stokes' theorem and Green's theorem for simply connected regions.
- ✓ Students will verify integral theorems in simple cases.
- ✓ They will understand the change of variables, the Jacobian, and their use in evaluating surface and volume integrals.

3. Orthogonal Curvilinear Coordinates:

- ✓ Students will understand covariant and contravariant components, unit vectors, and unitary base vectors.
- ✓ They will comprehend the expressions for length, area, and volume elements.
- ✓ Students will derive general expressions for gradient, divergence, Laplacian, and curl.
- ✓ They will learn to express these in spherical and cylindrical polar coordinates.
- ✓ Students will understand the square of the element of arc length and volume element in general coordinates.

4. Analytic Functions:

- ✓ Students will understand analytic functions of real variables.
- ✓ They will be able to expand functions using Taylor's series and Maclaurin's series for functions of a single variable.
- ✓ Students will illustrate these expansions with simple problems.

5. Differential Equations:

- ✓ Students will understand exact and inexact differentials.
- ✓ They will be able to classify differential equations with examples.
- ✓ Students will solve first-order linear differential equations using integrating factors.
- ✓ They will understand second-order (linear) ODEs with constant coefficients and find particular integrals.

6. Partial Differential Equations:

- ✓ Students will be able to solve Laplace's equation in 2D and 3D using the method of separation of variables in Cartesian coordinates.

UNIT – II: Introduction to Thermodynamics

1. Basics of Kinetic Theory:

- ✓ Students will understand the macroscopic and microscopic description of matter.
- ✓ They will comprehend the postulates of the molecular kinetic theory of an ideal gas.
- ✓ Students will relate microscopic and macroscopic state variables.
- ✓ They will be able to derive and use the ideal gas equation and Van-der-Waal's equation.

2. Thermodynamic Description of System:

- ✓ Students will learn about thermodynamic systems and differentiate between intensive and extensive thermodynamic variables.
- ✓ They will understand thermodynamic equilibrium and the Zeroth law of thermodynamics, leading to the concept of temperature.
- ✓ Students will grasp the concepts of work, heat, and internal energy.
- ✓ They will distinguish between state functions and path functions.

3. First Law of Thermodynamics:

- ✓ Students will understand the statement and explanation of the first law of thermodynamics and its differential form.
- ✓ They will comprehend the significance of the first law and quasi-static processes.
- ✓ Students will analyze various thermodynamic processes and apply the first law to derive the general relation between C_P and C_V.
- ✓ They will calculate work done during isothermal and adiabatic processes and understand compressibility and expansion coefficients.
- ✓ Students will study the concept of free expansion.

4. Second Law of Thermodynamics:

- ✓ Students will differentiate between reversible and irreversible processes with examples.

- ✓ They will understand the conversion of work into heat and vice versa, including the role of heat reservoirs and heat engines.
- ✓ Students will learn about Carnot’s cycle, Carnot engine and its efficiency, and the operation of refrigerators and heat pumps, including the coefficient of performance.
- ✓ They will comprehend the statements of the second law of thermodynamics (Kelvin-Planck and Clausius Statements) and their equivalence.
- ✓ Students will study Carnot’s theorem and its applications, including the thermodynamic scale of temperature and its equivalence to the perfect gas scale.

5. Entropy:

- ✓ Students will grasp the concept of entropy and Clausius theorem.
- ✓ They will understand Clausius inequality and the second law of thermodynamics in terms of entropy.
- ✓ Students will study the entropy of a perfect gas and gas mixtures, including the increase of entropy due to diffusion.
- ✓ They will learn the principle of increase of entropy and entropy changes in reversible and irreversible processes with examples.
- ✓ Students will analyze the concept of entropy of the universe and temperature-entropy diagrams for the Carnot cycle.

6. Third Law of Thermodynamics:

- ✓ Students will understand the third law of thermodynamics and the concept of the unattainability of absolute zero temperature.

7. Theory of Radiation:

- ✓ Students will study blackbody radiation and spectral distribution.
- ✓ They will understand the concept of energy density and derive Planck's law.
- ✓ Students will deduce Wien’s distribution law, Rayleigh-Jeans law, Stefan-Boltzmann law, and Wien’s displacement law from Planck’s law.

SEC-1P: Introduction to Python programming and Graph Plotting

1. Introduction to Programming in Python (Version-3):

- ✓ Students will understand the basics of using the Python interpreter as a calculator.
- ✓ They will be able to define and manipulate various data types including int, float, complex, list, tuple, set, and string.
- ✓ Students will perform basic mathematical operations and write compound statements in Python.
- ✓ They will use logical conditions (if, elif, else) and loops (for, while).
- ✓ Students will define user functions using def, return statement, default values for arguments, keyword arguments, and lambda functions.
- ✓ They will learn to import and utilize modules such as math, cmath, and random.
- ✓ Students will use help and dir commands to access inbuilt manuals.

- ✓ They will understand local and global namespaces and perform I/O operations, including file handling in Python scripts.

2. The Python Data Types:

- ✓ Students will define and manipulate lists, including reading and changing elements, slicing, concatenation, and list comprehension.
- ✓ They will use built-in functions like range(), len(), sum(), min(), max() and list methods such as append(), extend(), count(), index(), sort(), insert(), pop(), remove(), and reverse().
- ✓ Students will contrast and compare tuples with lists and perform packing/unpacking using tuples.
- ✓ They will manipulate sets using methods like update(), pop(), remove(), and perform set-theoretic operations such as union, intersection, difference, and symmetric difference.
- ✓ Students will define and manipulate strings using various delimiters, indexing, slicing, concatenation, and string methods like strip(), split(), join(), find(), count(), replace(), and string formatting.
- ✓ They will create and manipulate dictionaries using built-in functions and dictionary methods.

3. Problems and Applications:

- ✓ Students will write Python programs to find odd and even numbers and the factors of an integer.
- ✓ They will generate lists of random numbers and compute statistical measures such as mean, variance, and standard deviation.
- ✓ Students will solve quadratic equations to find roots.
- ✓ They will compute the area of a triangle using Heron's formula.
- ✓ Students will check for strong numbers and Armstrong numbers.
- ✓ They will determine the primality of an integer, define a Python function for this purpose, and find all prime numbers within a given range or relative to a given value.
- ✓ Students will implement and understand sorting algorithms like Bubble, Insertion, or Selection sort.
- ✓ They will sum series to a given decimal place (e.g., Sine, Cosine, Exponential).
- ✓ Students will simulate the motion of a particle under a given force using Euler's method and plot graphs using Matplotlib.
- ✓ They will perform matrix operations such as addition, multiplication, and transpose using list comprehension.
- ✓ Students will perform curve fitting, least squares fit, and evaluate the goodness of fit.
- ✓ They will plot polynomial or transcendental functions, identify real roots by plotting, and write Python code to refine a possible root.

4. Introduction to Graph Plotting:

- ✓ Students will use Matplotlib to create basic XY-plots of functions including power laws, exponential functions, trigonometric functions, and hyperbolic functions.

- ✓ They will define Python functions and plot them within a specified domain.
- ✓ Students will create various types of plots such as bar charts, histograms, polar plots, and pie plots.
- ✓ They will plot data from files, save figures, and create subplots and multiple plots.

MI: Mathematical Physics and Mechanics

MI – 1T: Mathematical Physics and Mechanics

1. Differential Equations:

- ✓ Students will understand the concepts of exact and inexact differentials.
- ✓ They will be able to solve first-order linear differential equations using the integrating factor method.
- ✓ Students will solve second-order linear differential equations with constant coefficients.
- ✓ They will find particular integrals for given differential equations.

2. Vector Calculus:

- ✓ Students will learn the properties of vectors under rotations.
- ✓ They will understand the scalar product and its invariance under rotations.
- ✓ Students will interpret the scalar triple product in terms of area and volume.
- ✓ They will differentiate between scalar and vector fields.
- ✓ Students will perform vector differentiation, including the gradient of a scalar field and its geometrical interpretation.
- ✓ They will understand and compute the divergence and curl of a vector field.
- ✓ Students will comprehend the statements of Gauss' divergence theorem, Green's theorem, and Stokes' theorem.

3. Fundamentals of Dynamics:

- ✓ Students will understand the concepts of reference frames and inertial frames.
- ✓ They will apply Galilean transformations and understand Galilean invariance.
- ✓ Students will review and apply Newton's laws of motion.
- ✓ They will analyze the dynamics of a system of particles and the concept of the center of mass.
- ✓ Students will understand non-inertial frames and fictitious forces.

4. Gravitation and Central Force Motion:

- ✓ Students will understand gravitational potential energy and calculate the potential and field due to a spherical shell and solid sphere.
- ✓ They will analyze the motion of a particle in a central force field, including the conservation of angular momentum and constant areal velocity.

5. Rotational Dynamics:

- ✓ Students will understand and apply the perpendicular and parallel axes theorems.

- ✓ They will calculate the radius of gyration and the moment of inertia for rectangular, cylindrical, and spherical bodies.
- ✓ Students will analyze the pure rolling motion of a body on an inclined plane.

6. Motion under Central Forces:

- ✓ Students will understand the two-body problem and its reduction to a one-body problem with a reduced mass.
- ✓ They will define and understand the nature of central forces, including their conservative and spherically symmetric properties.
- ✓ Students will analyze the features of motion under a central force field and solve the differential equation of orbit.
- ✓ They will derive energy expressions and understand the nature of forces from the equation of orbit and vice versa.

7. General Properties of Matter:

- ✓ Students will understand the relationship between various elastic constants.
- ✓ They will analyze the torsion of a cylinder or wire.
- ✓ Students will understand surface tension and surface energy, including concepts like angle of contact, capillarity, and Jurin's law.
- ✓ They will calculate excess pressure and apply it to phenomena like soap bubbles.
- ✓ Students will comprehend the molecular theory of surface tension and methods like the ripple method.
- ✓ They will understand viscosity, Reynold's number, and derive Poiseuille's equation for the flow of liquid through a capillary tube.
- ✓ Students will apply Stoke's law to high viscous liquids.

MI – 1P: Mathematical Physics and Mechanics

1. Measurements of Length (or Diameter) Using Vernier Calipers, Screw Gauge, and Travelling Microscope:

- ✓ Students will understand the principles of precision measurement tools.
- ✓ They will gain proficiency in using vernier calipers, screw gauges, and travelling microscopes for accurate measurements.
- ✓ Students will learn to calculate measurement errors and understand the significance of precision and accuracy in experiments.

2. Determining g and Velocity for a Freely Falling Body Using Digital Timing Technique:

- ✓ Students will understand the principles of free fall and gravitational acceleration.
- ✓ They will use digital timing techniques to measure the time of fall and calculate the acceleration due to gravity.
- ✓ Students will learn to analyze experimental data to determine velocity and acceleration.

3. Studying the Motion of a Spring and Calculating (a) Spring Constant (b) Value of g:

- ✓ Students will understand Hooke's Law and the properties of springs.
- ✓ They will perform experiments to measure the spring constant.

- ✓ Students will calculate the acceleration due to gravity g using the motion of the spring.

4. Determining g by Bar Pendulum:

- ✓ Students will understand the principles of pendulum motion.
- ✓ They will perform experiments using a bar pendulum to measure the period of oscillation.
- ✓ Students will calculate the acceleration due to gravity g from the experimental data.

5. Determining g by Kater's Pendulum:

- ✓ Students will explore the use of Kater's pendulum for precise measurements of gravitational acceleration.
- ✓ They will measure the period of oscillation and calculate g using the properties of Kater's pendulum.
- ✓ Students will compare the results with those obtained from other methods.

6. Determining the Moment of Inertia of a Flywheel:

- ✓ Students will understand the concept of moment of inertia and its significance in rotational dynamics.
- ✓ They will perform experiments to measure the moment of inertia of a flywheel.
- ✓ Students will analyze the rotational motion and calculate the moment of inertia from experimental data.

7. Determining the Modulus of Rigidity of a Wire by Maxwell's Needle / Determining the Elastic Constants of a Wire by Searle's Method:

- ✓ Students will understand the mechanical properties of materials, such as rigidity and elasticity.
- ✓ They will use Maxwell's needle apparatus to measure the modulus of rigidity of a wire.
- ✓ Students will perform experiments using Searle's method to determine the elastic constants of a wire.
- ✓ They will analyze experimental data to calculate the modulus of rigidity and elastic constants.

SEMESTER - II

MJ-2: Foundation of Physics -2

MJ-2T: Foundation of Physics -2:

UNIT – I: Preliminary Classical Mechanics:

1. Introduction to Classical Mechanics:

- ✓ Students will understand the fundamental concepts of classical mechanics and its historical development up to Newton.
- ✓ They will comprehend Newton's laws of motion and apply them to various force laws and corresponding motions.
- ✓ Students will analyze Newton's second law in the context of a system of particles.
- ✓ They will understand the concept of Galilean invariance.
- ✓ Students will calculate work, power, kinetic and potential energies, and distinguish between conservative and dissipative forces.
- ✓ They will study the conservation of linear and angular momentum and understand torque.
- ✓ Students will recognize the limitations of Newton's laws.

2. Dynamics of a System of Particles:

- ✓ Students will understand the concept of the center of mass (c.m.) and calculate its position in simple symmetrical cases.
- ✓ They will differentiate between laboratory and center of mass frames of reference.
- ✓ Students will analyze the effects of external forces and interaction forces between particles.
- ✓ They will understand the motion of the center of mass under external force.
- ✓ Students will calculate kinetic energy and angular momentum in both the center of mass and laboratory frames.
- ✓ They will understand the torque-angular momentum relationship and the conservation of mechanical energy.

3. Rotating Frame of Reference:

- ✓ Students will comprehend the concept of non-inertial frames and fictitious forces.
- ✓ They will understand rotating frames of reference and the effects of Coriolis and centrifugal forces.
- ✓ Students will analyze the Coriolis deflection of particles and its effects on nature, such as the rotation of cyclones.

4. Motion Under Central Forces:

- ✓ Students will understand the two-body problem and its reduction to a one-body problem with a reduced mass.

- ✓ They will define and understand the nature of central forces, including their conservative and spherically symmetric properties.
- ✓ Students will analyze motion under a central force field and solve the differential equation of orbit.
- ✓ They will derive energy expressions and understand the nature of forces from the equation of orbit and vice versa.
- ✓ Students will study motion under inverse square attractive forces, including the polar equation of conics and the dependence of orbits on energy.
- ✓ They will learn Kepler's laws and derive Newton's law of gravitation from Kepler's laws.
- ✓ Students will understand the Laplace-Runge-Lenz vector and the nature of orbits under inverse square repulsive forces.
- ✓ They will analyze equivalent one-dimensional motion and the stability of orbits.

5. Scattering:

- ✓ Students will understand the concepts of two-body collision and scattering.

6. Mechanics of Continuum:

- ✓ Students will understand the kinematics of moving fluids and differentiate between compressible and incompressible fluids.
- ✓ They will comprehend the equation of continuity and the concepts of streamline and turbulent flow.
- ✓ Students will understand Reynold's number and derive Stokes' law from dimensional analysis.
- ✓ They will study Poiseuille's equation and Euler's equation, including the special case of fluid statics.
- ✓ Students will apply principles such as Pascal's law and Archimedes' principle.
- ✓ They will understand and apply Bernoulli's theorem to various fluid mechanics problems.

UNIT – II: Basic Electricity & Magnetism

1. Electric Field and Electric Potential:

- ✓ Students will understand the concept of electric field and Coulomb's law.
- ✓ They will be able to describe electric field lines and calculate electric flux.
- ✓ Students will understand the conservative nature of the electrostatic field and calculate the electrostatic potential.
- ✓ They will determine the potential and electric field of a dipole and compute the force and torque on a dipole.
- ✓ Students will calculate the potential due to linear, surface, and volume charge distributions (e.g., uniform line charge, disc, spherical shell, sphere).
- ✓ They will analyze equipotential surfaces and apply Gauss' Law to charge distributions with spherical, cylindrical, and planar symmetry.
- ✓ Students will solve Laplace's and Poisson's equations in various scenarios.

2. Electrostatic Energy & Capacitors:

- ✓ Students will compute the electrostatic energy of a system of charges and of a charged sphere.
- ✓ They will understand the behavior of conductors and dielectrics in an electrostatic field.
- ✓ Students will analyze surface charge and force on a conductor.
- ✓ They will calculate the capacitance of systems of charged conductors, including parallel-plate capacitors and spherical and cylindrical capacitors.

3. Method of Images:

- ✓ Students will apply the method of images to solve problems involving a point charge near an earthed plane infinite sheet and an earthed spherical conductor.

4. Dielectric Properties of Matter:

- ✓ Students will understand the concept of electric field in matter and polarization.
- ✓ They will calculate polarization charges and understand electrical susceptibility and dielectric constant.
- ✓ Students will work with the displacement vector D and relate it to the electric field E and polarization P.
- ✓ They will apply Gauss' Law in dielectrics and understand the boundary conditions for D and E

5. Lorentz Force:

- ✓ Students will calculate the force on a moving charge in simultaneous electric and magnetic fields.
- ✓ They will analyze the force on a current-carrying conductor in a magnetic field and the trajectory of charged particles in uniform electric and magnetic fields.
- ✓ Students will understand the basic principles of a cyclotron.

6. Magnetic Field:

- ✓ Students will compute the magnetic force between current elements and define the magnetic field B.
- ✓ They will apply Biot-Savart's Law to simple cases like a straight wire and a circular loop.
- ✓ Students will understand the concept of a current loop as a magnetic dipole and its dipole moment.
- ✓ They will apply Ampere's Circuital Law to scenarios involving an infinite straight wire, an infinite planar surface current, and a solenoid.
- ✓ Students will understand the properties of B such as curl and divergence, and analyze the axial vector property of B and its consequences.
- ✓ Students will work with the vector potential and calculate the magnetic force on a point charge, a current-carrying wire, and between current elements, as well as the torque on a current loop in a uniform magnetic field.

7. Magnetic Properties of Matter:

- ✓ Students will understand and calculate magnetization M, magnetic intensity H, and their relation to magnetic susceptibility and permeability.
- ✓ They will qualitatively describe diamagnetism, paramagnetism, and ferromagnetism.
- ✓ Students will understand the B-H loop and calculate hysteresis loss.

SEC 2: Basic Instrumentation
SEC-2P: Basic Instrumentation

1. Basic Ideas of Measurement:

- ✓ Students will understand the concepts of accuracy and precision in data measurement.
- ✓ They will comprehend the sensitivity and range of resolution of various instruments.
- ✓ Students will identify and analyze uncertainties and errors in measurements, including loading effects.

2. Resistances:

- ✓ Students will understand the use and function of carbon resistors, electronic potentiometers, and electrical rheostats.
- ✓ They will apply the potentiometer in a potential divider circuit and understand its practical applications.

3. Analog and Digital Voltmeters and Ammeters:

- ✓ Students will learn the basic construction and principles of voltage and current measurements using analog and digital meters.
- ✓ They will understand the concept of resistances in voltmeters and ammeters across different ranges.
- ✓ Students will gain insights into the working principles of digital meters and their specifications.
- ✓ They will compare the advantages of digital meters over analog meters and understand range changes in meters.

