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Memo. No.- Date:

Criterion 2 - Teaching-learning and Evaluation

2.6 Student Performance and Learning Outcome

2.6.1 Programme Outcomes (POs) and Course Outcomes (COs) for all Programmes offered by the institution are stated and displayed on website the Curriculum

DOCUMENTS

POs and COs of all UG and PG Courses

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The program outcome of Bengali

1. Language Proficiency: Students will be able to read, write, speak, and comprehend Bengali at a level of proficiency suitable for their program.

2. Cultural Understanding: Students will gain a deeper understanding of Bengali culture, literature, and history.

3. Communication Skills: Students will be able to effectively communicate in Bengali, both verbally and in writing.

4. Critical Thinking: Students will develop critical thinking skills through the analysis of Bengali texts, literature, and cultural practices.

5. Research Skills: Students will learn to conduct research using Bengali sources and materials.

6. Translation Skills: Students may acquire translation skills from Bengali to English or other languages.

7. Appreciation of Literature: Students will develop an appreciation for Bengali literature and its significance in the cultural context.

8. Understanding of Diverse Perspectives: Students will gain an understanding of diverse perspectives and experiences through Bengali texts, literature, and cultural practices.

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The program outcome of English

1. Critical Thinking and Analysis: Students will develop critical thinking and analytical skills to interpret literary texts.

2. Literary Knowledge: Students will gain a broad understanding of English literature, including its history, genres, and key works.

3. Reading and Writing Skills: Students will develop advanced reading and writing skills, including the ability to write critically and persuasively.

4. Research Skills: Students will learn to conduct research using literary sources and critical theories.

5. Communication Skills: Students will develop effective communication skills, both written and verbal.

6. Cultural Understanding: Students will gain an understanding of the cultural and historical contexts of literary works.

7. Theoretical Understanding: Students will develop an understanding of literary theories and critical approaches.

8. Creative Writing Skills: Students may develop creative writing skills, including poetry, fiction, and drama.

9. Critical Evaluation: Students will learn to critically evaluate literary texts and develop well-supported arguments.

10. Preparing for Future Careers: Students will be prepared for careers in teaching, writing, editing, publishing, and other fields related to English literature.

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The program outcome of Sanskrit

1. Language Proficiency: Students will develop reading, writing, speaking, and comprehension skills in Sanskrit.
2. Understanding of Classical Texts: Students will gain a deep understanding of classical Sanskrit texts, including the Vedas, Upanishads, and epics like the Ramayana and Mahabharata.
3. Literary Analysis: Students will develop skills in analyzing and interpreting Sanskrit literature, including poetry, drama, and philosophy.
4. Cultural Understanding: Students will gain an understanding of ancient Indian culture, history, and philosophy.
5. Critical Thinking and Research: Students will develop critical thinking and research skills to explore Sanskrit texts, commentaries, and related fields.
6. Translation Skills: Students may develop skills in translating Sanskrit texts into modern languages.
7. Appreciation of Indian Heritage: Students will develop an appreciation for India's rich cultural and intellectual heritage.
8. Understanding of Philosophy and Ethics: Students will gain an understanding of Indian philosophical systems, ethics, and moral principles.
9. Communication Skills: Students will develop effective communication skills to convey Sanskrit concepts, texts, and research findings.
10. Preparing for Future Careers: Students will be prepared for careers in teaching, research, translation, and other fields related to Sanskrit.
11. Students may develop Skills in Comparative Literature and Linguistics

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The program outcome of History

1. Historical Knowledge: Students will gain a broad understanding of historical events, processes, and cultural contexts.
2. . Research Skills: Students will learn to conduct historical research using various sources and methods.
3. Contextual Understanding: Students will gain an understanding of the historical context of social, political, and cultural developments.
4. Chronological Thinking: Students will develop skills in chronological thinking and understanding of historical timelines.
5. Cultural Competence: Students will gain an understanding of diverse cultures and historical experiences.
6. Historical Interpretation: Students will learn to interpret historical sources and develop well-supported arguments.
7. Empathy and Perspective-Taking: Students will develop empathy and perspective-taking skills to understand historical events from multiple viewpoints.
8. Preparing for Future Careers: Students will be prepared for careers in education, research, writing, and other fields related to history.
9. students may also achieve expertise Archival research, Historical preservation, Museum studies, Cultural resource management, Historical tourism and Digital humanities