4. Digital Multimeter:

- ✓ Students will understand the block diagram and working principle of a digital multimeter.
- ✓ They will be able to measure resistance, current (both DC and AC), voltage (both DC and AC), inductance, and perform diode and transistor checking using a digital multimeter.

5. Introduction to Electrical Household Wiring:

Concept of Basic Electricity

- ✓ Students will understand power rating and transformer action.

- ✓ They will measure electrical quantities such as voltage, current, resistance, impedance, power factor, and energy.
- ✓ Students will become familiar with various electrical components like PVC wires, conduit pipes, sockets, plugs, switches, fuses, and circuit breakers (MCB, RCCB, ELCB).
- ✓ They will understand the concepts of live, neutral, and earth connections, and the consequences of faulty earth connections.

Circuit Connection and Wiring

- ✓ Students will learn how to perform two-way switching in stairs and bed switch connections.
- ✓ They will understand wiring for fluorescent/LED tube circuits and connections from lamp posts to home distribution boards.
- ✓ Students will assess total load, sub-circuits, and components with specifications, and perform connections for appliances like refrigerators and microwave ovens.
- ✓ They will understand single-phase and three-phase circuits and their applications.

Safety and Security

- ✓ Students will recognize potential fire hazards in electrical circuits and take appropriate precautions.
- ✓ They will learn the safe handling of tools and equipment, fire fighting techniques, and the use of fire extinguishers.

6. One Short Project:

- ✓ Students will plan and estimate power, points, and circuit connections for a real-world application, demonstrating their understanding of electrical wiring and circuit design.

MI-2: Thermal Physics and Statistical Mechanics

MI-2T: Thermal Physics and Statistical Mechanics

1. Thermodynamic Description of System:

- ✓ Students will understand the Zeroth Law of thermodynamics and the concept of temperature.
- ✓ They will learn the First Law of thermodynamics and its implications on internal energy, heat, and work.
- ✓ Students will explore various thermodynamic processes and their applications of the First Law.
- ✓ They will derive and apply the general relation between CP and CV.
- ✓ Students will calculate work done during isothermal and adiabatic processes.
- ✓ They will comprehend compressibility and expansion coefficients.
- ✓ Students will differentiate between reversible and irreversible processes.
- ✓ They will understand the Second Law of thermodynamics and the concept of entropy.

- ✓ Students will analyze Carnot's cycle and theorem.
- ✓ They will evaluate entropy changes in reversible and irreversible processes.
- ✓ Students will interpret entropy-temperature diagrams.
- ✓ They will learn about the Third Law of thermodynamics and the unattainability of absolute zero.

2. Thermodynamic Potentials:

- ✓ Students will understand the concepts of enthalpy, Gibbs, Helmholtz, and internal energy functions.
- ✓ They will derive and apply Maxwell's relations to various thermodynamic processes.
- ✓ Students will explore the Joule-Thompson effect and the Clausius-Clapeyron equation.
- ✓ They will derive expressions for $(C_P - C_V)$ and C_P/C_V.
- ✓ Students will understand and apply TdS equations in thermodynamic problems.

3. Kinetic Theory of Gases:

- ✓ Students will derive and experimentally verify Maxwell's law of distribution of velocities.
- ✓ They will understand the concept of mean free path.
- ✓ Students will explore transport phenomena, including viscosity, conduction, and diffusion.
- ✓ They will comprehend the law of equipartition of energy and apply it to specific heat calculations for mono-atomic and diatomic gases.

4. Theory of Radiation:

- ✓ Students will understand blackbody radiation and spectral distribution.
- ✓ They will derive Planck's law and deduce Wien's distribution law, Rayleigh-Jeans Law, Stefan-Boltzmann Law, and Wien's displacement law from Planck's law.
- ✓ Students will grasp the concept of energy density in the context of radiation.

5. Statistical Mechanics:

- ✓ Students will understand phase space, macrostate, and microstate concepts.
- ✓ They will explore the relationship between entropy and thermodynamic probability.
- ✓ Students will derive and apply Maxwell-Boltzmann law and distribution of velocities.
- ✓ They will understand quantum statistics, including Fermi-Dirac and Bose-Einstein distribution laws.
- ✓ Students will compare and contrast the three statistical distributions: Maxwell-Boltzmann, Fermi-Dirac, and Bose-Einstein.

MI-2P: Thermal Physics and Statistical Mechanics

1. Measurement of Planck's Constant Using Black Body Radiation:

- ✓ Students will understand the principles of black body radiation.
- ✓ They will learn the experimental setup and procedures to measure Planck's constant.

- ✓ Students will gain hands-on experience in using instruments to measure radiation intensity.
- ✓ They will analyze the collected data to estimate Planck's constant accurately.

2. Estimating the Temperature of a Torch Bulb Filament from Resistance Measurement and Verifying Stefan's Law:

- ✓ Students will learn how to measure the resistance of a filament at various temperatures.
- ✓ They will calculate the temperature of the filament using resistance data.
- ✓ Students will verify Stefan's Law by comparing theoretical and experimental results.

3. Studying the Variation of Thermo-EMF Across Two Junctions of a Thermocouple with Temperature:

- ✓ Students will understand the working principle of a thermocouple.
- ✓ They will measure thermo-EMF at different temperatures.
- ✓ Students will analyze the relationship between temperature and thermo-EMF.
- ✓ They will gain practical skills in setting up and using thermocouples.

4. Determining the Coefficient of Thermal Conductivity of Copper by Searle's Apparatus:

- ✓ Students will understand the concept of thermal conductivity.
- ✓ They will use Searle's apparatus to measure the thermal conductivity of copper.
- ✓ Students will learn to analyze experimental data and calculate the coefficient of thermal conductivity.

5. Determining the Coefficient of Thermal Conductivity of a Bad Conductor by Lees and Chorlton's Disc Method:

- ✓ Students will explore the methods to measure the thermal conductivity of bad conductors.
- ✓ They will set up and use Lees and Chorlton's disc apparatus for experiments.
- ✓ Students will analyze data to determine the coefficient of thermal conductivity.

6. Determining the Mechanical Equivalent of Heat (J) by the Method of Callendar and Barne:

- ✓ Students will understand the concept of the mechanical equivalent of heat.
- ✓ They will perform experiments using Callendar and Barne's method to measure J.
- ✓ Students will analyze and interpret experimental data to determine the mechanical equivalent of heat.

Course Outcome (CO) – UG PHYSICS (General) (CBCS)

SEMESTER - I

DSC 1A: Mechanics

DSC 1A -T: Mechanics:

1. Vectors:

- Students will demonstrate proficiency in vector algebra, including addition, subtraction, and scalar multiplication of vectors.
- They will understand the concepts of scalar and vector products and apply them to solve problems in physics and engineering.
- Students will be able to compute derivatives of vectors with respect to a parameter, essential for understanding dynamics and motion in various systems.

2. Ordinary Differential Equations:

- They will solve first-order homogeneous differential equations, which are fundamental in modeling various physical phenomena.
- Students will analyze and solve second-order homogeneous differential equations with constant coefficients, crucial for understanding oscillatory and vibrational motion in systems.

3. Laws of Motion:

- Understanding frames of reference, students will apply Newton's Laws of motion to analyze the dynamics of particles and systems.
- They will calculate the center of mass of objects and systems, essential for understanding their overall motion and behavior.

4. Momentum and Energy:

- Students will demonstrate an understanding of the conservation of momentum and apply it to solve problems involving collisions and interactions between particles.
- They will analyze work and energy in various physical scenarios, including the conservation of energy principles and the motion of rockets.

5. Rotational Motion:

- Understanding angular velocity, torque, and angular momentum, students will apply principles of rotational motion to solve problems involving rotating bodies.
- They will understand and apply the conservation of angular momentum in various physical systems.

6. Gravitation:

- Students will apply Newton's Law of Gravitation to analyze the motion of particles in central force fields.
- They will comprehend Kepler's Laws and apply them to understand the motion of celestial bodies and satellites in orbit.

7. Oscillations:

- Understanding simple harmonic motion (SHM), students will solve differential equations describing SHM and analyze its properties.
- They will comprehend the concepts of kinetic and potential energy, damping, and resonance in oscillatory systems.

8. Elasticity:

- Students will understand Hooke's law and stress-strain diagrams, applying them to analyze the behavior of elastic materials under various loads.
- They will calculate elastic moduli and Poisson's ratio, essential for engineering applications involving materials under stress.

9. Special Theory of Relativity:

- Students will understand the postulates of the Special Theory of Relativity, including the constancy of the speed of light.
- They will analyze phenomena such as length contraction, time dilation, and relativistic addition of velocities, crucial for understanding high-speed motion and relativistic effects.

DSC 1A-P: Mechanics Lab:

Program outcomes for each experiment:

1. Measurements of Length with Vernier Caliper, Screw Gauge, and Travelling Microscope:

- Student will understand and perform accurate measurements using vernier calipers, screw gauges, and travelling microscopes.
- They will learn how to read and interpret measurements with precision.

2. Determination of Building Height using a Sextant:

- Student will be able to apply principles of trigonometry and angular measurements to determine the height of a building using a sextant.
- Student will understand the concepts of angles of elevation and depression.

3. Study of Motion of a Spring:

- Student will be able to determine the spring constant, gravitational acceleration (g), and modulus of rigidity of a spring.
- Student will be able to apply principles of Hooke's Law and simple harmonic motion.

4. Determination of Moment of Inertia of a Flywheel:

- Student will be able to measure and calculate the moment of inertia of a flywheel using experimental methods.
- Student will understand the concept of rotational inertia and its significance.

5. Determination of g and Velocity for a Freely Falling Body using Digital Timing Technique:

- Student will use digital timing techniques to accurately measure the time of fall of a freely falling body.

- They will be able to calculate the gravitational acceleration (g) and velocity of the falling body.

6. Determination of Young's Modulus of a Wire by Optical Lever Method:

- They will measure the elongation of a wire under tension using the optical lever method.
- They will calculate Young's modulus of the wire from the measured values.

7. Determination of Modulus of Rigidity of a Wire by Maxwell's Needle:

- Determine the modulus of rigidity of a wire by measuring its torsional deflection using Maxwell's needle.
- Understand the principles of torsional motion and shear modulus.

8. Determination of Elastic Constants of a Wire by Searle's Method:

- Measure the elastic constants of a wire using Searle's method, which involves applying known loads and measuring the corresponding extensions.
- Understand the relationship between stress, strain, and elastic constants.

9. Determination of g using Bar Pendulum:

- Measure the period of oscillation of a bar pendulum and calculate the gravitational acceleration (g).
- Student will understand the principles of simple harmonic motion and gravitational force.

10. Determination of g using Kater's Pendulum:

- Measure the period of oscillation of a Kater's pendulum and calculate the gravitational acceleration (g).
- Student will understand the principles of compound pendulum motion and gravitational force.

SEMESTER - II

DSC 1B: Electricity and Magnetism

DSC 1B-T: Electricity and Magnetism:

1. Vector Analysis:

Vector Algebra:

- Students will be able to differentiate between scalar and vector quantities.
- Acquire proficiency in performing operations such as addition, subtraction, scalar multiplication, and vector multiplication (both scalar and vector products).
- Can perform application of vector algebra in solving problems across various domains of science and engineering.

Gradient, Divergence, and Curl:

- Students can gather comprehensive understanding of gradient, divergence, and curl operators.
- They can build ability to compute these operators in Cartesian, cylindrical, and spherical coordinate systems.
- They can recognize the physical significance of gradient, divergence, and curl in various contexts, such as fluid flow, electromagnetism, and heat transfer.

Vector Integration:

- Students can gather proficiency in performing line, surface, and volume integrals of vector fields.
- Develop understanding the interpretation of these integrals in terms of flux, circulation, and volume properties.
- Can apply the vector integration techniques to solve problems related to electromagnetism, fluid dynamics, and other physical phenomena.

Application of Gauss-Divergence Theorem and Stoke's Theorem:

- Students can make a clear understanding the statement and significance of Gauss's divergence theorem.
- Develop ability to apply the theorem to evaluate volume integrals by converting them into surface integrals.
- Can apply Gauss's divergence theorem in solving problems related to electric fields, fluid flow, and heat transfer.
- Develop understanding the statement and significance of Stoke's theorem.
- Acquire ability to convert surface integrals to line integrals using Stoke's theorem.
- Can applyStoke's theorem in solving problems related to fluid dynamics, electromagnetism, and circulation phenomena.

2. Electrostatics:

Electrostatic Field and Electric Flux:

- Students can develop a clear concept of electrostatic field and its properties.
- Can build ability to calculate electric field intensity due to different charge distributions using Coulomb's law and superposition principle.
- They can apply the principle of electrostatic field to analyze and solve problems related to charged particles and distributions.
- Students develop proficiency in understanding electric flux and its significance.
- They can be able to calculate electric flux through closed surfaces surrounding charged objects.

Application of Gauss's Theorem of Electrostatics:

- Students can understand the statement and significance of Gauss's theorem in electrostatics.
- They can make successful application of electric flux in Gauss's theorem and its practical implications in analyzing electric fields.
- Can develop ability to apply Gauss's theorem to determine electric fields for various charge distributions, including point charges, infinite lines of charge, uniformly charged spherical shells and solid spheres, plane charged sheets, and charged conductors.
- Can develop knowledge in using Gauss's theorem to simplify the calculation of electric fields in situations with high symmetry.

Electric Potentialand Calculation of Electric Field from Electric Potential:

- Students can make a clear concept of electric potential and its relation to electric field.
- They can be able to calculate electric potential due to different charge distributions, including point charges, electric dipoles, uniformly charged spherical shells and solid spheres.
- They can successfully apply electric potential in solving problems related to energy calculations and capacitance.
- Can build proficiency in determining electric field from electric potential using gradient operator.
- They can develop ability to calculate electric field for various charge distributions based on given electric potential distributions.

Capacitance of Conductors:

- Students make a clear understanding of capacitance and its significance in storing electric charge.
- Can build ability to calculate capacitance for isolated spherical conductors and various capacitor configurations including parallel plate, spherical, and cylindrical capacitors.
- Can apply of capacitance concepts in designing and analyzing capacitor systems.

Energy in Electrostatic Fields:

- Students can make a clear understanding of energy per unit volume in electrostatic fields and its importance.
- Can build ability to calculate energy stored in electric fields for different charge distributions.
- Can apply the energy concepts in analyzing and designing electrostatic systems.

Dielectric Medium and Polarization and Parallel Plate Capacitor with Dielectric:

- Students can make a clear understanding of dielectric medium and its effect on electric fields.
- They can develop a clear idea of polarization concepts and displacement vectors in dielectric materials.
- They can apply Gauss's theorem in dielectrics to analyze electric fields in the presence of dielectric materials.
- Make understanding of the behavior of parallel plate capacitors completely filled with dielectric material.
- Be able to calculate the capacitance and electric field distribution in parallel plate capacitors with dielectric materials.

3. Magnetism:

Biot-Savart's Law:

- Students can develop a clear concept of Biot-Savart's law and its application in calculating the magnetic field produced by steady currents.
- Can build ability to apply Biot-Savart's law to compute magnetic fields generated by straight conductors, circular coils, and solenoids carrying current.
- Can develop proficiency in solving problems involving the magnetic field produced by current-carrying elements.

Application of Divergence and Curl of Magnetic Field:

- They can gather knowledge of divergence and curl of the magnetic field and their significance in magnetostatics.
- Build ability to compute divergence and curl of magnetic fields in various scenarios.
- Develop knowledge to apply of divergence and curl in analyzing the behavior of magnetic fields and understanding their characteristics.

Magnetic Vector PotentialApplication of Ampere's Circuital Law:

- Develop concept of magnetic vector potential and its relation to magnetic field.
- Gather ability to calculate magnetic vector potential for different current distributions.
- Can apply the concept of magnetic vector potential in simplifying calculations and solving problems in magnetostatics.
- Make clear concept of Ampere's circuital law and its significance in magnetostatics.
- Students shall be able to apply Ampere's law to compute magnetic fields around closed loops carrying current.
- Develop proficiency in using Ampere's law to analyze magnetic fields in symmetric current distributions.

Magnetic Properties of Materials:

- Students can understand magnetic intensity, magnetic induction, permeability, and magnetic susceptibility.
- Can develop ability to differentiate between various magnetic materials based on their properties.
- Can acquire introduction to diamagnetic, paramagnetic, and ferromagnetic materials, including their characteristics and behaviors in external magnetic fields.

4. Electromagnetic Induction

Faraday's Laws of Electromagnetic Induction:

- Students can understand Faraday's laws and their significance in explaining the generation of electromotive force (emf) in conductors.
- They are be able to apply Faraday's laws to analyze the induced emf in various scenarios, including moving magnets, changing magnetic fields, and electromagnetic induction phenomena.

Application of Lenz's Law, Self-Inductance and Mutual Inductance:

- Students can comprehension of Lenz's law and its role in determining the direction of induced currents.
- They are be able to apply Lenz's law to predict the direction of induced currents in response to changing magnetic fields.
- Develop proficiency in solving problems involving electromagnetic induction while considering the principles of Lenz's law.
- Can have a clear idea of self-inductance and its significance in circuits containing coils or solenoids.
- They develop ability to calculate the self-inductance of a single coil using appropriate formulas and techniques.
- They can apply self-inductance concepts in analyzing and designing circuits with inductive components.
- Students can develop the idea of mutual inductance and its importance in coupled circuits and calculate the mutual inductance between two coils or circuits.

- Gather knowledge in solving problems involving mutual inductance and its applications in transformers and mutual inductance devices.

Energy Stored in Magnetic Fields:

Students can understand the energy stored in magnetic fields in inductive components.

Develop ability to calculate the energy stored in magnetic fields using appropriate formulas and techniques and can apply the energy stored in magnetic fields in analyzing the behavior of inductive circuits and designing efficient energy storage systems.

5. Maxwell`s equations and Electromagnetic wave propagation

Equation of Continuity of Current and Displacement Current:

- Students can make a clear concept of the equation of continuity and its application in analyzing the flow of electric charge.
- They are able to apply the equation of continuity to derive relationships between current density, charge density, and electric field in various scenarios.
- Develop proficiency in solving problems involving the conservation of electric charge in conducting media.
- They can understand the concept of displacement current and its significance in Maxwell's equations.
- Develop ability to recognize the role of displacement current in maintaining the continuity of electric current in situations involving changing electric fields.
- Can apply the concept of displacement current to analyze and solve problems in electromagnetic fields.

Mastery of Maxwell's Equations:

- Students have a clear understanding Maxwell's equations and their importance in describing electromagnetic phenomena.
- They can develop ability to interpret and apply Maxwell's equations to analyze electric and magnetic fields in various situations, including static and dynamic scenarios.
- They can solve problems involving Maxwell's equations and their applications in electromagnetism.

Poynting Vector and Energy Density in Electromagnetic Fields:

- Students can understand the concept of Poynting vector and its significance in describing the direction and magnitude of energy flow in electromagnetic fields.
- Can develop ability to calculate the Poynting vector to determine the rate of energy transfer per unit area in electromagnetic waves. Also can apply the Poynting vector in analyzing the energy flow and radiation patterns in electromagnetic systems.
- Students can make a clear understanding of energy density in electromagnetic fields and its importance in characterizing the energy content of electric and magnetic fields.
- Acquire ability to calculate energy density in electromagnetic fields using appropriate formulas and techniques.
- Can develop the knowledge to apply of energy density concepts in analyzing the distribution and storage of energy in electromagnetic systems.

Electromagnetic Wave Propagation:

- Students can understand wave propagation through vacuum and isotropic electric media.
- They can analyze the behavior of electromagnetic waves, including their speed, wavelength, and frequency.
- Develop proficiency in solving problems involving the propagation of electromagnetic waves in different media and understanding their implications in communication and radiation.
- They can understand the transverse nature of electromagnetic waves and their polarization states.
- Generate ability to describe the polarization of electromagnetic waves and analyze its effects on wave propagation and interaction with materials. And can able to solve problems involving the polarization of electromagnetic waves and their applications in optics and communication.

DSC 1B-P: Electricity and Magnetism Lab

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c)

DC Current, and (d) checking electrical fuses.

- Students shall understand how to measure resistances, AC and DC voltages, DC current, and check electrical fuses using a multimeter.

2. Ballistic Galvanometer: (i) Measurement of charge and current sensitivity

(ii) Measurement of CDR (iii) Determine a high resistance by Leakage Method

(iv) To determine Self Inductance of a Coil by Rayleigh's Method .

- Students shall build ability to measure charge and current sensitivity.
- They shall understanding of the measurement of Critical Damping Resistance (CDR).
- Students shall develop ability in determining high resistance using the Leakage Method.
- They shall develop capability in determining the self-inductance of a coil using Rayleigh's Method.

3. To compare capacitances using De'Sauty's bridge.

- Students shall built competency in comparing capacitances using De'Sauty's bridge.

4. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).

- They shall built ability to measure the field strength (B) and its variation in a solenoid, including determining dB/dx.

5. To study the Characteristics of a Series RC Circuit

- Students shall develop understanding the behavior and characteristics of a series RC circuit.

6. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor

- Students shall develop proficiency in studying the resonance frequency of a series LCR circuit.
- Students shall develop ability to determine the Quality Factor of a series LCR circuit.

7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q

- They shall develop proficiency in studying the anti-resonant frequency of a parallel LCR circuit.
- They shall built ability to determine the Quality Factor (Q) of a parallel LCR circuit.

8. To determine a Low Resistance by Carey Foster's Bridge.

- Students will develop capability in determining low resistance using Carey Foster's bridge.

9. To verify the Thevenin and Norton theorem

- Students shall develop ability to verify Thevenin's and Norton's theorems experimentally.

SEMESTER - III

DSC-1C (CC-3): Thermal Physics and Statistical Mechanics

DSC 1C-T: Thermal Physics and Statistical Mechanics

Laws of Thermodynamics and Thermodynamic Description of system:

Zeroth Law of Thermodynamics and Temperature

- Students can understand the condition of two systems are in thermal equilibrium with a third system, then they are in equilibrium with each other.
- They can develop the concept of temperature as a measure of the average kinetic energy of particles in a system.
- Allows the construction of a temperature scale based on this principle.

First Law of Thermodynamics and Internal Energy

- They shall learn the energy conservation and transformation also convertability of heat to work and vice versa through various thermodynamic processes
- Students shall learn that the change in internal energy of a system is equal to the heat added to the system minus the work done by the system.
- Knows that Internal energy is the sum of the kinetic and potential energies of the particles in a system.

Various Thermodynamic Processes

- Learn about isothermal, adiabatic, isobaric, and isochoric processes.
- Each process involves specific changes in pressure, volume, and temperature of the system.
- General relationship between specific heat at constant pressure (CP) and specific heat at constant volume (CV) is CP - CV = R, where R is the gas constant.

Work Done during Isothermal and Adiabatic Processes

- Learn about work done during an isothermal process and adiabatic process.
- Can have idea about compressibility is a measure of how much a substance can be compressed.
- Expansion coefficient relates the change in volume of a substance to the change in temperature.
- Knows about reversible processes occur infinitely slowly and can be reversed without leaving any effect on the surroundings. Also about irreversible processes occur spontaneously and result in an increase in entropy.

Second Law of Thermodynamics & Entropy

- Learn about states that the entropy of a closed system always increases over time.
- Learn that Entropy is a measure of the disorder or randomness of a system.

Carnot's Cycle & Theorem, Entropy Changes

- Carnot's cycle is a theoretical thermodynamic cycle that operates between two heat reservoirs and is the most efficient cycle possible.
- Carnot's theorem states that no engine working between two heat reservoirs can be more efficient than a Carnot engine.
- Learn about Entropy changes in reversible processes are zero, while in irreversible processes, entropy always increases.
- Graphical representations showing changes in entropy with temperature for various thermodynamic processes.

Third Law of Thermodynamics

- Learn that as the temperature of a system approaches absolute zero, the entropy of the system approaches a minimum value.

Thermodynamic Potentials:

- Students shall understand the concept of Thermodynamic Potentials.
- They gain a comprehensive understanding of Enthalpy, Gibbs, Helmholtz, and Internal Energy functions as fundamental thermodynamic potentials.
- They shall learn to interpret these potentials in terms of the state of a system and their relationships with temperature, pressure, volume, and entropy.
- They shall analyze Phase Transitions and Equilibrium
- Be able to apply the concepts of Enthalpy, Gibbs, and Helmholtz functions to analyze phase transitions and equilibrium conditions in different systems.
- They shall understand how these potentials help in predicting phase changes, such as vaporization, condensation, and freezing.
- Shall be able to derivation and application of Maxwell's relations in thermodynamics.
- They use Maxwell's relations to establish connections between measurable thermodynamic quantities, facilitating the calculation of properties like entropy, enthalpy, and specific heats.

- Be able to investigate important thermodynamic processes such as the Joule-Thompson Effect and their practical implications.
- Students shall understand the Clausius-Clapeyron Equation and its significance in determining phase transition pressures and temperatures.

Practical Applications and Problem-Solving Skills

- Students shall apply the knowledge of thermodynamic potentials, Maxwell's relations, and equations to solve practical problems in various fields, including chemical engineering, physics, and materials science.
- They develop problem-solving skills to analyze complex thermodynamic systems, predict their behavior under different conditions, and optimize processes for efficiency and sustainability.

Kinetic Theory of Gases:

Maxwell's Law of Distribution of Velocities

- Students gain a deep understanding of the theoretical derivation of Maxwell's Law, which describes the distribution of velocities of gas particles in a system at thermal equilibrium.
- They shall learn the mathematical basis behind the distribution function and its significance in statistical mechanics.
- Students acquire knowledge of experimental techniques used to verify Maxwell's Law of distribution of velocities.
- They explore how experimental observations align with the predictions of the distribution function, validating the theoretical framework of kinetic theory.
- Students shall learn about the concept of mean free path, which represents the average distance a particle travels between collisions in a gas.
- Students shall understand the zeroth-order approximation of mean free path and its significance in characterizing the behavior of gases under varying conditions.
- They shall study the mechanisms of viscosity, thermal conduction, and diffusion in gases.
- They shall able to analyze transport phenomena in the vertical direction to understand how gravity affects the distribution and movement of gas particles.
- They shall explore the mathematical models describing these phenomena and their applications in diverse fields such as fluid dynamics, heat transfer, and mass transport.
- Students learn the Law of Equipartition of Energy, which states that each degree of freedom of a system in thermal equilibrium contributes equally to its total energy.
- They shall capable to apply this principle to analyze the specific heat capacities of gases, including mono-atomic and diatomic gases.
- Students shall understand how the distribution of energy among different degrees of freedom influences the thermal behavior and properties of gases, providing insights into their heat capacity and thermodynamic processes.

Theory of Radiation

- Students shall gain a thorough understanding of blackbody radiation as the emission of electromagnetic radiation from a perfect absorber and emitter of radiation.
- Learn about the characteristics of blackbody radiation, including its spectral distribution and dependence on temperature.
- Students shall understand the spectral distribution of blackbody radiation, which describes the intensity of radiation emitted at different wavelengths.
- They shall be able to describe the concept of energy density, which quantifies the energy per unit volume or per unit frequency interval of blackbody radiation.
- Students shall learn the theoretical derivation of Planck's law, which describes the spectral distribution of blackbody radiation.
- They are capable to explain the significance of Planck's constant and temperature in the expression of the law, and how it accounts for the observed behavior of blackbody radiation.
- Students gather knowledge about Wien's distribution law, which provides a relationship between the wavelength of maximum emission and temperature for blackbody radiation.
- They shall develop understanding about the Rayleigh-Jeans Law, which approximates the spectral distribution of blackbody radiation at long wavelengths and low frequencies.
- They shall study the Stefan-Boltzmann Law, which relates the total energy radiated per unit surface area of a blackbody to its temperature.
- Students learn Wien's displacement law, which states the relationship between the wavelength of maximum emission and the temperature of a blackbody.
- Students acquire understanding aboutthese laws are deduced from Planck's law and their significance in describing the behavior of blackbody radiation across different temperatures and wavelengths.

Statistical Mechanics

Phase Space, Macrostate, and Microstate

- Students gain a comprehensive understanding of phase space as the space of all possible states of a system, characterized by position and momentum coordinates.
- Students shall learn the concepts of macrostate and microstate in statistical mechanics, where a macrostate describes the overall state of a system, while a microstate specifies the precise configuration of its individual particles.
- They shall study entropy as a measure of the disorder or randomness of a system, directly related to the number of microstates consistent with a given macrostate.
- Students shall understand thermodynamic probability as the probability of finding a system in a particular macrostate, proportional to the number of microstates associated with that macrostate.

Maxwell-Boltzmann Law - Distribution of Velocity

- Students shall learn about the Maxwell-Boltzmann distribution, which describes the distribution of velocities of particles in an ideal gas at thermal equilibrium.

- They shall understand the factors influencing the shape of the distribution curve, including temperature and mass of the particles.

Quantum Statistics

- Students shall study quantum statistics, which describe the behavior of particles obeying quantum mechanics principles, such as electrons and photons.
- They shall learn the Fermi-Dirac distribution law, which governs the distribution of fermions (such as electrons) in a system, accounting for the Pauli exclusion principle.
- They shall understand the Bose-Einstein distribution law, applicable to bosons (such as photons), which allows multiple particles to occupy the same quantum state.
- They shall be able to analyze and compare the Maxwell-Boltzmann, Fermi-Dirac, and Bose-Einstein statistics in terms of their applicability to different types of particles and systems.
- Students shall understand the distinct characteristics of each distribution, including the effects of particle indistinguishability, quantum statistics, and degeneracy.

DSC 1C-P: Thermal Physics and Statistical Mechanics Lab:

1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.

- Students will obtain accurate measurements of electrical power input and heat generated.
- They shall be able to analyze the data to determine the mechanical equivalent of heat by comparing the electrical energy input with the heat produced.

2. Measurement of Planck's constant using black body radiation:

- They shall measure the intensity of black body radiation at different wavelengths.
- Students shall analyze the data using Planck's law and fitting techniques to determine Planck's constant.

3. To determine Stefan's Constant:

- Students shall measure the total radiation emitted by a black body at various temperatures.
- Students shall analyze the data to determine Stefan's constant by fitting the results to the Stefan-Boltzmann law.

4. To determine the coefficient of thermal conductivity of copper by Searle's apparatus:

- Students shall be able to measure the temperature difference across a copper rod of known length and area.
- They shall apply heat to one end of the rod and measure the rate of heat flow.
- They shall calculate the coefficient of thermal conductivity using Fourier's Law.

5. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method:

- Students shall measure the thermal conductivity of a thin copper foil using the Angstrom method which involves measuring temperature gradient across the sample under steady-state conditions.

6. **To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method:**
   - Students shall measure the rate of temperature rise of a disc of known material and dimensions when heat is applied.
   - Students shall calculate the thermal conductivity using the formula specific to Lee and Charlton's method.
7. **To determine the temperature co-efficient of resistance by Platinum resistance thermometer:**
   - Students shall learn how to measure the resistance of the platinum resistance thermometer at different temperatures.
   - Analyze the data to determine the temperature coefficient of resistance.
8. **To study the variation of thermo emf across two junctions of a thermocouple with temperature:**
   - Students shall measure the temperature difference across the two junctions of the thermocouple.
   - They will record the corresponding thermoelectric voltage and analyze the data to study the relationship between temperature and thermoelectric voltage.
9. **To record and analyze the cooling temperature of a hot object as a function of time using a thermocouple and suitable data acquisition system:**
   - Students shall record temperature data at regular intervals as the hot object cools down and analyze the temperature-time curve to understand the cooling behavior of the object.
10. **To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge:**
    - Students shall apply a known temperature to the RTD.
    - They shall measure the resistance of the RTD using an off-balance bridge or null method and determine the relationship between resistance and temperature to calibrate the RTD.

SEMESTER - IV

DSC-1D (CC-4): Waves and Optics

DSC 1D-T: Waves and Optics

1. Superposition of Two Collinear Harmonic oscillations

Course Outcome of Linearity and Superposition Principle:

Linearity and Superposition Principle:

- Students can develop concept of the concept of linearity and superposition principle in physics.

- They are able to recognize linear systems and understand their behavior under varying inputs.
- Acquire proficiency in applying the superposition principle to analyze complex systems by considering individual contributions from different sources.

Analysis of Oscillations with Equal Frequencies:

- Students can analyze oscillations with equal frequencies and their behavior under superposition.
- Can develop ability to understand the constructive and destructive interference patterns that result from the superposition of oscillations with equal frequencies.
- Can solve problems involving oscillations with equal frequencies and applying the superposition principle to determine resultant oscillations.

Beats (Oscillations with Different Frequencies):

- Students can develop idea of beats phenomenon arising from the superposition of oscillations with slightly different frequencies.
- Develop ability to calculate beat frequencies and understand their physical significance. Be able to solve problems involving beats phenomenon and analyzing the resulting amplitude modulation in waveforms.

Linearity and Superposition Principle:

- Develop ability to apply the linearity and superposition principle to analyze complex systems composed of multiple oscillatory components.
- Gather knowledge in using the principle to predict the behavior of systems under various conditions and inputs.

2. Superposition of Two Perpendicular Harmonic Oscillations

Graphical Methods and Analytical Methods:

- Students can have Ability in using graphical techniques to represent and analyze data, functions, and relationships.
- They develop Capacity to plot various types of graphs, including line graphs, bar graphs, scatter plots, and histograms.
- They can understand graphical analysis techniques such as curve fitting, interpolation, and extrapolation.
- Develop skill of analytical methods for solving mathematical problems and analyzing data.
- Gather Aptitude to apply analytical techniques such as differentiation, integration, and algebraic manipulation to solve equations and equations systems.
- They dvelop expertise in using analytical methods to derive mathematical models and equations from experimental data or theoretical principles.

Lissajous Figures and Analysis of Lissajous Figures with Equal Frequencies:

- Students Graspthe idea of Lissajous figures and their significance in representing harmonic motion.

- Develop ability to generate Lissajous figures using graphical methods or mathematical equations and understand the relationship between the frequencies and phase differences of oscillatory systems and the resulting Lissajous figures.
- They can develop Skill in analyzing Lissajous figures generated by oscillations with equal frequencies and can interpret the shapes and patterns of Lissajous figures with equal frequencies.
- Develop understanding of the physical significance of Lissajous figures with equal frequencies in characterizing phase relationships and harmonic motion.

Analysis of Lissajous Figures with Unequal Frequencies:

- Students can analyzeLissajous figures generated by oscillations with unequal frequencies.
- They improve ability to interpret the shapes and patterns of Lissajous figures with unequal frequencies, including the formation of beats.
- They have a clear understanding of the various applications of Lissajous figures in physics, engineering, and signal analysis and generate ability to use Lissajous figures to visualize and analyze phase relationships, frequency ratios, and amplitude modulation in oscillatory systems.

3. Waves Motion- General

Transverse Waves:

- Students can have a clear idea of the concept of transverse waves and their characteristics and are able to differentiate between transverse and longitudinal waves.
- Build proficiency in analyzing the behavior of transverse waves on a string, including their propagation and reflection.

Analysis of Travelling Waves and Standing Waveson a String:

- Develop proficiency in understanding the concept of travelling waves and their representation on a string.
- Build ability to calculate the velocity, frequency, wavelength, and amplitude of travelling waves.
- They can solve problems involving the superposition of travelling waves and their interference patterns.
- Students can understand standing wave patterns formed on a string fixed at both ends and can calculate the frequencies and wavelengths of standing waves based on the boundary conditions.
- They understandnormal modes of vibration of a string and their significance.
- They are able to calculate the frequencies and wavelengths of normal modes based on the string's length, tension, and mass per unit length.

Analysis of Group Velocity and Phase Velocity:

- Students can understand group velocity and phase velocity concepts in wave propagation.

- Can build ability to calculate group and phase velocities for waves on a string and other wave media.

Plane Waves and Spherical Waves:

- Students can graspthe idea of plane waves and their characteristics in wave propagation.
- Can build ability to analyze the mathematical representation and physical properties of plane waves.
- They can understand the idea of spherical waves and their behavior in wave propagation.
- Gather ability to calculate the intensity, amplitude, and directionality of spherical waves.

4. Fluids

Surface Tension, Spherical and Cylindrical Drops and Bubbles:

- Students can understand the concept of surface tension and its physical origin.
- They develop ability to differentiate between synclastic and anticlastic surfaces and their implications for surface tension.
- Understand excess pressure in curved surfaces and its relationship with surface tension and can apply surface tension concepts to analyze the behavior of spherical and cylindrical drops and bubbles and calculate the excess pressure inside drops and bubbles based on their curvature.
- They can understand Laplace's law and its application in determining the pressure difference across curved interfaces.

Variation of Surface Tension with Temperature:

- Students can grasp the variation of surface tension with temperature and able to analyze the temperature dependence of surface tension using empirical and theoretical models.
- Develop understanding of Jaeger's method for measuring surface tension.

Viscosity and Rate Flow of Liquid in a Capillary Tube:

- Students understand the concept of viscosity and its physical significance.
- Make ability to differentiate between viscous and non-viscous fluids.
- Understand the molecular origins of viscosity and its role in fluid flow.
- Develop skill in analyzing the rate of flow of liquids in capillary tubes.
- They can derive and apply Poiseuille's formula to calculate the flow rate.
- They study the experimental techniques for determining the coefficient of viscosity of a liquid and able to perform viscosity measurements using viscometers and other experimental setups.
- They learn the variation of viscosity with temperature.

5. Sound

- Students can understand the concept of simple harmonic motion (SHM) and its application in various physical systems.