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The program outcome of Philosophy

1. Logical Reasoning: Students will learn to construct and deconstruct logical arguments, and develop sound reasoning skills.
2. Ethical Decision-Making: Students will develop skills in applying ethical theories and principles to real-world issues.
3. Understanding of Philosophical Theories: Students will gain a deep understanding of major philosophical theories, including metaphysics, epistemology, ethics, and logic.
4. Knowledge of Philosophical History: Students will develop a broad understanding of the history of philosophy, including ancient, medieval, modern, and contemporary philosophy.
5. Research and Writing Skills: Students will learn to conduct philosophical research, and develop clear and persuasive writing skills.
6. Problem-Solving Skills: Students will develop skills in applying philosophical concepts to complex problems.
7. Intellectual Curiosity: Students will cultivate intellectual curiosity, and develop a love for lifelong learning.
8. Students may also study interdisciplinary subjects like Aesthetics and philosophy of art, Philosophy of mind and cognitive science, Philosophy and Science etc.

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The program outcome of Political Science

1. Understanding of Political Systems: Students will gain a comprehensive understanding of political systems, institutions, and processes.
2. Critical Thinking and Analysis: Students will develop critical thinking and analytical skills to evaluate political phenomena and issues.
3. Research Skills: Students will learn to conduct research using various methods and sources, including qualitative and quantitative approaches.
4. Understanding of Political Theory: Students will gain a broad understanding of political theories, including classical and contemporary perspectives.
5. Global Perspectives: Students will develop an understanding of global politics, international relations, and comparative politics.
6. Policy Analysis: Students will learn to analyze and evaluate public policies and programs.
7. Civic Engagement: Students will develop skills in civic engagement, including voting, activism, and community participation.
8. Ethical Reasoning: Students will develop skills in ethical reasoning and decision-making in political contexts.
9. Students will be prepared for careers in government, public policy, law, international relations, and other fields related to political science.

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The program outcome of Sanskrit

1. Language Proficiency: Students will develop reading, writing, speaking, and comprehension skills in Sanskrit.

2. Understanding of Classical Texts: Students will gain a deep understanding of classical Sanskrit texts, including the Vedas, Upanishads, and epics like the Ramayana and Mahabharata.

3. Literary Analysis: Students will develop skills in analyzing and interpreting Sanskrit literature, including poetry, drama, and philosophy.

4. Cultural Understanding: Students will gain an understanding of ancient Indian culture, history, and philosophy.

5. Critical Thinking and Research: Students will develop critical thinking and research skills to explore Sanskrit texts, commentaries, and related fields.

6. Translation Skills: Students may develop skills in translating Sanskrit texts into modern languages.

7. Appreciation of Indian Heritage: Students will develop an appreciation for India's rich cultural and intellectual heritage.

8. Understanding of Philosophy and Ethics: Students will gain an understanding of Indian philosophical systems, ethics, and moral principles.

9. Communication Skills: Students will develop effective communication skills to convey Sanskrit concepts, texts, and research findings.

10. Preparing for Future Careers: Students will be prepared for careers in teaching, research, translation, and other fields related to Sanskrit.

11. Additionally, students may also develop skills in Ancient Indian history and civilization, Philosophy and ethics, Yoga and Ayurveda, Comparative literature and Linguistics.