- They can analyze forced vibrations and resonance phenomena in mechanical and electrical systems.
- They can apply Fourier's theorem to decompose complex periodic signals into simpler sinusoidal components.
- They can evaluate the intensity and loudness of sound waves, including the concept of decibels and intensity levels.
- They are able toexplain the relationship between musical notes, musical scales, and the frequency components of sound waves.
- Analyze the acoustics of buildings, including the concepts of reverberation and time of reverberation and can calculate absorption coefficients using Sabine's formula to design spaces with desirable acoustic properties.
- They implement techniques for measuring reverberation time in halls and auditoria. And assess the acoustic aspects of halls and auditoria for optimal sound quality and audience experience.

Wave Optics and Interference:

- Students can define the electromagnetic nature of light and understand its properties as a wave phenomenon.
- Students can explain the concept of a wavefront and its significance in understanding the propagation of light.
- They can apply Huygens' principle to predict the propagation of light waves through various mediums and obstacles.
- Can analyze interference phenomena, including division of amplitude and division of wavefront.
- They interpret Young's double-slit experiment to demonstrate the wave nature of light and observe interference patterns.
- Students can investigate interference phenomena using Lloyd's mirror and Fresnel's biprism setups.
- Students can understand phase changes upon reflection using Stokes' treatment and its implications in interference.
- Students can explore interference in thin films, including parallel and wedge-shaped films, and analyze resulting interference patterns and examine fringes of equal inclination (Haidinger fringes) and fringes of equal thickness (Fizeau fringes) and their applications.
- Students can apply Newton's rings experiment to measure the wavelength and refractive index of a medium using interference patterns.

Michelson's Interferometer:

- Students gain an understanding of the various forms of fringe patterns observed in interference experiments.
- They can explore methods for calculating wavelength differences between interfering light waves using fringe patterns and understand how fringe patterns can be utilized to determine the refractive index of a medium.

Diffraction and Polarization:

- Students can understand the principles of Fraunhofer diffraction and its application to single-slit and double-slit configurations.
- Students can analyze the diffraction patterns produced by multiple slits and diffraction gratings and their applications in optics.
- They can understand Fresnel diffraction phenomena, including the concept of half-period zones and the formation of Fresnel pattern and learn to analyze and interpret Fresnel diffraction patterns using half-period zone analysis for various geometries such as straight edges, slits, and wires.
- They van investigate the transverse nature of light waves and comprehend their polarization state and acquire knowledge of the production and analysis of plane-polarized light, including the use of polarizers and analyzers.
- Students can understand circular and elliptical polarization states of light and their significance in various optical applications.

DSC 1D-P: Waves and Optics Lab

1. To investigate the motion of coupled oscillators:

- Students Shall understand the behavior of coupled oscillators.
- They shall analyze the relationship between the oscillation frequencies and damping effects.
- They Gain insights into resonance phenomena in coupled oscillatory systems.

2. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify λ^2 – T Law:

- Students Shall understand the principles of Melde's experiment.
- They shall determine the frequency of the tuning fork using the experiment.
- They shall verify the relationship between frequency, tension, and wavelength as per the λ^2 – T law.

3. To study Lissajous Figures:

- Students shall understand the generation of Lissajous figures through the superposition of two harmonic oscillations.
- They shall analyze the relationship between the frequencies and phases of the oscillations.

4. Familiarization with Schuster`s focusing; determination of the angle of prism:

- Students shall understand the concept of Schuster's focusing method and determine the angle of a prism using the Schuster's focusing technique.

5. To determine the Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method):

- Understand Poiseuille's method for measuring viscosity.
- Students shall determine the coefficient of viscosity of water by measuring the flow rate through a capillary tube.

6. To determine the Refractive Index of the Material of a given Prism using Sodium Light:

- Students shall understand the principle of measuring refractive index using a prism.
- They are capable to determine the refractive index of the material of the prism using sodium light.

7. To determine Dispersive Power of the Material of a given Prism using Mercury Light:

- Students Shall understand the concept of dispersive power and determine the dispersive power of the material of the prism using mercury light.

8. To determine the value of Cauchy Constants of a material of a prism:

- Students shall understand Cauchy's equation relating refractive index to wavelength.
- They shall be able to determine the Cauchy constants of the material of the prism using experimental data.

9. To determine the Resolving Power of a Prism:

- Students shall understand the concept of resolving power in optics and determine the resolving power of the prism experimentally.

10. To determine the wavelength of sodium light using Fresnel Biprism:

- Students shall understand the principle of interference using a Fresnel biprism and measure the wavelength of sodium light using the interference fringes produced by the biprism.

11. To determine the wavelength of sodium light using Newton's Rings:

- Students shall understand the formation of Newton's rings and will measure the wavelength of sodium light using the pattern of Newton's rings.

12. To determine the wavelength of Laser light using Diffraction of Single Slit:

- Students shall understand the principle of single-slit diffraction and are capable to measure the wavelength of laser light using the diffraction pattern produced by a single slit.

13. To determine wavelength of (1) Sodium & (2) spectrum of Mercury light using plane diffraction Grating:

- Students shall understand the principles of diffraction grating and be able to measure the wavelengths of sodium and mercury light using the diffraction pattern produced by the grating.

14. To determine the Resolving Power of a Plane Diffraction Grating:

- Students shall understand the concept of resolving power for a diffraction grating and be able to determine the resolving power of the diffraction grating experimentally.

15. To measure the intensity using photosensor and laser in diffraction patterns of single and double slits:

- Students shall understand the principles of diffraction and will measure the intensity distribution in the diffraction patterns produced by single and double slits using a photosensor and laser setup.

SEMESTER - V

DSE-1: Elements of Modern Physics

DSE1-T: Elements of Modern Physics

- Students understand Planck's quantum hypothesis and its implications in explaining blackbody radiation and comprehend Planck's constant and its significance in quantum mechanics.
- They can explain the concept of light as a collection of photons and its application in understanding the photoelectric effect and Compton scattering and its role in validating the particle nature of light, as well as the conservation of momentum and energy.
- They can understand the concept of matter waves proposed by de Broglie and relate it to the wave-particle duality of quantum particles and can calculate the de Broglie wavelength of particles and understand its significance in quantum mechanics.
- They can learn Davisson-Germer experiment and its role in confirming the wave nature of matter, particularly electrons and analyze diffraction patterns produced by electrons and their interpretation in terms of wave-particle duality.
- They can relate the principles of quantum mechanics to the behavior of both particles and waves at the atomic and subatomic levels.

Problems with Rutherford model

- Students can understand the instability of atoms and the need to explain the observed discrete atomic spectra.
- They can understand the historical development leading to Bohr's model as a solution to the problem of atomic stability and explain Bohr's quantization rule and its significance in stabilizing atomic orbits.
- Students can understand the concept of quantized energy levels in atoms and their role in determining atomic stability and can apply Bohr's quantization rule to calculate energy levels for hydrogen-like atoms and predict their spectra.
- Students understand the principles governing the emission and absorption of photons by atoms and can interpret the spectral lines observed in the emission and absorption spectra of hydrogen and hydrogen-like atoms.
- They can compare Bohr's model with classical mechanics and appreciate its successes and limitations and can analyze experimental evidence supporting Bohr's model and its contributions to the advancement of atomic theory.

Position measurement

- Students can understand the concept of wave-particle duality and its implications for the behavior of particles at the quantum level and analyze the Heisenberg uncertainty principle and its role in defining the limitations of simultaneously measuring a particle's position and momentum.
- They can understand the impossibility of precisely determining a particle's trajectory due to the uncertainty principle and apply the uncertainty principle to estimate the minimum energy of a confined particle within a given region.

- Students explore the relationship between the uncertainty in energy and the uncertainty in time, as described by the energy-time uncertainty principle.
- Students can understand thought experiments, such as the gamma ray microscope, to illustrate the challenges of measuring the position of particles at microscopic scales.
- They can explore the philosophical and conceptual implications of the uncertainty principle on our understanding of the nature of reality and understand the importance of the uncertainty principle in shaping modern physics and its role in challenging classical notions of determinism and causality.
- Students can understand the principles of the two-slit interference experiment and its application not only to light (photons) but also to matter waves, including atoms and particles.
- They can analyze the concept of linear superposition principle as a consequence of interference phenomena, both in classical wave theory and in quantum mechanics.
- Students can explore the concept of matter waves and their wave amplitudes, linking the behavior of particles to wave-like properties as described by de Broglie's hypothesis.
- They can gain proficiency in solving the Schrödinger equation for non-relativistic particles, including understanding the role of momentum and energy operators in quantum mechanics.
- Students are able to interpret stationary states, wave functions, and their physical significance, including probabilities and normalization, and analyze the probability and probability current densities in one dimension to understand the distribution and flow of particles in quantum systems.

One dimensional infinitely rigid box

- Students can understand the concept of a one-dimensional infinitely rigid box as a simplified model for quantum mechanical systems confined within a potential well.
- They can analyze the quantization of energy levels within the rigid box, including the derivation of the allowed energy eigenvalues and eigenfunctions.
- They gain proficiency in solving the Schrödinger equation for the rigid box potential and calculating the corresponding energy eigenvalues and eigenfunctions.
- Student explore the implications of quantized energy levels within the rigid box, including the interpretation of wave functions and the physical significance of energy states.
- They can apply the principles learned from the one-dimensional rigid box model to understand the behavior of particles in other confined quantum systems and to analyze experimental observations related to quantum confinement effects.
- Students can understand the size and structure of the atomic nucleus and its relationship with atomic weight, including the composition of protons and neutrons within the nucleus.
- They can analyze the impossibility of an electron being in the nucleus as a consequence of the Heisenberg uncertainty principle, and appreciate the role of quantum mechanics in understanding atomic structure.
- They can explore the nature of the nuclear force, including its short-range nature and its role in binding nucleons together within the nucleus.
- They can interpret the NZ graph (number of protons vs. number of neutrons) and understand its significance in predicting the stability of atomic nuclei.

- They can apply the semi-empirical mass formula to calculate the binding energy of atomic nuclei and analyze its implications for nuclear stability, nuclear reactions, and the energy released in nuclear processes.

Radioactivity:

- Students can understand the factors influencing the stability of atomic nuclei, including the balance between the strong nuclear force and the electromagnetic repulsion between protons.
- They can analyze the law of radioactive decay and its application in predicting the decay rate of unstable nuclei over time.
- They can calculate and interpret mean life and half-life values, and understand their significance in describing the rate of decay of radioactive isotopes.
- Students will explore α decay and β decay processes, including the energy released, decay spectra, and the role of the Pauli exclusion principle in β decay and the prediction of neutrinos.
- Students develop the knowledge about γ-ray emission accompanying radioactive decay processes and understand its role in releasing excess energy from excited nuclei, as well as its importance in nuclear spectroscopy and imaging techniques.

Fission and fusion

- Students will understand the concept of mass deficit in nuclear reactions and its relationship with Einstein's theory of relativity, particularly the equivalence of mass and energy ($E=mc^2$), and appreciate how this leads to the generation of energy in nuclear processes.
- They will be able to analyze the process of nuclear fission, including the nature of fragments produced, the release of energy, and the emission of neutrons, and understand its significance in both energy production and nuclear weapons.
- They can understand the operation of nuclear reactors, focusing on the interaction of slow neutrons with Uranium-235 nuclei, and understand the principles underlying controlled nuclear fission reactions for power generation.
- They shall understand nuclear fusion and thermonuclear reactions, including the fusion of light nuclei to form heavier ones and the release of energy, and understand its potential as a clean and efficient energy source.

- Students can explain the challenges and prospects associated with nuclear fusion as a sustainable energy solution, including the current state of research and development efforts towards achieving practical fusion power plants

DSE1-P: Elements of Modern Physics Lab

1. To determine the value of Boltzmann constant using V-I characteristic of PN diode:

- Students shall understand the behavior of a PN diode under varying voltage and current conditions and analyze the V-I characteristic curve to determine the Boltzmann constant.

2. To determine the work function of material of filament of directly heated vacuum diode:

- Students shall understand the principles of directly heated vacuum diodes and analyze the relationship between temperature and emission of electrons to determine the work function of the filament material.

3. To determine the value of Planck's constant using LEDs of at least 4 different colors:

- Students shall understand the relationship between the energy of photons emitted by LEDs and their wavelengths and use the energy-wavelength relationship to determine Planck's constant.

4. To determine the ionization potential of mercury:

- Students shall understand the process of ionization in mercury atoms and are able to measure the energy required to ionize mercury atoms to determine the ionization potential.

5. To determine the wavelength of H-alpha emission line of Hydrogen atom:

- Students shall understand the atomic structure of hydrogen and the emission spectrum.
- They shall measure the wavelength of the H-alpha emission line using spectroscopic techniques.

6. To determine the absorption lines in the rotational spectrum of Iodine vapor:

- Students shall understand the principles of rotational spectroscopy and be able to identify and analyze the absorption lines in the rotational spectrum of iodine vapor.

7. To study the diffraction patterns of single and double slits using laser source and measure its intensity variation using Photo-sensor and compare with incoherent source – Na light:

- Students shall understand the principles of diffraction and interference and be able to measure and analyze the intensity variations in diffraction patterns produced by single and double slits using both laser and incoherent light sources.

8. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light:

- Students shall understand the principles of the photoelectric effect.
- They shall measure the photo current as a function of light intensity and wavelength and determine the maximum energy of photoelectrons as a function of light frequency.

9. To determine the value of e/m by magnetic focusing:

- Students shall understand the principles of magnetic focusing of charged particles and be able to measure the trajectory of charged particles in a magnetic field to determine the charge-to-mass ratio.

10. To set up the Millikan oil drop apparatus and determine the charge of an electron:

- Students shall understand the principles of the Millikan oil drop experiment and are be able to measure the charge of individual oil droplets and use the data to determine the charge of an electron.

SEC-3: Renewable Energy and Energy Harvesting

SEC-3T: Renewable Energy and Energy Harvesting:

1. Understanding of Solar Energy Systems:

- Students will comprehend the importance of solar energy and its various applications.
- They will understand the principles behind solar pond, solar water heaters, flat plate collectors, solar distillation, solar cookers, solar greenhouses, and solar cells.
- Proficiency in storage techniques of solar energy and the operation of absorption air conditioning systems.

2. Knowledge of Photovoltaic (PV) Systems:

- Students will understand the need and characteristics of photovoltaic (PV) systems.
- They will be able to analyze PV models, equivalent circuits, and the operation of sun tracking systems.

3. Understanding of Wind Energy Harvesting:

- Students will grasp the fundamentals of wind energy and wind turbines.
- They will understand the different electrical machines used in wind turbines, power electronic interfaces, and grid interconnection topologies.

4. Comprehension of Ocean Energy Systems:

- Students will understand the potential of ocean energy compared to wind and solar energy.
- They will learn about wave characteristics and statistics, wave energy devices, tide characteristics, tide energy technologies, ocean thermal energy, osmotic power, and ocean biomass.

5. Knowledge of Geothermal Energy:

- Students will understand geothermal resources and technologies.
- They will be able to analyze the environmental impact of geothermal power sources.

6. Understanding of Hydro Energy Systems:

- Students will grasp the resources and technologies involved in hydropower.
- They will analyze the environmental impact of hydroelectric power sources.

7. Proficiency in Piezoelectric Energy Harvesting:

- Students will understand the physics and characteristics of the piezoelectric effect.
- They will be able to describe the materials and mathematical models associated with piezoelectricity.
- Proficiency in analyzing piezoelectric parameters, modeling piezoelectric generators, and their applications, including human power harvesting.

8. Knowledge of Electromagnetic Energy Harvesting:

- Students will comprehend the principles and mathematical models of linear generators.
- They will understand recent applications of electromagnetic energy harvesting.

9.Understanding of Carbon Capture Technologies:

- Students will understand the principles behind carbon capture technologies, including cells, batteries, and power consumption.
- They will analyze the environmental issues associated with renewable energy sources and evaluate their sustainability.

SEC-2P: Renewable Energy and Energy Harvesting Lab:

1. Training Modules on Renewable Energy:

- Students will understand the principles and applications of solar energy, wind energy, and other renewable energy sources.

- They will be able to demonstrate practical knowledge through interactive training modules.
- Proficiency in explaining the importance, operation, and applications of each renewable energy source.

2. Conversion of Vibration to Voltage using Piezoelectric Materials:

- Students will comprehend the concept of piezoelectricity and its application in energy harvesting.
- They will be able to demonstrate the conversion of mechanical vibration into electrical energy using piezoelectric materials.
- Understanding of the working principles and potential applications of piezoelectric energy harvesting systems.

3. Conversion of Thermal Energy into Voltage using Thermoelectric Modules:

- Students will understand the principles of thermoelectricity and its application in energy conversion.
- They will be able to demonstrate the conversion of heat energy into electrical energy using thermoelectric modules.
- Proficiency in explaining the working principles and efficiency of thermoelectric energy conversion systems.

SEMESTER - VI

DSE-2: Nuclear & Particle Physics

DSE2-T: Nuclear & Particle Physics

General Properties of Nuclei:

- Student will learn about the constituents of the nucleus, including protons and neutrons, and their intrinsic properties such as spin and isospin.
- They will understand quantitative facts about nuclear size, mass, and charge density, and how these properties relate to nuclear stability.
- Students will explore the concept of binding energy, including average binding energy and its variation with mass number, and analyze the main features of the binding energy versus mass number curve.
- They will study the N/A plot, angular momentum, parity, magnetic moment, electric moments, and nuclear excited states.

Nuclear Models:

- Students will be introduced to the Liquid Drop Model approach and the Semi-Empirical Mass Formula, understanding the significance of various terms in predicting nuclear properties and stability.
- They will learn about the conditions of nuclear stability and explore two-nucleon separation energies.

- Students will delve into the Fermi Gas Model, understanding degenerate Fermion gas and the nuclear symmetry potential, and gather evidence for nuclear shell structure and magic numbers.
- They will grasp the basic assumptions of the Shell Model, the concept of mean field, residual interaction, and the nature of the nuclear force.

Radioactivity Decay:

- They will understand the basics of α-decay processes, the theory of α-emission, the Gamow factor, and the Geiger-Nuttall law.
- Students will explore α-decay spectroscopy and study β-decay processes, including energy kinematics, positron emission, electron capture, and the neutrino hypothesis.
- They will learn about gamma decay, gamma ray emission, kinematics, and internal conversion.

Nuclear Reactions:

- Students will categorize types of nuclear reactions and understand conservation laws such as energy, momentum, and charge.
- They will analyze the kinematics of reactions, calculate Q-values, determine reaction rates, and comprehend reaction cross-sections.
- Students will differentiate between compound and direct reactions, resonance reactions, and Coulomb scattering.

Interaction of Nuclear Radiation with Matter:

- They will learn about energy loss due to ionization using the Bethe-Bloch formula, as well as energy loss of electrons and Cerenkov radiation.
- Students will understand gamma ray interaction through matter, including the photoelectric effect, Compton scattering, and pair production.
- They will explore neutron interaction with matter and its effects.

Detectors for Nuclear Radiations:

- Students will understand the principles behind gas detectors, estimating electric fields, and particle mobility in ionization chambers and GM Counters.
- They will grasp the basic principles of scintillation detectors and the construction of photomultiplier tubes (PMTs).
- Students will learn about semiconductor detectors (Si & Ge) for charge particle and photon detection, including concepts of charge carriers and mobility.

Particle Accelerators:

- They will explore accelerator facilities available in India, including Van de Graaff generators (Tandem accelerators), linear accelerators, cyclotrons, and synchrotrons.

Particle Physics:

- Students will delve into particle interactions, understanding basic features and types of particles and their families.
- They will explore symmetries and conservation laws, including energy and momentum conservation, angular momentum conservation, parity, baryon number, lepton number, isospin, strangeness and charm, and the concept of the quark model, color quantum number, and gluons.

Course Outcomes (COs)
of 3-Year B.Sc. Multidisciplinary Studies with Physics
Under CCFUP-2023 & NEP-2020

SEMESTER - I

MJ-A1/B1: Mathematical Methods and Mechanics (including STR)

MJ-A1/B1T: Mathematical Methods and Mechanics (including STR)

1. Differential Equations:

- ✓ Students will understand the classification and solutions of differential equations.
- ✓ They will learn to solve first-order linear differential equations using the integrating factor method.
- ✓ Students will tackle second-order linear differential equations with constant coefficients and find particular integrals for non-homogeneous equations.
- ✓ Application of these techniques to physical problems will be emphasized.

2. Vector Calculus:

- ✓ Students will gain a solid understanding of vector algebra and calculus.
- ✓ They will learn to compute and interpret gradients, divergences, and curls of vector fields.
- ✓ Applications of vector calculus to physical problems, including fluid dynamics and electromagnetism, will be covered.
- ✓ Students will understand the significance of Gauss', Green's, and Stokes' theorems in vector calculus.

3. Fundamentals of Dynamics:

- ✓ Students will understand the principles of dynamics and reference frames.
- ✓ They will explore the transformation laws between different reference frames, including inertial and non-inertial frames.
- ✓ The concept of fictitious forces in non-inertial frames will be introduced.
- ✓ Students will apply Newton's laws of motion to systems of particles and understand the significance of the center of mass frame.

4. Gravitation and Central Force Motion:

- ✓ Students will understand the principles of gravitation and central force motion.
- ✓ They will analyze the gravitational potential energy and fields generated by spherical shells and solid spheres.
- ✓ The motion of particles under central force fields will be studied, emphasizing the conservation of angular momentum and areal velocity.

5. Rotational Dynamics:

- ✓ Students will understand the principles of rotational dynamics.
- ✓ They will learn to calculate the moment of inertia for different geometries using perpendicular and parallel axes theorems.
- ✓ The concept of radius of gyration will be introduced.
- ✓ Applications to real-world problems, such as the rolling motion of bodies on inclined planes, will be explored.

6. Motion Under Central Forces:

- ✓ Students will understand the dynamics of two-body problems and central force fields.
- ✓ They will reduce the two-body problem to an equivalent one-body problem using the concept of reduced mass.
- ✓ The nature of central forces and their conservative properties will be explored.
- ✓ Students will derive and analyze differential equations of orbits and energy expressions in central force fields.

7. General Properties of Matter:

- ✓ Students will understand the mechanical and physical properties of matter.
- ✓ They will explore the relations between different elastic constants and study torsion in cylindrical bodies.
- ✓ Concepts of surface tension, capillarity, and the molecular theory of surface tension will be introduced.
- ✓ Applications to real-world problems, including viscosity and fluid flow in capillary tubes, will be covered.

8. Special Theory of Relativity:

- ✓ Students will understand the fundamental principles of the special theory of relativity.
- ✓ They will learn about the constancy of the speed of light and the postulates of relativity.
- ✓ Lorentz transformations, length contraction, and time dilation will be explored with practical examples.
- ✓ Students will apply relativistic concepts to solve simple problems involving the addition of velocities and other relativistic effects.

MJ-A1/B1P: Mathematical Methods and Mechanics (including STR)

1. Measurements of Length (or Diameter) Using Vernier Calipers, Screw Gauge, and Travelling Microscope:

- ✓ Students will understand the principles of precision measurement tools.
- ✓ They will gain proficiency in using vernier calipers, screw gauges, and travelling microscopes for accurate measurements.
- ✓ Students will learn to calculate measurement errors and understand the significance of precision and accuracy in experiments.

2. Determining g and Velocity for a Freely Falling Body Using Digital Timing Technique:

- ✓ Students will understand the principles of free fall and gravitational acceleration.
- ✓ They will use digital timing techniques to measure the time of fall and calculate the acceleration due to gravity.

- ✓ Students will learn to analyze experimental data to determine velocity and acceleration.

3. Studying the Motion of a Spring and Calculating (a) Spring Constant (b) Value of g:

- ✓ Students will understand Hooke's Law and the properties of springs.
- ✓ They will perform experiments to measure the spring constant.
- ✓ Students will calculate the acceleration due to gravity g using the motion of the spring.

4. Determining g by Bar Pendulum:

- ✓ Students will understand the principles of pendulum motion.
- ✓ They will perform experiments using a bar pendulum to measure the period of oscillation.
- ✓ Students will calculate the acceleration due to gravity g from the experimental data.

5. Determining g by Kater’s Pendulum:

- ✓ Students will explore the use of Kater’s pendulum for precise measurements of gravitational acceleration.
- ✓ They will measure the period of oscillation and calculate g using the properties of Kater’s pendulum.
- ✓ Students will compare the results with those obtained from other methods.

6. Determining the Moment of Inertia of a Flywheel:

- ✓ Students will understand the concept of moment of inertia and its significance in rotational dynamics.
- ✓ They will perform experiments to measure the moment of inertia of a flywheel.
- ✓ Students will analyze the rotational motion and calculate the moment of inertia from experimental data.

7. Determining the Modulus of Rigidity of a Wire by Maxwell’s Needle / Determining the Elastic Constants of a Wire by Searle’s Method:

- ✓ Students will understand the mechanical properties of materials, such as rigidity and elasticity.
- ✓ They will use Maxwell’s needle apparatus to measure the modulus of rigidity of a wire.
- ✓ Students will perform experiments using Searle’s method to determine the elastic constants of a wire.
- ✓ They will analyze experimental data to calculate the modulus of rigidity and elastic constants.

SEC 1:

- ✓ Same as SEC-01 of Discipline A/B/C of Hons. prog.

MI: Mathematical Physics and Mechanics

MI – 1T: Mathematical Physics and Mechanics

1. Differential Equations:

- ✓ Students will understand the concepts of exact and inexact differentials.
- ✓ They will be able to solve first-order linear differential equations using the integrating factor method.
- ✓ Students will solve second-order linear differential equations with constant coefficients.
- ✓ They will find particular integrals for given differential equations.

2. Vector Calculus:

- ✓ Students will learn the properties of vectors under rotations.
- ✓ They will understand the scalar product and its invariance under rotations.
- ✓ Students will interpret the scalar triple product in terms of area and volume.
- ✓ They will differentiate between scalar and vector fields.
- ✓ Students will perform vector differentiation, including the gradient of a scalar field and its geometrical interpretation.
- ✓ They will understand and compute the divergence and curl of a vector field.
- ✓ Students will comprehend the statements of Gauss' divergence theorem, Green's theorem, and Stokes' theorem.

3. Fundamentals of Dynamics:

- ✓ Students will understand the concepts of reference frames and inertial frames.
- ✓ They will apply Galilean transformations and understand Galilean invariance.
- ✓ Students will review and apply Newton's laws of motion.
- ✓ They will analyze the dynamics of a system of particles and the concept of the center of mass.
- ✓ Students will understand non-inertial frames and fictitious forces.

4. Gravitation and Central Force Motion:

- ✓ Students will understand gravitational potential energy and calculate the potential and field due to a spherical shell and solid sphere.
- ✓ They will analyze the motion of a particle in a central force field, including the conservation of angular momentum and constant areal velocity.

5. Rotational Dynamics:

- ✓ Students will understand and apply the perpendicular and parallel axes theorems.
- ✓ They will calculate the radius of gyration and the moment of inertia for rectangular, cylindrical, and spherical bodies.
- ✓ Students will analyze the pure rolling motion of a body on an inclined plane.

6. Motion under Central Forces:

- ✓ Students will understand the two-body problem and its reduction to a one-body problem with a reduced mass.
- ✓ They will define and understand the nature of central forces, including their conservative and spherically symmetric properties.
- ✓ Students will analyze the features of motion under a central force field and solve the differential equation of orbit.
- ✓ They will derive energy expressions and understand the nature of forces from the equation of orbit and vice versa.

7. General Properties of Matter:

- ✓ Students will understand the relationship between various elastic constants.
- ✓ They will analyze the torsion of a cylinder or wire.
- ✓ Students will understand surface tension and surface energy, including concepts like angle of contact, capillarity, and Jurin's law.
- ✓ They will calculate excess pressure and apply it to phenomena like soap bubbles.
- ✓ Students will comprehend the molecular theory of surface tension and methods like the ripple method.
- ✓ They will understand viscosity, Reynold's number, and derive Poiseuille's equation for the flow of liquid through a capillary tube.
- ✓ Students will apply Stoke's law to high viscous liquids.

MI – 1P: Mathematical Physics and Mechanics

1. Measurements of Length (or Diameter) Using Vernier Calipers, Screw Gauge, and Travelling Microscope:

- ✓ Students will understand the principles of precision measurement tools.
- ✓ They will gain proficiency in using vernier calipers, screw gauges, and travelling microscopes for accurate measurements.
- ✓ Students will learn to calculate measurement errors and understand the significance of precision and accuracy in experiments.

2. Determining g and Velocity for a Freely Falling Body Using Digital Timing Technique:

- ✓ Students will understand the principles of free fall and gravitational acceleration.
- ✓ They will use digital timing techniques to measure the time of fall and calculate the acceleration due to gravity.
- ✓ Students will learn to analyze experimental data to determine velocity and acceleration.

3. Studying the Motion of a Spring and Calculating (a) Spring Constant (b) Value of g:

- ✓ Students will understand Hooke's Law and the properties of springs.
- ✓ They will perform experiments to measure the spring constant.
- ✓ Students will calculate the acceleration due to gravity g using the motion of the spring.

4. Determining g by Bar Pendulum:

- ✓ Students will understand the principles of pendulum motion.

- ✓ They will perform experiments using a bar pendulum to measure the period of oscillation.
- ✓ Students will calculate the acceleration due to gravity g from the experimental data.

5. Determining g by Kater's Pendulum:

- ✓ Students will explore the use of Kater's pendulum for precise measurements of gravitational acceleration.
- ✓ They will measure the period of oscillation and calculate g using the properties of Kater's pendulum.
- ✓ Students will compare the results with those obtained from other methods.

6. Determining the Moment of Inertia of a Flywheel:

- ✓ Students will understand the concept of moment of inertia and its significance in rotational dynamics.
- ✓ They will perform experiments to measure the moment of inertia of a flywheel.
- ✓ Students will analyze the rotational motion and calculate the moment of inertia from experimental data.

7. Determining the Modulus of Rigidity of a Wire by Maxwell's Needle / Determining the Elastic Constants of a Wire by Searle's Method:

- ✓ Students will understand the mechanical properties of materials, such as rigidity and elasticity.
- ✓ They will use Maxwell's needle apparatus to measure the modulus of rigidity of a wire.
- ✓ Students will perform experiments using Searle's method to determine the elastic constants of a wire.
- ✓ They will analyze experimental data to calculate the modulus of rigidity and elastic constants.

SEMESTER - II

MJ-2:

- ✓ Same as like A1 for students taken Physics as Discipline-B

SEC 1:

- ✓ Same as SEC-02 of Discipline A/B/C of Hons. prog.

MI-2: Thermal Physics and Statistical Mechanics

MI-2T: Thermal Physics and Statistical Mechanics

1. Thermodynamic Description of System:

- ✓ Students will understand the Zeroth Law of thermodynamics and the concept of temperature.
- ✓ They will learn the First Law of thermodynamics and its implications on internal energy, heat, and work.
- ✓ Students will explore various thermodynamic processes and their applications of the First Law.
- ✓ They will derive and apply the general relation between CP and CV.
- ✓ Students will calculate work done during isothermal and adiabatic processes.
- ✓ They will comprehend compressibility and expansion coefficients.
- ✓ Students will differentiate between reversible and irreversible processes.
- ✓ They will understand the Second Law of thermodynamics and the concept of entropy.
- ✓ Students will analyze Carnot's cycle and theorem.
- ✓ They will evaluate entropy changes in reversible and irreversible processes.
- ✓ Students will interpret entropy-temperature diagrams.
- ✓ They will learn about the Third Law of thermodynamics and the unattainability of absolute zero.

2. Thermodynamic Potentials:

- ✓ Students will understand the concepts of enthalpy, Gibbs, Helmholtz, and internal energy functions.
- ✓ They will derive and apply Maxwell's relations to various thermodynamic processes.
- ✓ Students will explore the Joule-Thompson effect and the Clausius-Clapeyron equation.
- ✓ They will derive expressions for (C_P – C_V) and C_P/C_V.
- ✓ Students will understand and apply TdS equations in thermodynamic problems.

3. Kinetic Theory of Gases:

- ✓ Students will derive and experimentally verify Maxwell's law of distribution of velocities.
- ✓ They will understand the concept of mean free path.
- ✓ Students will explore transport phenomena, including viscosity, conduction, and diffusion.
- ✓ They will comprehend the law of equipartition of energy and apply it to specific heat calculations for mono-atomic and diatomic gases.

4. Theory of Radiation:

- ✓ Students will understand blackbody radiation and spectral distribution.
- ✓ They will derive Planck's law and deduce Wien's distribution law, Rayleigh-Jeans Law, Stefan-Boltzmann Law, and Wien's displacement law from Planck's law.
- ✓ Students will grasp the concept of energy density in the context of radiation.

5. Statistical Mechanics:

- ✓ Students will understand phase space, macrostate, and microstate concepts.
- ✓ They will explore the relationship between entropy and thermodynamic probability.
- ✓ Students will derive and apply Maxwell-Boltzmann law and distribution of velocities.
- ✓ They will understand quantum statistics, including Fermi-Dirac and Bose-Einstein distribution laws.
- ✓ Students will compare and contrast the three statistical distributions: Maxwell-Boltzmann, Fermi-Dirac, and Bose-Einstein.

MI-2P: Thermal Physics and Statistical Mechanics

1. Measurement of Planck's Constant Using Black Body Radiation:

- ✓ Students will understand the principles of black body radiation.
- ✓ They will learn the experimental setup and procedures to measure Planck's constant.
- ✓ Students will gain hands-on experience in using instruments to measure radiation intensity.
- ✓ They will analyze the collected data to estimate Planck's constant accurately.

2. Estimating the Temperature of a Torch Bulb Filament from Resistance Measurement and Verifying Stefan's Law:

- ✓ Students will learn how to measure the resistance of a filament at various temperatures.
- ✓ They will calculate the temperature of the filament using resistance data.
- ✓ Students will verify Stefan's Law by comparing theoretical and experimental results.

3. Studying the Variation of Thermo-EMF Across Two Junctions of a Thermocouple with Temperature:

- ✓ Students will understand the working principle of a thermocouple.
- ✓ They will measure thermo-EMF at different temperatures.
- ✓ Students will analyze the relationship between temperature and thermo-EMF.
- ✓ They will gain practical skills in setting up and using thermocouples.

4. Determining the Coefficient of Thermal Conductivity of Copper by Searle's Apparatus:

- ✓ Students will understand the concept of thermal conductivity.
- ✓ They will use Searle's apparatus to measure the thermal conductivity of copper.
- ✓ Students will learn to analyze experimental data and calculate the coefficient of thermal conductivity.

5. Determining the Coefficient of Thermal Conductivity of a Bad Conductor by Lees and Chorlton's Disc Method:

- ✓ Students will explore the methods to measure the thermal conductivity of bad conductors.
- ✓ They will set up and use Lees and Chorlton's disc apparatus for experiments.
- ✓ Students will analyze data to determine the coefficient of thermal conductivity.

6. Determining the Mechanical Equivalent of Heat (J) by the Method of Callendar and Barne:

- ✓ Students will understand the concept of the mechanical equivalent of heat.
- ✓ They will perform experiments using Callendar and Barne's method to measure J.
- ✓ Students will analyze and interpret experimental data to determine the mechanical equivalent of heat.

GOVERNMENT GENERAL DEGREE COLLEGE, SALBONI
GOVERNMENT OF WEST BENGAL
AFFILIATED TO VIDYASAGAR UNIVERSITY

COURSE OUTCOME (CO)
BACHELOR OF SCIENCE - MATHEMATICS HONOURS
(CBCS SYLLABUS)

SL. NO	PAPER	OUTCOME
	SEMESTER-I	
1	**C1T: Calculus, Geometry & Differential Equation**	This course deals with the applications of derivatives, reduction formula for integration and application of integration and analytical geometry of two and tree dimension. It also helps to improve the skill of plotting different types of curve.
2	**C2T : Algebra**	This course deals with the basic knowledge of complex numbers, inequalities and its application to constraint optimization, theory of equation and set theory. It also helps to improve the knowledge of matrices and linear transformation.
	SEMESTER-II	
3	**C3T : Real Analysis**	Understanding the algebraic and order properties of Real numbers and Archimedean property, completeness property and its equivalence properties of Real numbers and concept of countable and uncountable sets and ideas of bounded and unbounded sets, concept of limit point and isolated points of a subset of Real numbers and sequence of Real numbers and infinite series and their convergence are the main goals of this course.
4	**C4T : Differential Equation & Vector Calculus**	Students can solve differential equations of second order and systems of linear differential equations with the help of this course. They also explore application in diverse Mathematical field like Geometry and physical problems with the help of Ordinary differential equations. This course includes introductory concepts of Dynamical System and Mathematical Biology. In addition, it provides the basic knowledge of vector algebra and power series solution of a differential equation.
	SEMESTER-III	
5	**C5T : Theory of Real Function and introduction to Metric Space**	Developing the concept of metric space, topology metric space, continuity of a function, differentiability of a function and the application of mean value theorem,, successive derivatives and series expansion of functions are the main goals of this course.
6	**C6T : Group Theory - I**	This course equips students with a fundamental understanding of algebraic structure known as group. The students grasp core concept such as group operation, subgroup, normal subgroup, group homomorphism, external and internal products of group and example of different well-known groups.
7	**C7T : Numerical Methods & Lab**	Students can solve the transcendental and polynomial equations, system of linear algebraic equations, ordinary differential equations with the help of numerical methods. In addition, this course helps to generate the ideas of numerical differentiation and integration. Students will gain in expertise in error analysis. Numerical lab emphasises on algorithmic understanding programming proficiency and practical applications of numerical method.
8	**SEC1: Logic and Sets**	This course aims to equip students with foundational skills in logical reasoning and set theory. Students explore the principle of deductive reasoning, truth tables and formal proofs. Additionally, the course delves into Set theory, covering concepts like unions, intersections and cardinality. The outcome is a solid understanding of logical structures, enabling students to analyze arguments critically and apply set theory principles on various mathematical contexts.