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The program outcome of Mathematics

1. Strong mathematical foundation: Students will have a deep understanding of mathematical concepts, theories, and techniques.
2. Problem-solving skills: Ability to apply mathematical knowledge to solve problems in various fields.
3. Critical thinking and analytical skills: Develop critical thinking, logical reasoning, and analytical skills.
4. Communication skills: Effectively communicate mathematical ideas, theories, and solutions.
5. Computational skills: Proficiency in mathematical software and programming languages.
6. Research and project management skills: Ability to conduct mathematical research, design projects, and manage time effectively.
7. Preparation for graduate studies: Foundation for pursuing advanced degrees in mathematics or related fields.
8. Career opportunities: Prepared for careers in fields like actuarial science, data analysis, cryptography, scientific research, and education.
9. Logical reasoning and argumentation: Develop ability to construct and deconstruct mathematical arguments.
10. Interdisciplinary connections: Understand connections between mathematics and other disciplines.

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The program outcome of Physics

1. Understanding of Fundamental Principles: Students will gain a deep understanding of the fundamental principles of physics, including mechanics, electromagnetism, thermodynamics, and quantum mechanics.
2. Problem-Solving Skills: Students will develop strong problem-solving skills, including the ability to analyze complex problems, identify key concepts, and apply relevant principles.
3. Experimental Skills: Students will gain hands-on experience with experimental techniques, including data collection, analysis, and interpretation.
4. Mathematical Skills: Students will develop strong mathematical skills, including the ability to apply mathematical models to physical systems.
5. Communication Skills: Students will develop clear and concise communication skills to convey complex physical concepts and research findings.
6. Understanding of Modern Physics: Students will gain an understanding of modern physics topics, including relativity, particle physics, and condensed matter physics.
7. Research Skills: Students will learn to conduct research using various methods and tools, including computational simulations and data analysis.
8. Preparing for Future Careers: Students will be prepared for careers in research, industry, education, and other fields related to physics.
9. Additionally, students may also develop skills in Computational physics, Data analysis and visualization, Laboratory management, Science communication and Teaching and education

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The program outcome of Chemistry

1. Students will gain a deep understanding of chemical principles, including atomic structure, chemical bonding, and chemical reactions.

2. Knowledge of Chemical Properties and Processes: Students will learn about the properties and processes of chemicals, including thermodynamics, kinetics, and spectroscopy.

3. Laboratory and Experimental Skills: Students will develop laboratory and experimental skills, including chemical synthesis, analysis, and instrumentation.

4. Critical Thinking and Problem-Solving: Students will develop critical thinking and problem-solving skills to address complex chemical issues.

5. Understanding of Chemical Systems: Students will learn about chemical systems, including chemical equilibrium, acid-base chemistry, and electrochemistry.

6. Knowledge of Organic and Inorganic Chemistry: Students will study the principles and reactions of organic and inorganic chemistry.

7. Understanding of Physical Chemistry: Students will learn about the principles of physical chemistry, including quantum mechanics and statistical thermodynamics.

8. Students will be prepared for careers in chemistry, research, industry, and related fields.

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The program outcome of Computer Science

1. Programming Skills: Students will gain proficiency in programming languages, including syntax, semantics, and software development.
2. Problem-Solving Skills: Students will develop strong problem-solving skills, including the ability to analyze complex problems, identify key concepts, and apply relevant algorithms.
3. Data Structures and Algorithms: Students will understand data structures, algorithms, and software design patterns.
4. Computer Systems: Students will gain knowledge of computer architecture, operating systems, and networking fundamentals.
5. Software Engineering: Students will learn software engineering principles, including design, development, testing, and maintenance.
6. Data Analysis and Visualization: Students will develop skills in data analysis, interpretation, and visualization.
7. Artificial Intelligence and Machine Learning: Students will gain knowledge of AI and ML concepts, including neural networks, deep learning, and natural language processing.
8. Web Development: Students will learn web development frameworks, including front-end and back-end development.
9. Database Systems: Students will understand database concepts, including data modeling, normalization, and querying.
10. Students will be prepared for careers in software development, data science, AI, web development, Computer Graphics, Cyber Security, cloud computing and other fields related to computer science.

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The program outcome of Physiology

1. Understanding of Physiological Principles: Students will gain a deep understanding of physiological principles, including the functions and processes of living organisms.