SEMESTER-IV		
9	**C8T : Riemann Integration & Series of functions**	Generating the concept of Riemann Integration, Improper integral, Sequence of Functions, Fourier series and Power series are the ultimate aims of this course.
10	**C9T: Multivariate Calculus**	This course targets to encompass the portions of solving double and triple integral and developing the concept of Multivariate Calculus. Multivariate Differential Calculus equips students with the tools to analyze function of multiple variables and their limit and continuity. Key outcomes include mastering partial derivative, understanding the chain rule and exploring the optimization techniques. Students learn to compute gradient, enabling them to solve real world problem in fields like Physics and Engineering. Additionally, student often gain proficiency in vector calculus, preparing them for advanced coursework and applications in diverse scientific and mathematical discipline.
11	**C10T: Ring Theory and Linear Algebra-I**	This course deals with the Ring, Field, Vector Spaces and Linear Transformation and its matrix representation, Ideal and different types of operations of Ideal, factor ring and ring homomorphism theorem.
12	**SEC2: Graph Theory**	This course helps to generate the idea of Graph Theory. Students grasp fundamental concepts such as vertices, edges and adjacency matrices. They learn to identify cycles, paths, walks and connectivity within graphs. Additionally, they explore graph algorithms, enhancing problems solving ability.
SEMESTER-V		
13	**C11: Partial Differential Equation & Applications**	With the help of this course, students can solve partial differential equations of first and second order, specially they derive and solve heat equation, wave equation and Laplace equation with differential initial and boundary conditions.
14	**C12 : Group Theory - II**	This course deals with the advanced knowledge of group theory. Students explore concept of Sylow theorem, group action, fundamental theorem of finite Abelian group, Automorphism, automorphism group of finite and infinite cyclic group, simplicity and non-simplicity test of group.
15	**DSE 1 : Linear Programming**	Students can solve Linear Programming Problem specially transportation problem, primal-dual problem and assignment problem by different methods with the help of this course. Students are able to comprehend the basics of formulating linear programming problems, interpreting result and applying these techniques to the real world scenarios. The outcome includes the capacity to model and optimize the problem of game theory by linear programming method and graphical method.
16	**DSE 2 : Probability & Statistics**	Developing the deeper concept on probability and statistic are the ultimate aim of this course. By the course's conclusion, students should possess a thorough understanding of probability theory, statistical methods and their real world applications. The key outcomes include the ability to critically analyze data and comprehend the principles governing random phenomena. Students should be proficient in conducting hypothesis tests, constructing confidence interval and interpreting the results in various contexts.
SEMESTER-VI		
17	**C13: Metric Spaces & Complex Analysis**	This course enlightens the advanced knowledge of foundational concepts of distance, continuity and convergence within mathematical spaces. They explore the properties like completeness, compactness and connectedness. The course often covers metric space example, such as Euclidean spaces and introduces fundamental theorems like the Banach Fixed Point theorem. Application to real analysis and topology are emphasized providing a solid mathematical framework for understanding continuity and convergence in various contexts. The course of Complex analysis introduces fundamental concepts in complex analysis, covering complex numbers, functions and integration. Students explore Cauchy's theorem, residues. Emphasis is placed on analytic properties of functions in complex plane,
18	**C14 : Ring Theory and Linear Algebra-II**	Students typically gain deep knowledge of algebraic structure. They explore concepts such as polynomial ring over commutative rings,

		division algorithm, division algorithm, principle ideal domain, factorization of polynomials, reducibility and irreducibility tests Eiseastion criterion of irreducibility, unique factorization domain and Euclidean domain. Students learn to apply algebraic concepts to solve problems, proving theorems and prepare themselves for advanced studies in algebra. In Linear Algebra course, student typically explore advanced topics such as dual space, transpose of a linear transformation and its matrix in the dual basis, Eigen space of a linear operator, Cayley-Hamilton theorem, the minimal polynomial for a linear operator, Inner product space and norms, Least square approximation,, minimal solution to the system of linear equations. Normal and self adjoint operators, orthogonal projections and spectral theorem. Overall, the course equips students with a solid foundation in abstract algebra, fostering mathematical maturity and preparation for Functional Analysis course. This knowledge prepares the student for advanced studies in various branches of pure and applied mathematics.
19	**DSE 3 : Number Theory**	Developing the deeper understanding and concept of the properties and relationships of integers. Student will explore topics such as prime numbers, modular arithmetic, Diophantine equations. Students will also develop analytical thinking and abstract reasoning, fostering a solid foundation for advanced mathematics and related discipline.
20	**DSE 2 : Mathematical Modelling**	This course provides the basic ideas of mathematical modeling and equips students with skill to represent real world problems mathematically. It covers techniques like differential equations, optimization and statistical methods. Students learn to formulate, analyze and solve problem using mathematical models.

4-YEAR UNDERGRADUATE PROGRAMME

COURSE OUTCOME (CO)
BACHELOR OF SCIENCE (HONOURS) – MAJOR IN MATHEMATICS
(CCFUP & NEP)

SL. NO	PAPER	OUTCOME
SEMESTER-I		
1	**MATHMJ101: T : Calculus, Geometry & Differential Equation**	This course deals with the applications of derivatives, reduction formula for integration and application of integration and analytical geometry of two and tree dimension. It also helps to improve the skill of plotting different types of curve.
2	**MATSECSEC01 : P: MATLAB-1**	The course typically includes gain familiarity with the MATLAB, understand and use basic MATLAB syntax, including variable arrays, matrices and arithmetic operations. It also develops programming skills in MATLAB including 'If statements', 'loops'. It also create plots and visualization to represent data efficiently. Apply MATLAB programming to solve real world scientific problem. It ensure that students can effectively use MATLAB for wide range of applications in Mathematics.
SEMESTER-II		
3	**MATHMJ102 : T : Algebra**	This course deals with the basic knowledge of complex numbers, inequalities and its application to constraint optimization, theory of equation and set theory. It also helps to improve the knowledge of matrices and linear transformation.
		The programme outcome of learning MATLAB programming typically includes ability of the learners to use MATLAB effectively for various

4	**MATSECSEC02 : P: MATLAB-2**	applications, including engineering, science and mathematics. It also makes the student capable to develop, test and implement algorithms for various computational problems. It develops proficiency in handling data using MATLAB's powerful plotting and data manipulation tools. It improves critical thinking and analytical skills through the application of MATLAB to real world problem. These outcomes prepare individuals for careers in various field, including engineering, data science, finance, research and academia.

-

GOVERNMENT GENERAL DEGREE COLLEGE, SALBONI
GOVERNMENT OF WEST BENGAL
AFFILIATED TO VIDYASAGAR UNIVERSITY

COURSE OUTCOME (CO)
BACHELOR OF SCIENCE - MATHEMATICS (GENERAL)
(CBCS SYLLABUS)

SL. NO	PAPER	OUTCOME
	SEMESTER-I	
1	**DSC1A (CC-1): Differential Calculus**	This course deals with the application of derivatives.
	SEMESTER-II	
2	**DSC1B(CC-2): Differential Equations**	Students can learn to solve differential equations of second order and systems of linear differential equations with the help of this course. In addition, It helps to generate the basic ideas of Partial Differential Equations.
	SEMESTER-III	
3	**DSC1C(CC-3): Real Analysis**	Understanding the properties of real numbers, sequence of real numbers and infinite series are the main goals of this course.
4	**SEC1: Theory of Equation**	This course deals with the theory of equations.
	SEMESTER-IV	
5	**DSC1D(CC-4): Algebra**	This course helps to develop the basic concept on group theory, ring theory and fields.
6	**SEC2: Integral Calculus**	Developing the idea of integration by partial fraction, reduction formula and the knowledge of application of integrations are the aims of this course.
	SEMESTER-V	
7	**DSE1A: Vector Calculus & Analytical Geometry**	This course deals with the analytical geometry in two or three dimension and algebra of vectors.
8	**SEC-III: Mathematical Modeling**	This course provides the basic ideas of mathematical modelling.
	SEMESTER-VI	
9	**DSE1B: Numerical Methods**	Students can solve the transcendental and polynomial equations, ordinary differential equations with the help of numerical methods. In addition, this course helps to generate the idea of numerical differentiation and integration
10	**SEC-IV: Probability and Statistics**	Developing the deeper concept on probability and statistic are the ultimate aim of this course.

COURSE OUTCOME (CO)
BACHELOR OF SCIENCE - MATHEMATICS (GENERAL)
(CCFUP & NEP SYLLABUS)

SL. NO	PAPER	OUTCOME
SEMESTER-I		
1	**MAJOR (Disc.-A1): MATPMJ 101: Calculus, Geometry & Differential Equation**	This course deals with the applications of derivatives, reduction formula for integration and application of integration and analytical geometry of two and tree dimension. It also helps to improve the skill of plotting different types of curve.
SEMESTER-II		
2	**MAJOR (Disc.-B1): Calculus, Geometry & Differential Equation**	This course deals with the applications of derivatives, reduction formula for integration and application of integration and analytical geometry of two and tree dimension. It also helps to improve the skill of plotting different types of curve.

-

Course Outcomes and Program Specific Outcomes

B.Sc. (Honours)-CBCS Curriculum				
Semester	**Course**	**Course Title**	**Program Specific Outcomes**	**Course Outcomes**
SEMESTER-I	**CC-1**	Organic Chemistry-I (Theo)	Students will be able to understand the structures, bonding, and physical properties of organic molecules and reactive intermediates. They will also gain concepts of basic stereochemistry.	• Students will be able to learn valence bond theory, molecular orbital theory and MO picture of different types of organic molecules. • Students will gain knowledge of hybridization and shape of organic molecules. • Students will know the influence of hybridization on bond properties of organic molecules. • Students will learn different types of reactive intermediates. • Students will learn molecular projection interconversions and symmetry elements, as well as to describe the stereochemical characteristics of organic molecules.
		Organic Chemistry-I (Lab)	Students will be able to detect solid and liquid organic compounds by chemical tests.	• Students will be able to separate components of a binary solid mixture. • Students will be able to determine boiling point of common organic liquid compounds. • Students will be able to identify pure organic solid and liquid compounds.
	CC-2	Physical Chemistry-I (Theo)	Students will gain elementary knowledge of kinetic theory of gases, thermodynamics and chemical kinetics.	• Students will know about ideal gas model, real gas models-especially van der Waals' gas model. • Students will learn the fundamentals of thermodynamics with different thermodynamic processes. • Students will be able to derive thermodynamic relations. • Students will learn the laws of thermochemistry.

				• Students will gain knowledge of rate law, order and molecularity of a reaction. • Students will know about half-life of a reaction. • Students will be able to understand the effect of temperature on reaction rate.
		Physical Chemistry-I (Lab)	Students will learn to study the reaction kinetics of some well-known reactions, technique to determine pH of unknown solution and heat of neutralization.	• Students will be able to learn the determination of pH of unknown solution by colour matching method. • Students will be able determine the heat of neutralization of a strong acid by a strong base. • Students will be able to study the kinetics of acid-catalyzed hydrolysis of methyl acetate. • Students will be able to study study of kinetics of decomposition of H_2O_2. • Students will be able determine the heat of solution of oxalic acid from solubility measurement.
	GE1	Inorganic Chemistry-I (Theo) & Organic Chemistry-I (Theo)	Students will gain the elementary concepts of atomic structure, chemical periodicity, acids and bases, redox reactions. They will also learn about fundamental organic chemistry, basic stereochemistry and preparation and reactions of alkenes and alkynes.	• Students will be able to acquire knowledge about different theories of structure of atom and their application. • Students will learn about importance of periodicity in chemical and physical properties. • Students will gain knowledge of pH, buffer, Acid-base neutralization curves, indicator, choice of indicators etc. • Students will know the method of balancing equation of redox reaction, standard redox potentials with sign conventions, redox titration. • Students will get elementary idea of inductive effect, resonance, hybridization. • Students will learn about isomerism in organic compounds.

				• Students will learn about absolute configuaration of chiral molecules. • Students will learn about structure of organic molecules on the basis of VBT. • Students will get idea of different types of elimination reactions for synthesis of alkenes. • Students will learn about electrophilic addition reactions to alkenes and alkynes.
		Inorganic Chemistry-I (Lab) & Organic Chemistry-I (Lab)	Students will gain experimental knowledge of titrimetric estimations and qualitative analysis of single solid organic compounds.	• Students will be able to estimate sodium carbonate and sodium hydrogen carbonate present in a mixture. • Students will be able to estimate oxalic acid by titrating it with $KMnO_4$. • Students will be able to estimate water of crystallization in Mohr's salt by titrating with $KMnO_4$. • Students will be able to estimate Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator. • Students will be able to estimate Cu (II) ions iodometrically using $Na_2S_2O_3$. • Students will be able to detect special elements (N, Cl, and S) in organic compounds. • Students will be able to acquire the techniques for detection of functional groups: Aromatic-NO_2, Aromatic -NH_2, -COOH, carbonyl (no distinction of –CHO and >C=O needed), -OH (phenolic) in solid organic compounds.
SEMESTER-II	**CC-3**	Inorganic Chemistry-I (Theo)	Students will gain the basic concepts of atomic structure, chemical periodicity, acids and bases, redox reactions.	• Students will gain knowledge of different theories of structure of atom and their application. • Students will know about the electronic configuration of atoms and modern IUPAC Periodic table.

				• Students will understand the importance of periodicity in chemical and physical properties. • Students will learn different concepts of acid-base theory. • Students also learn about pH, buffer, Acid-base neutralization curves, indicator, choice of indicators etc. • Students will be able to balance equation of redox reactions. • Students will get elementary idea of standard redox potentials with sign conventions, redox titration.
		Inorganic Chemistry-I (Lab)	Students will be able to acquire knowledge through hands-on experience of titrations.	• Students will be able to do acid and base titrations. • Students will be able to do oxidation-reduction titrimetric analysis.
	CC-4	Organic Chemistry-II (Theo)	Students will have understanding of stereochemistry of compounds having chiral axes as well as detailed knowledge of reaction mechanism.	• Students will know about chiral axis and stereoisomerism arising out of chiral axis. • Students will acquire knowledge of conformation and relative stability of conformers. • Students will learn about free energy, enthalpy and entropy factor, calculation of enthalpy change via BDE. • Students will gain concepts of organic acids and bases. • Students will be able to draw comparison between nucleophilicity and basicity. • Students will know about tautomerism and application of thermodynamic principles in tautomeric equilibria. • Students will know kinetic control and thermodynamic control of reactions.

				• Students will learn about primary and secondary kinetic isotopic effect. • Students will know different types of nucleophilic substitution reactions at sp^3centre and elimination reactions.
		Organic Chemistry-II (Lab)	Students will be able to prepare some important organic compounds with the help of common organic reactions in the laboratory.	Students will be able to experimentally conduct • Nitration of aromatic compounds. • Hydrolysis of amides/imides/esters. • Acetylation of phenols/aromatic amines. • Benzoylation of phenols/aromatic amines. • Diazo coupling reactions of aromatic amines. • Bromination of anilides using green approach (Bromate-Bromide method). • Green ‘multi-component-coupling’ reaction. • Selective reduction of m-dinitrobenzene to m-nitroaniline.
	GE2	Physical Chemistry-I (Theo) & Inorganic Chemistry-II (Theo)	Students will gain elementary knowledge of kinetic theory of gases, liquid and solid states of matter. They will also be able to understand various types of bonding in molecules with suitable examples.	Students will gain knowledge of • Maxwell’s distribution of speed and kinetic energy of gas molecules. • Van der Waals equation and its features, derivation and application • Viscosity of gases and effect of temperature and pressure on coefficient of viscosity. • Effect of temperature on surface tension and coefficient of viscosity of a liquid. • Bravais Lattice and Laws of Crystallography. • Indexing of crystal planes and Bragg’s law of diffraction. • Rate law, order and molecularity of a reaction. • Effect of temperature on reaction rate. • Qualitative idea of valence bond and band theories.

				• Molecular orbital concept of bonding and MO diagrams of different inorganic compounds. • Group trends in electronic configuration.
		Physical Chemistry-I (Lab) & Inorganic Chemistry-II (Lab)	Students will be able to do hands-on experiments on viscosity and surface tension measurements of liquids, reaction kinetics and inorganic semimicro analysis.	• Students will be able to determine the surface tension of a liquid using Stalagmometer. • Students will be able to determine relative and absolute viscosity of a liquid using an Ostwald's viscometer. • Students will be able study the kinetics of acid hydrolysis of methyl acetate with hydrochloric acid. • Students will be able to do qualitative semimicro analysis of mixtures containing three radicals.
SEMESTER-III	**CC-5**	Physical Chemistry-II (Theo)	Students will learn the laws which govern transport processes and can apply the laws of thermodynamics to various physical and chemical processes. Students will also acquire some knowledge on basics of quantum mechanics.	• Students will learn about viscosity of fluid. • Students will learn about conductance of strong and weak electrolytes. • Students will understand partial properties and Chemical potential. • Students will know about chemical potential and other properties of ideal substances. • Students will gain elementary concepts of operators. • Setting up of Schrodinger equation for one-dimensional box and its solution. • Setting up of Schrodinger equation for simple Harmonic Oscillator.
		Physical Chemistry-II (Lab)	Students will gain knowledge through hands-on experiments on conductometric study of ionic solutions, viscosity of liquids and conductometric titrations.	• Students can determine the viscosity of unknown liquid (glycerol, sugar) with respect to water. • Students can determine the partition coefficient for the distribution of I_2 between water and CCl_4.

				• Students can determine the Keq for $KI + I_2 = KI_3$, using partition coefficient between water and CCl_4. • Students can study the conductometric titration of an acid (strong, weak/ monobasic, dibasic) against base strong. • Students can verify the Ostwald's dilution law and can determine Ka of weak acid.
	CC-6	Inorganic Chemistry-II (Theo)	Students will be able to understand various types of bonding in molecules with suitable examples, nuclear chemistry, radioactivity.	• Students will acquire qualitative idea of valence bond and band theories. • Students will learn about Molecular orbital concept of bonding and MO diagrams of different inorganic compounds. • Students will know about various type nuclear reactions. • Students will learn the principles of determination of age of rocks and minerals, radiocarbondating.
		Inorganic Chemistry-II (Lab)	Students will acquire some practical knowledge on inorganic estimations.	• Students will be able to estimate Vitamin C. • Students will learn the estimation method of available chlorine in bleaching powder by iodometric titration. • Students will be able to estimate Cu in brass. • Students will learn the estimation method of Cr and Mn in Steel.
	CC7	Organic Chemistry-III (Theo)	Students will be able to investigate the mechanisms of electrophilic addition reactions, elimination reactions, and some reactions related to carbonyl compounds.	• Students will learn about electrophilic addition reactions to C=C and C≡C bonds • Students will know about electrophilic and nucleophilic aromatic substitution. • Students will gain knowledge of nucleophilic addition reaction to carbonyl group.

				• Students will gain knowledge of some important name reactions e.g. Aldol, Knoevenagel, Claisen-Schmidt, Dieckmann, Stobbe, Mannich, Perkin reactions. • Students will gain knowledge of the preparation and use of organometallic reagents. • Students will learn about twelve (12) principles of green chemistry.
		Organic Chemistry-III (Lab)	Students will acquire the ability to identify functional group(s) present in an organic compound.	• Students will be able to detect special elements (N, S, Cl, Br) by Lassaigne's test. • Students will learn to detect the functional groups ($-NO_2$), ($-NH_2$), phenolic –OH, (-COOH) etc. by systematic chemical tests. • Students will be able to determine melting point of a given organic compounds.
	SEC 1	Pharmaceutical Chemistry (Theo)	Concepts will be built on the design and synthesis of drug molecules.	• Students will understand basic retrosynthetic approach for drug synthesis. • Students will gain knowledge of synthesis of some potent drugs which are used as analgesics agents, antipyretic agents, anti-inflammatory agents, antibiotics, antibacterial and antifungal agents, antiviral agents etc.
		Pharmaceutical Chemistry (Lab)	Students will learn to synthesize drug molecules.	• Students will learn to prepare aspirin. • Students will learn to prepare magnesium bisilicate (antacid).
	GE3	Physical Chemistry-II (Theo) &	Concept will be built on chemical energetics, chemical equilibrium and ionic equilibrium, aromatic hydrocarbons, organometallic compounds and carbonyl compounds.	• Students will gain fundamental understanding of thermodynamics with different thermodynamic processes. • Students will learn to derive thermodynamic relations. • Students will learn laws of thermochemistry.

		Organic Chemistry-II (Theo)		• Students will know equilibrium constant and standard Gibbs free energy change. • Students will learn about K_P, K_C and K_X and relation among them. • Students will learn mechanism and scope of Nucleophilic aromatic substitution. • Students will acquire concepts of preparation of benzene from phenol, acetylene and benzene sulphonic acid. • Students will acquire concepts of preparations and uses of Grignard reagents. • Students will learn name reactions of aromatic compounds viz. Reimer-Tiemann reaction, Houben-Hoesch condensation, Schotten-Baumann reaction, Aldol, Cannizaro, Wittig, benzoin condensation reactions.
		Physical Chemistry-II (Lab) & Organic Chemistry-II (Lab)	Students will have experimental learing on thermochemistry and pH measurement. They will be able to detect solid and liquid organic compounds.	• Students will be able to determine heat capacity of calorimeter for different volumes. • Students will be able to determine enthalpy of neutralization of hydrochloric acid with sodium hydroxide. • Students will be able to determine enthalpy of ionization of acetic acid. • Students will be able to determine enthalpy of hydration of copper sulphate. • Students will be able to measure pH of different solutions like aerated drinks, fruit juices, shampoos and soaps. • Students will be able to identify of pure organic solid and liquid compounds.
SEMESTER-IV	**CC8**	Physical Chemistry-III (Theo)	Students will gain knowledge about solution chemistry and understanding of quantum	Students will be able to acquire knowledge of • Students will know about colligative properties.

			mechanical treatment of H-like system.	• Students will get the concept of phase, component and degrees of freedom. • Students will be able to understand phase diagram of one, two and three component systems • Students will learn Debye-Huckel limiting law. • Students will be able to derive mean ionic activity coefficient. • Students will learn Faraday's laws of electrolysis. • Students will learn the rules of oxidation/reduction of ions based on half-cell potentials. • Students will get some concept of dipole moment and polarizability. • Students will learn the Schrödinger equation in spherical polar coordinates. • Students will acquire concepts of quantum mechanical problem related to hydrogen atom and hydrogen like system.
		Physical Chemistry-III (Lab)	Students will acquire the hands-on skill to study the solubility product, effect of ionic strength on ionic reactions, phase diagram of liquid-liquid binary system.	• Students will be able to determine solubility of sparingly soluble salt in water, in electrolyte with common ions and in neutral electrolyte (using common indicator). • Students will be able to perform potentiometric titration of Mohr's salt solution against standard $K_2Cr_2O_7$ solution. • Students will be able to determine Ksp for AgCl by potentiometric titration of $AgNO_3$ solution against standard KCl solution. • Students will be able to study the effect of ionic strength on the rate of Persulphate – Iodide reaction.

				• Students will be able to study the phenol-water phase diagram. • Students will be able to study the pH-metric titration of acid (mono- and di-basic) against strong base.
	CC9	Inorganic Chemistry-III (Theo)	Students will gain an introduction of industrially important inorganic materials and their extraction, preparation and application in various field.	• Students will know about the chief modes of occurrence of metals based on standard electrode potential. • Students will learn about the methods of purification of metals. • Students will acquire concepts on relative stability of different oxidation states and anomalous behaviour of s- and p- block elements. • Students will have understanding on structural aspects and applications of silicones and siloxanes, borazines, silicates and phosphazenes. • Students will learn Werner's theory of coordination complexes. • Students will learn IUPAC nomenclature of coordination complexes.
		Inorganic Chemistry-III (Lab)	Students will learn to synthesize some coordination compounds in laboratory.	• Students will be able to perform complexometric titration e.g. Zn(II) in a mixture of Zn(II) and Cu(II), • Students will be able to estimate hardness of water. • Students will be able to learn the techniques of preparation of some inorganic complexes.
	CC10	Organic Chemistry-IV (Theo)	Students will learn about nitrogenous compounds, organic spectroscopy and their various applications.	Students will be able to acquire knowledge of • Preparation, separation and identification of primary, secondary and tertiary amines. • Preparation and reactions of aliphatic and aromatic nitro compounds, alkyl nitrile and isonitrile.

				• Reactions of diazonium salts and their related compounds. • Rearrangement to electron-deficient carbon, nitrogen and oxygen atoms. • Aromatic rearrangement reactions and rearrangement reactions by green approach. • Retrosynthetic analysis, strategy of ring synthesis and asymmetric synthesis. • UV, IR and NMR Spectroscopy and their applications for identification of simple organic molecules
		Organic Chemistry-IV (Lab)	Students will acquire some practical knowledge on estimations of organic compounds.	• Students will be able to estimate glycine by Sörensen's formol method. • Students will be able to perform estimation of glucose by titration using Fehling's solution. • Students will be able to estimate sucrose by titration using Fehling's solution. • Students will be able to perform estimation of vitamin-C (reduced). • Students will be able to estimate aromatic amine (aniline) by bromination (Bromate-Bromide) method. • Students will be able to estimate phenol by bromination (Bromate-Bromide) method. • Students will be able to perform estimation of acetic acid in commercial vinegar.
	SEC 2	Pesticides Chemistry (Theo)	Students will get an overall knowledge of pesticide synthesis and uses.	Students will come to know about • Benefits and adverse effects of pesticides • Structure activity relationship of pesticides. • Synthesis and uses of representative pesticides viz. DDT, Malathion, Carbofuran, Chloranil etc.

		Pesticides Chemistry (Lab)	Students will learn to prepare some commercially important pesticides as well as to calculate acidity/alkalinity of a pesticide sample.	Students will be able to learn about • The calculation of acidity/alkalinity in given sample of pesticide formulations as per BIS specifications. • The preparation of simple organophosphates, phosphonates and thiophosphates.
	GE4	Physical Chemistry-III (Theo) & Analytical and Environmental Chemistry (Theo)	Students will gain elementary knowledge of Phase equilibria, conductance and electromotive force. They will also gain brief knowledge of Environmental Chemistry.	• Students will be able to acquire knowledge of ideal solutions and Raoult's law. • Students will have understanding of phases, components and degrees of freedom of a system. • Students will learn Gibbs Phase Rule and its thermodynamic derivation. • Students will be able to derive Clausius – Clapeyron equation. • Students will learn about conductance of strong and weak electrolytes. • Students will learn electromotive force of a cell and its measurement. • Students will have concept on solubility product and common ion effect.
		Physical Chemistry-III (Lab) & Analytical and Environmental Chemistry (Lab)	Students will be able to do hands-on experiments on phase diagram of a binary system, conductometric titrations and potentiometric titrations.	• Students will be able to determine the critical solution temperature and composition of the phenol water system. • Students will be able to determine dissociation constant of a weak acid by conductometric titration. • Students will be able to perform the conductometric titrations of strong acid vs strong base and strong acid vs strong base.

				• Students will be able to perform the potentiometric titrations of weak acid vs. strong base, potassium dichromate vs. Mohr's salt.
SEMESTER-V	**CC11**	Inorganic Chemistry-IV (Theo)	Solid concept will be built on the theory and application of coordination chemistry as well as on the general properties of d- and f-block elements.	• Students will know about valence bond description and its limitations. • Students will be able to acquire knowledge on elementary Crystal Field Theory. • Students will learn about magnetism and colour of coordination compounds. • Students will have understanding of 3d, 4d and 5d elements in term of electronic configuration, oxidation states, redox properties. • Students will learn electronic configuration, oxidation states, colour, spectral and magnetic properties of lanthanides and actinides.
		Inorganic Chemistry-IV (Lab)	Students will gain practical knowledge on Chromatographic separation of metal ions and gravimetry.	• Students will be able to perform paper chromatographic separation of metal ions. • Students will learn gravimetric estimation of Ni(II) using Dimethylglyoxime (DMG). • Students will be able to estimate copper as CuSCN gravimetrically. • Students will learn gravimetric estimation of Al(III) by precipitating with oxine. • Students will be able to measure of 10Dq by spectrophotometric method.
	CC12	Organic Chemistry-V (Theo)	Basic knowledge of pericyclic reactions, dynamic stereochemistry, structure and synthesis of carbohydrates,	Students will be able to acquire knowledge about • Students will be able to acquire knowledge of synthesis of polynuclear hydrocarbons and their derivatives.

			biomolecules and heterocyclic compounds.	• Students will learn the synthesis of heterocyclic compounds (5- and 6-membered) and their important chemical reactions. • Students will gain concepts on conformational analysis, symmetry properties and optical activity of cyclohexane and its derivatives. • Students will have understanding of reaction mechanism e.g. elimination (E2, E1), nucleophilic substitution (S_N1, S_N2, S_Ni, NGP), rearrangements in cyclohexane system. • Students will be able to acquire knowledge on mechanism, stereochemistry, regioselectivity in case of electrocyclic reactions, cycloaddition reactions and sigmatropic reactions. • Students will know about the structure of monosaccharides, disaccharides and polysaccharides. • Students will learn reactions and transformations of monosaccharides. • Students will learn synthesis and chemical reactions of amino acids. • Students will have understanding of primary, secondary and tertiary structures of peptides and proteins. • Students will learn about details structural analysis and chemical reactions of nucleic acids.
		Organic Chemistry-V (Lab)	Chromatographic separations of biomolecules, dyes and pigments and spectroscopic analysis of various organic compounds.	• Students will be able to acquire hands-on learning of thin layer, column and paper chromatographic separation techniques of mixture of amino acids, dyes and pigments. • Students will be able to analyse IR and ^{1}H NMR spectra of some common organic compounds.

	DSE1	Advanced Physical Chemistry (Theo)	Students will gain basic knowledge of solid-state chemistry, statistical thermodynamics, polymer chemistry and dielectric properties of molecules.	• Students will be able to gather knowledge on Bravais Lattice and Laws of Crystallography. • Students will learn about indexing of crystal planes and Bragg's law of diffraction. • Students will have knowledge about the structures of NaCl and KCl crystals. • Students will have understanding of relation between entropy and probability. • Students will know Boltzmann distribution formula (with derivation). • Students will learn about polymer science and dielectric properties of molecules.
		Advanced Physical Chemistry (Lab)	Computer programs based on numerical methods related physical chemistry.	• Students will be able to understand numerical methods of computation with the help of programming.
	DSE2	Analytical Methods in Chemistry (Theo)	Students will get the basic learning on quantitative and qualitative aspects of analysis, optical methods of analysis, thermal methods of analysis, electroanalytical methods & solvent separation techniques.	• Qualitative and quantitative aspects of analysis. • Students will learn basic principles of instrumentation for single and double beam UV-visible spectrophotometer. • Students will learn basic principles of instrumentation for single and double beam IR spectrophotometer. • Students will gain knowledge on Flame Atomic Absorption and emission Spectrometry. • Students will learn the theory of thermogravimetric analysis and the techniques for quantitative estimation of Ca and Mg from their mixture. • Students will have concept of basic principle of pH metric, potentiometric and conductometric titrations.

				• Students will have concept of chromatographic separation techniques.
		Analytical Methods in Chemistry (Lab)	Students will be able to learn chromatographic separation techniques and spectrophotometric techniques.	Students will be able to acquire hands-on learning of • Chromatographic separation of organic molecules, dyes and active ingredients of plants, flowers and juices. • Spectrophotometric determination of pKIn. • pH determination of soil.
SEMESTER-VI	**CC13**	Inorganic Chemistry-V (Theo)	Concept will be built on bioinorganic chemistry, organometallic chemistry, reaction kinetics of inorganic compounds.	Students will be able to learn • Students will learn about essential and beneficial elements, major, trace and ultra-trace elements. • Students will have knowledge of basic chemical reactions in the biological systems and the role of metal ions ((specially Na^{+}, K^{+}, Mg^{2+}, Ca^{2+}, $Fe^{3+}/^{2+}$, $Cu^{2+}/^{+}$, and Zn^{2+}). • Students will have knowledge of dioxygen management proteins, electron transfer proteins. • Students will know organometallic compounds and their classification depending of bond types. • Students will have knowledge of preparation and structure of some important Organometallic compounds e.g. Zeise's salt, ferrocene. • Students will learn the reaction mechanisms in inorganic compounds. • Students will learn trans-effect and its application in complex synthesis
		Inorganic Chemistry-V (Lab)	Students will have practical knowledge of qualitative semimicro analysis.	Students will be able to learn through hands-on experiments of qualitative semimicro analysis of mixtures containing four radicals and to assign the most probable composition.

	CC14	Physical Chemistry-V(Theo)	Concepts will be built on molecular spectroscopy, photochemistry and colloids.	• Students will be able to gather knowledge Rotational, Vibrational, Raman and Nuclear magnetic Resonance (NMR) spectroscopy. • Students will learn principle and applications of Electron Spin Resonance (ESR) spectroscopy. • Students will learn the Lambert-Beer's law and its limitations. • Students will know the physical significance of absorption coefficients. • Students will learn Laws of photochemistry. • Students will have the concepts of photochemical processes and rate of photochemical processes. • Students will learn about surface tension, surface energy and capillary action of liquid. • Students will gain concepts on physical and chemical adsorption and different adsorption isotherm. • Students will learn about lyophobic and lyophilic colloids, their stability and zeta potential.
		Physical Chemistry-V (Lab)	Students will have expertise on spectrophotometric studies.	• Students will be able to determine the surface tension of a liquid using Stalagmometer. • Students will be able to determine the CMC from surface tension measurements. • Students will be able to verify Beer and Lambert's Law for $KMnO_4$ and $K_2Cr_2O_7$ solution, spectrophotometrically. • Students will be able to study the kinetics of $K_2S_2O_8$ + KI reaction, spectrophotometrically. • Students will be able to determine the pH of unknown buffer spectrophotometrically. • Students will be able to determine the CMC from Spectrophotometric measurement.

	DSE3	Green Chemistry (Theo)	Students will come to know the principles of green chemistry, examples of green synthesis, reactions and some real-world cases, present scenario and future trends of green chemistry.	• Students will know twelve fundamental principles of green chemistry with their explanations and designing green syntheses using these principles. • Students will have knowledge of green synthesis of the some industrially important compounds e.g. adipic acid, catechol etc. • Students will have ability to design microwave assisted reactions in water, Ultrasound assisted reactions. • Students will know about combinatorial green chemistry. • Students will learn the role of green chemistry in sustainable development.
		Green Chemistry (Lab)	Students will learn to synthesize organic compounds using the principles of green chemistry.	• Students will learn to prepare and characterize gold nanoparticles of using tea leaves extract. • Students will learn to prepare biodiesel from vegetable/ waste cooking oil. • Students will be able to perform benzoin condensation using thiamine hydrochloride as a catalyst instead of cyanide. • Students will be able to perform solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II).
	DSE4	Polymer Chemistry (Theo)	Students will be able to learn functionality, kinetics of polymerisation, molecular wt. determination, glass transition temperature.	Students will gather knowledge of • Different types of polymerization processes. • Relationships between functionality, extent of reaction and degree of polymerization. • Nature structure and properties of polymers. • Determination of molecular weight of polymers. • Glass transition temperature (Tg) and determination of Tg.

		Polymer Chemistry (Lab)	Students will learn to prepare synthetic polymers.	• Students will be able to Prepare nylon 66/ polymer • Students will be able to prepare acrylamide by redox polymerization of • Students will be able to prepare acrylonitrile by precipitation polymerization. • Students will be able to prepare urea-formaldehyde resin. • Students will be able to prepare novalac resin/ resold resin. • Students will be able to determine the molecular weight of polymer by viscometry. • Students will be able to determine the viscosity-average molecular weight of poly(vinyl alcohol).
B.Sc. (General)-CBCS Curriculum				
SEMESTER-I	**DSC 1A/2A/3A**	Atomic Structure, Bonding, general organic chemistry & aliphatic hydrocarbons (Theo)	Students will gain the elementary concepts of atomic structure and chemical bonding. Students will also be able to know about fundamental organic chemistry, basic stereochemistry and organic reaction mechanism.	• Students will be able to acquire knowledge of different theories of structure of atom and their application. • Students will have the understanding of shapes of orbitals and quantum numbers. • Students will know about lattice energy and Born-Haber cycle. • Students will have qualitative idea of valence bond and band theories. • Students will understand molecular orbital concept of bonding and MO diagrams of different inorganic compounds. • Students will know about inductive effect, resonance, hybridization, isomerism in organic compounds. • Students will be able to determine absolute configuaration of chiral molecules.

				• Students will understand structure of organic molecules on the basis of VBT. • Students will know about different types of elimination reactions for synthesis of alkenes. • Students will learn different electrophilic addition reactions to alkenes and alkynes.
		Atomic Structure, Bonding, general organic chemistry & aliphatic hydrocarbons (Lab)	Students will gain experimental knowledge of titrimetric estimations and qualitative analysis of single solid organic compounds.	• Students will be able estimate sodium carbonate and sodium hydrogen carbonate present in a mixture. • Students will learn to estimate oxalic acid by titrating it with $KMnO_4$. • Students will be able estimate water of crystallization in Mohr's salt by titrating with $KMnO_4$. • Students will learn to estimate Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator. • Students will learn to estimate Cu (II) ions iodometrically using $Na_2S_2O_3$. • Students will learn to detect special elements (N, Cl, and S) in organic compounds. • Students will learn to detect functional groups: Aromatic-NO_2, Aromatic -NH_2, -COOH, carbonyl (no distinction of –CHO and >C=O needed), -OH (phenolic) in solid organic compounds.
SEMESTER-II	**DSC 1B/2B/3B**	Chemical Energetics, Equilibria &Functional Organic	Concept will be built on chemical energetics, chemical equilibrium and ionic equilibrium, aromatic hydrocarbons, organometallic	Students will gain understanding of • Fundamentals of thermodynamics with different thermodynamic processes. • Laws of thermochemistry. • Equilibrium constant and standard Gibbs free energy change.