2. Knowledge of Human Physiology: Students will learn about the structure and function of the human body, including the nervous, circulatory, respiratory, and digestive systems.

3. Understanding of Physiological Mechanisms: Students will study the physiological mechanisms that maintain homeostasis, including regulation of temperature, pH, and blood pressure.

4. Laboratory and Experimental Skills: Students will develop laboratory and experimental skills, including data collection, analysis, and interpretation.

5. Communication Skills: Students will develop clear and effective communication skills to convey physiological concepts and research findings.

6. Understanding of Pathophysiology: Students will learn about the physiological changes that occur in disease states, including the mechanisms and consequences of disease.

7. Knowledge of Pharmacology: Students will study the effects of drugs on physiological processes and the mechanisms of drug action.

8. Students will learn about the structure and function of the nervous system, including the mechanisms of neural transmission and integration.

9. Physiology students may develop career into Research scientist, Clinical physiologist, Medical doctor, Pharmacologist, Neuroscientist, Teaching faculty, Healthcare consultant, and Public health specialist.

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The program outcome of Microbiology

1. Understanding of Microbial Structure and Function: Students will gain a deep understanding of the structure and function of microorganisms, including bacteria, viruses, and other microbes.

2. Knowledge of Microbial Diversity: Students will learn about the diversity of microorganisms, including their classification, evolution, and distribution.

3. Understanding of Microbial Growth and Metabolism: Students will study the growth and metabolism of microorganisms, including the factors that influence their growth and survival.

4. Laboratory and Experimental Skills: Students will develop laboratory and experimental skills, including microbial isolation, cultivation, and identification.

5. Critical Thinking and Problem-Solving: Students will develop critical thinking and problem-solving skills to address complex microbiological issues.

6. Communication Skills: Students will develop clear and effective communication skills to convey microbiological concepts and research findings.

7. Understanding of Microbial Interactions: Students will learn about the interactions between microorganisms and their environments, including host-microbe interactions.

8. Knowledge of Microbial Diseases: Students will study the role of microorganisms in human disease, including the mechanisms of pathogenesis and the immune response.

9. Understanding of Microbial Ecology: Students will learn about the ecological roles of microorganisms, including their contributions to nutrient cycling and environmental processes.

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Memo. No.- Date:

The program outcome of Zoology

1. Understanding of Animal Structure and Function: Students will gain a deep understanding of the structure and function of animals, from molecules to ecosystems.

2. Knowledge of Animal Diversity: Students will learn about the diversity of animal life, including evolution, classification, and distribution.

3. Understanding of Animal Behavior: Students will study animal behavior, including social behavior, communication, and behavioral ecology.

4. Knowledge of Wildlife Conservation: Students will learn about wildlife conservation principles and practices, including habitat management and species preservation.

5. Laboratory and Field Skills: Students will develop laboratory and field skills, including animal handling, experimentation, and data analysis.

6. Communication Skills: Students will develop clear and effective communication skills to convey zoological concepts and research findings.

7. Understanding of Animal Physiology: Students will study animal physiology, including nutrition, metabolism, and disease.

8. Knowledge of Animal Development: Students will learn about animal development, including embryology, growth, and morphogenesis.

9. Potential career paths for zoology graduates include, Wildlife biologist, Conservation biologist, Research scientist, Zoo or aquarium manager, Animal behaviourist, Wildlife rehabilitator, Environmental consultant, Animal welfare specialist, Science writer or communicator and teaching faculty.

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The program outcome of Geography

1. Understanding of Geographic Concepts: Students will gain a deep understanding of geographic concepts, including spatial relationships, place, and environment.

2. Spatial Analysis and Thinking: Students will develop skills in spatial analysis, including mapping, GIS, and spatial modeling.

3. Environmental Understanding: Students will gain knowledge of environmental systems, including ecosystems, climate, and natural resources.

4. Cultural and Social Understanding: Students will understand the cultural and social aspects of geography, including population dynamics, urbanization, and globalization.

5. Research Skills: Students will learn to conduct geographic research using various methods and tools, including fieldwork, remote sensing, and GIS.