		Chemistry (Theo)	compounds and carbonyl compounds.	• Definitions of K_P, K_C and K_X and relation among them. • Mechanism and scope of Nucleophilic aromatic substitution. • Preparation of benzene from phenol, acetylene and benzene sulfonic acid. • Preparations and uses of Grignard reagents. • Name reactions of aromatic compounds viz. Reimer-Tiemann reaction, Houben-Hoesch condensation, Schotten-Baumann reaction, • Nucleophilic addition reaction to carbonyl group. • Some important name reactions e.g. Aldol, Cannizaro, Wittig, benzoin condensation reactions.
		Chemical Energetics, Equilibria &Functional Organic Chemistry (Lab)	Students will have experimental learing on thermochemistry and pH measurement. They will be able to detect solid and liquid organic compounds.	• Students will be able to determine enthalpy of neutralization of hydrochloric acid with sodium hydroxide. • Students will be able to determine enthalpy of ionization of acetic acid. • Students will be able to determine enthalpy of hydration of copper sulphate. • Students will be able to measure the pH of different solutions like aerated drinks, fruit juices, shampoos and soaps. • Students will be able to identify of pure organic solid and liquid compounds.
SEMESTER-III	**DSC 1C/2C/3C**	Solutions, Phase equilibrium, Conductance , Electrochemi	Students will gain elementary knowledge of Phase equilibria, conductance and electromotive force. They will also gain brief understanding of structure, synthesis and reactions of	Students will be able to acquire knowledge of • Ideal solutions and Raoult's law. • Phases, components and degrees of freedom of a system. • Gibbs Phase Rule and its thermodynamic derivation. • Derivation of Clausius-Clapeyron equation.

		stry & Functional Organic Chemistry (Theo)	aliphatic and aromatic acids, amines and biomolecules.	• Conductance of strong and weak electrolytes. • Electromotive force of a cell and its measurement. • Acidic and alkaline hydrolysis of esters. • Preparation and reactions of aliphatic and aromatic amines. • Reactions and transformations of monosaccharides. • Synthesis and chemical reaction of amino acids.
		Phase equilibrium, Conductance , Electrochemistry & Functional Organic Chemistry (Lab)		• Students will be able to detect the functional groups ($-NO_2$), ($-NH_2$), phenolic –OH, (-COOH) etc. by systematic chemical tests. • Students will be able to determine the critical solution temperature and composition of the phenol water system. • Students will be able to determine dissociation constant of a weak acid by conductometric titration. • Students will be able to perform the conductometric titrations of strong acid vs strong base and strong acid vs strong base. • Students will be able to perform the potentiometric titrations of weak acid vs. strong base, potassium dichromate vs. Mohr's salt. • Students will be able to separate amino acids by paper chromatography.
SEMESTER-IV	**DSC 1D/2D/3D**	Coordination Chemistry, States of matter Chemical Kinetics (Theo)	Students will acquire some elementary knowledge of kinetic theory of gases, solid and liquid states and chemical kinetics.	Students will gain some understanding on • Ideal gas model, real gas models-especially van der Waals' gas model. • Valence Bond theory and its limitations. • Elementary Crystal Field Theory.

				• Magnetism and Colour of coordination compounds • 3d, 4d and 5d elements in term of electronic configuration, oxidation states, redox properties. • Electronic configuration, oxidation states, colour, spectral and magnetic properties of lanthanides and actinides.
		Coordination Chemistry, States of matter Chemical Kinetics (Lab)	Students will have practical knowledge of qualitative semimicro analysis.	• Students will be able to determine the surface tension of a liquid using Stalagmometer. • Students will be able to determine relative and absolute viscosity of a liquid using an Ostwald's viscometer. • Students will be able study the kinetics of acid hydrolysis of methyl acetate with hydrochloric acid. • Students will be able to learn through hands-on experiments of qualitative semimicro analysis of acid and basic radicals.
SEMESTER-V	**DSE 1A**	Analytical Methods in Chemistry (Theo)	Students will get the basic learning on quantitative and qualitative aspects of analysis, optical methods of analysis, thermal methods of analysis, electroanalytical methods & solvent separation techniques.	• Students will know the qualitative and quantitative aspects of analysis. • Students will learn basic principles of instrumentation for single and double beam UV-visible spectrophotometer. • Students will learn basic principles of instrumentation for single and double beam IR spectrophotometer. • Students will gain knowledge on Flame Atomic Absorption and emission Spectrometry. • Students will learn the theory of thermogravimetric analysis and the techniques for quantitative estimation of Ca and Mg from their mixture.

				• Students will have concept of basic principle of pH metric, potentiometric and conductometric titrations. • Students will have concept of chromatographic separation techniques.
		Analytical Methods in Chemistry (Lab)	Students will be able to learn chromatographic separation techniques and spectrophotometric techniques.	Students will be able to acquire hands-on learning of • Chromatographic separation organic molecules, dyes and active ingredients of plants, flowers and juices. • Paper chromatographic separation of Fe^{3+}, Al^{3+}, and Cr^{3+}. • Separation and identification of the monosaccharide present in the given mixture (glucose & fructose) by paper chromatography. Reporting the Rf values. • Separate a mixture of Sudan yellow and Sudan Red by TLC technique and identify them on the basis of their Rf values. • Spectrophotometric determination of pKIn. • pH determination of soil.
	SEC 2	Analytical Clinical Biochemistry (Theo.)		Students will be able to acquire knowledge on • Structure and reactions transformations of monosaccharides. • Synthesis and chemical reactions of amino acids. • Classification and mechanism of action of enzymes. • Biological importance of triglycerides and phosphoglycerides and cholesterol. • Structural study and chemical reactions of nucleic acids.

		Analytical Clinical Biochemistry (Lab)	Students will be able to identify and estimate carbohydrates, lipids and proteins.	• Students will be to determine the iodine number of oil. • Students will be to determine the saponification number of oil. • Students will be to determine cholesterol using Liebermann- Burchard reaction. • Students will be to determine protein by the Biuret reaction.
SEMESTER-VI	**DSE 1B**	Green Chemistry (Theo)	Students will come to know the principles of green chemistry, examples of green synthesis, reactions and some real-world cases, present scenario and future trends of green chemistry.	• Students will know twelve fundamental principles of green chemistry with their explanations and designing green syntheses using these principles. • Students will have knowledge of green synthesis of the some industrially important compounds e.g. adipic acid, catechol etc. • Students will have ability to design microwave assisted reactions in water, Ultrasound assisted reactions. • Students will know about combinatorial green chemistry. • Students will learn the role of green chemistry in sustainable development.
		Green Chemistry (Lab)	Students will learn to synthesize organic compounds using the principles of green chemistry.	• Students will learn to prepare and characterize gold nanoparticles of using tea leaves extract. • Students will learn to prepare biodiesel from vegetable/ waste cooking oil. • Students will be able to perform benzoin condensation using thiamine hydrochloride as a catalyst instead of cyanide. • Students will be able to perform solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II).

	SEC 4	Pesticide Chemistry (Theo)	Students will get an overall knowledge of synthesis and uses of pesticide.	Students will come to know about • Benefits and adverse effects of pesticides • Structure activity relationship of pesticides. • Synthesis and uses of representative pesticides viz. DDT, Malathion, Carbofuran, Chloranil etc.
		Pesticide Chemistry (Lab)	Students will learn to prepare some commercially important pesticides as well as to calculate acidity/alkalinity of a pesticide sample.	• Students will be able to calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications. • Students will be able to prepare simple organophosphates, phosphonates and thiophosphates.
4-Year B.Sc. Honours Major in Chemistry (CCFUP-NEP)				
SEMESTER-I	**Major-1** **CEMHMJ101**	Organic Chemistry-I	Students will be able to understand the structures, bonding, and physical properties of organic molecules and reactive intermediates. They will also gain concepts of basic stereochemistry.	• Students will be able to learn valence bond theory, molecular orbital theory and MO picture of different types of organic molecules. • Students will gain knowledge of hybridization and shape of organic molecules. • Students will know the influence of hybridization on bond properties of organic molecules. • Students will learn different types of reactive intermediates. • Students will learn molecular projection interconversions and symmetry elements, as well as to describe the stereochemical characteristics of organic molecules.
		Organic Chemistry Lab- I	Students will be able to detect solid and liquid organic compounds by chemical tests.	• Students will be able to separate components of a binary solid mixture. • Students will be able to determine boiling point of common organic liquid compounds. • Students will be able to identify pure organic solid and liquid compounds.

	SEC	CEMSEC01	Chemistry of Cosmetics & Perfumes (Lab)	Students will learn to prepare cosmetics and perfumes.	• Students will learn to prepare talcum powder. • Students will learn to prepare shampoo. • Students will learn to prepare enamels. • Students will learn to prepare hair remover. • Students will learn to prepare face cream. • Students will learn to prepare nail polish and nail polish remover. • Students will learn to prepare lipstick.
	Minor-1	CEMMI01	Inorganic Chemistry-I (Theo) & Physical Chemistry-I (Theo)	Students will gain the elementary concepts of atomic structure, acids-bases, redox reactions and states of matter.	• Students will be able to acquire knowledge about different theories of structure of atom and their application. • Students will gain knowledge of pH, buffer, Acid-base neutralization curves, indicator, choice of indicators etc. • Students will know the method of balancing equation of redox reaction, standard redox potentials with sign conventions, redox titration. • Students will learn Maxwell's distribution of speed and kinetic energy of gas molecules, Van der Waals equation, viscosity of gases and effect of temperature and pressure on coefficient of viscosity. • Students will know about the effect of temperature on surface tension and coefficient of viscosity of a liquid. • Students will gain knowledge of Bravais Lattice and Laws of Crystallography, indexing of crystal planes and Bragg's law of diffraction.
			Inorganic Chemistry-I (Lab) &		• Students will be able to estimate sodium carbonate and sodium hydrogen carbonate present in a mixture. • Students will be able to estimate oxalic acid by titrating it with $KMnO_4$.

			Physical Chemistry-I (Lab)		• Students will be able to estimate water of crystallization in Mohr's salt by titrating with $KMnO_4$. • Students will be able to estimate Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator. • Students will be able to estimate Cu (II) ions iodometrically using $Na_2S_2O_3$. • Students will be able to determine the surface tension of a liquid using Stalagmometer. • Students will be able to determine relative and absolute viscosity of a liquid using an Ostwald's viscometer.
SEMESTER-II	**Major-2**	**CEMHMJ102**	Inorganic Chemistry-I	Students will gain the basic concepts of atomic structure, chemical periodicity, acids and bases, redox reactions.	• Students will gain knowledge of different theories of structure of atom and their application. • Students will know about the electronic configuration of atoms and modern IUPAC Periodic table. • Students will understand the importance of periodicity in chemical and physical properties. • Students will learn different concepts of acid-base theory. • Students also learn about pH, buffer, Acid-base neutralization curves, indicator, choice of indicators etc. • Students will be able to balance equation of redox reactions. • Students will get elementary idea of standard redox potentials with sign conventions, redox titration.
			Inorganic Chemistry Lab-I	Students will be able to acquire knowledge through hands-on experience of titrations.	• Students will be able to do acid and base titrations. • Students will be able to do oxidation-reduction titrimetric analysis.

<table>
<tr><td rowspan="3"></td><td>SEC</td><td>CEMSEC02</td><td>Medicinal & Pharmaceutical Chemistry (Lab)</td><td>Students will learn to extract phytochemicals from plant.</td><td>Students will learn to extract eucalyptus leaf ingredient
Students will learn to extract eugenol from clove
Students will learn to extract nicotine from tobacco.
Students will learn to extract curumine from turmeric.
Students will learn to extract caffeine from tea/coffee.</td></tr>
<tr><td rowspan="2">Minor-2</td><td rowspan="2">CEMMI01</td><td>Organic Chemistry-I & Physical Chemistry-II (Theo)</td><td>Students will learn about fundamental organic chemistry, basic stereochemistry and preparation and reactions of alkenes and alkynes. They will also gain elementary knowledge of chemical kinetics.</td><td>Students will get elementary idea of inductive effect, resonance, hybridization.
Students will learn about isomerism in organic compounds.
Students will learn about absolute configuaration of chiral molecules.
Students will learn about preparation methods and reactions of alkanes, alkenes and alkynes.
Students will gain knowledge of rate law, order and molecularity of a reaction.
Students will know about half-life of a reaction.
Students will be able to understand the effect of temperature on reaction rate.</td></tr>
<tr><td>Organic Chemistry-I & Physical Chemistry-II (Lab)</td><td></td><td>Students will be able to detect special elements (N, Cl, and S) in organic compounds.
Students will be able to acquire the techniques for detection of functional groups in solid organic compounds.
Students will be able to study the kinetics of acid-catalyzed hydrolysis of methyl acetate.
Students will be able to study study of kinetics of decomposition of H_2O_2.</td></tr>
</table>

3-Year B.Sc. (Multidisciplinary Studies) with Chemistry (CCFUP-NEP)

SEMESTER-I	**Major-1**	**CEMPMJ101**	Inorganic Chemistry-I (Theo) & Organic Chemistry-I (Theo)	Students will gain the basic concepts of atomic structure, redox reactions. Students will also gain elementary knowledge of fundamental organic chemistry, basic stereochemistry and preparation and reactions of alkenes and alkynes.	• Students will gain knowledge of different theories of structure of atom and their application. • Students will be able to balance equation of redox reactions. • Students will get elementary idea of standard redox potentials with sign conventions, redox titration. • Students will get elementary idea of inductive effect, resonance, hybridization. • Students will understand isomerism in organic compounds. • Students will learn about absolute configuaration of chiral molecules. • Students will learn about preparation methods and reactions of alkanes, alkenes and alkynes.
			Inorganic Chemistry-I (Lab) & Organic Chemistry-I (Lab)	Students will learn volumetric analysis of inorganic compounds. Students will also learn the methods of detection of special elements in organic compounds and paper chromatographic separation of amino acids and sugars.	• Students will be able to acquire hands-on learning paper chromatographic separation techniques of mixture of sugars (glucose, fructose), mixture of amino acids e.g. glycine, aspartic acid, glutamic acid etc. • Students will be able to estimate sodium carbonate and sodium hydrogen carbonate present in a mixture. • Students will be able to estimate oxalic acid by titrating it with $KMnO_4$. • Students will be able to estimate water of crystallization in Mohr's salt by titrating with $KMnO_4$. • Students will be able to estimate Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator.

					• Students will be able to estimate Cu (II) ions iodometrically using $Na_2S_2O_3$.
	Minor-1	CEMMI01/C1	Inorganic Chemistry-I (Theo) & Physical Chemistry-I (Theo)	Students will gain the elementary concepts of atomic structure, acids-bases, redox reactions and states of matter.	• Students will be able to acquire knowledge about different theories of structure of atom and their application. • Students will gain knowledge of pH, buffer, Acid-base neutralization curves, indicator, choice of indicators etc. • Students will know the method of balancing equation of redox reaction, standard redox potentials with sign conventions, redox titration. • Students will learn Maxwell's distribution of speed and kinetic energy of gas molecules, Van der Waals equation, viscosity of gases and effect of temperature and pressure on coefficient of viscosity. • Students will know about the effect of temperature on surface tension and coefficient of viscosity of a liquid. • Students will gain knowledge of Bravais Lattice and Laws of Crystallography, indexing of crystal planes and Bragg's law of diffraction.
			Inorganic Chemistry-I (Lab) & Physical Chemistry-I (Lab)		• Students will be able to estimate sodium carbonate and sodium hydrogen carbonate present in a mixture. • Students will be able to estimate oxalic acid by titrating it with $KMnO_4$. • Students will be able to estimate water of crystallization in Mohr's salt by titrating with $KMnO_4$.

					• Students will be able to estimate Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator. • Students will be able to estimate Cu (II) ions iodometrically using $Na_2S_2O_3$. • Students will be able to determine the surface tension of a liquid using Stalagmometer. • Students will be able to determine relative and absolute viscosity of a liquid using an Ostwald's viscometer.
SEMESTER-II	**Minor-2**	**CEMMI02/C2**	Organic Chemistry-I & Physical Chemistry-II (Theo)	Students will learn about fundamental organic chemistry, basic stereochemistry and preparation and reactions of alkenes and alkynes. They will also gain elementary knowledge of chemical kinetics.	• Students will get elementary idea of inductive effect, resonance, hybridization. • Students will know about isomerism in organic compounds. • Students will learn about absolute configuaration of chiral molecules. • Students will get idea of different types of elimination reactions for synthesis of alkenes. • Students will learn about electrophilic addition reactions to alkenes and alkynes. • Students will gain knowledge of rate law, order, molecularity and half-life of a reaction. • Students will be able to understand the effect of temperature on reaction rate.
			Organic Chemistry-I & Physical Chemistry-II (Lab)		• Students will be able to detect special elements (N, Cl, and S) in organic compounds. • Students will be able to acquire the techniques for detection of functional groups in solid organic compounds. • Students will be able to study the kinetics of acid-catalyzed hydrolysis of methyl acetate. • Students will be able to study study of kinetics of decomposition of H_2O_2.

Program Outcomes

PO-1: Students will develop critical thinking skills and the ability to solve complex problems in chemistry by applying theoretical knowledge to practical situations.

PO-2: Students will possess strong laboratory skills, including the ability to perform experiments, analyse data, and interpret results using modern techniques and instrumentation.

PO-3: Students will be able to select, design and apply appropriate experimental techniques along with IT tools to solve chemical problems.

PO-4: Students will recognize the interdisciplinary nature of chemistry and its connections to other fields such as biology, physics, environmental science, and materials science.

PO-5: Students will effectively communicate scientific ideas, both orally and in writing, to diverse audiences including peers, instructors, and the broader community.

PO-6: Students will be able to conduct research, design experiments, and evaluate scientific literature in order to contribute to the advancement of knowledge in chemistry.

PO-7: Students will be able to communicate effectively through report writing, documentation and effective presentations.

PO-8: Students will demonstrate professionalism in their interactions with colleagues and the broader community.

PO-9: Program will provide knowledge and skills to the students that will enable them to undertake further studies in chemistry on related areas or multi-disciplinary areas that can be helpful for self-employment, entrepreneurship or further studies in the same domain.

PO-10: Students will be prepared for a variety of career paths including industry, academia, government, and healthcare, as well as for further study in graduate or professional programs.