6. Critical Thinking and Problem-Solving: Students will develop critical thinking and problem-solving skills to address complex geographic issues.

7. Understanding of Geographic Technologies: Students will gain knowledge of geographic technologies, including GIS, remote sensing, and GPS.

8. Students will be prepared for careers in urban planning, environmental management, geographic information systems, and other fields related to geography.

9. Additionally, students may also develop skills in Cartography and mapping, Geographic information systems (GIS), remote sensing, Urban and regional planning, Environmental management, Climate change and sustainability, Globalization and development

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Name of the Academic Program: B.A HONOURS BENGALI
Course Outcome (CO)
Department of Bengali
P. R. Thakur Govt. College

NAME OF THE PROGRAMME	SEMESTER	COURSE CODE	COURSE TITLE	COURSE OUTCOME	
B.A –Bengali Honours	I	**BNGACOR01T**	**History of Pre-modern Bengali Literature**	**Course Unit: 1**	Students learn about the History of Bengali Literature from 8th to 15th Century in the Historical Back ground of Social economic and political Changes
				Course Unit: II	Students gain a clear idea about Mongal Kabya under changing social economic and political environment
				Course Unit: III	Students can achieve a comprehensive awareness about the tradition and translation literature in Bengali
				Course Unit: IV	Students can gain a clear idea about the history of ***Padaboli Sahitya , The Biography of Chaitanya*** and other Religious Literature
		BNGACOR02T	**Pre modern Bengali Literature**	**Course Unit:1**	Students can learn selected text ***of Baishnav Padaboli***- A Critical reading and analysis of the pieces
				Course Unit-II	Students study the selected pieces of ***Shakta Padabali*** to gain critical Understanding
				Course Unit-III	Students study the selected textbook on ***Chandimongal*** in a comprehensive and analytical Manner

Name of the Academic Program: B.A HONOURS BENGALI
Course Outcome (CO)
Department of Bengali
P. R. Thakur Govt. College

				Course Unit-IV	Students can study the text book on ***Chaityanya Bhagbat*** to gain a detailed understanding of the text under contemporaneous Setting
	II	**BNGACOR03T**	**Linguistics**	**Course Unit:1**	Students can gain Extensive explanation of the History of old Indo Aryan language, Middle Indo Aryan Language & new Indo Arian Language
				Course Unit:II	Students can learn about the regional varieties of Bengali Language.
				Course Unit:III	Students can achieve the knowledge regarding the phonetics of Bengali Language
				Course Unit: IV	Students can develop their knowledge about the Semantics, vocabulary and the evolution of words of Bengali language
		BNGACOR04T	**History of Modern Bengali Literature**	**Course Unit: I**	To acquaint the Students with the genre of Bengali Essays
				Course Unit: II	To acquaint the Students with History of modern drama, origin and development from 19^{th} to 20^{th} Century
				Course Unit: III	Enable students to gain an idea about the origin and development of modern Bengali Poetry from 19^{th} to 20^{th} Century

Name of the Academic Program: B.A HONOURS BENGALI
Course Outcome (CO)
Department of Bengali
P. R. Thakur Govt. College

				Course Unit:IV	Enable students to gather a comprehensive idea about the origin and development od short stories and novel.
	III	**BNGACOR05T**	**Bengali Prosody and Rhetoric**	**Course Unit: I**	To gain a thorough understanding of the concepts , methods, and classifications
				Course Unit: II	To learn application of Rhetoric
				Course Unit: III	To gain a thorough understanding of Bengali metres, its types and Classification
				Course Unit: IV	The students should be able to scan and identify Bengali Prosodic metres
		BNGACOR06T	**Bengali Drama and Theatre**	**Course Unit: I**	Enable students to gain an idea of the history of Bengali stage
				Course Unit: II	**Madhusudan Dutta and Krishnakumari**: The students get to know the history and tragedy involved
				Course Unit: III	**Raja – Rabindranath Thakur:** Students are expected to gain a critical insight into the drama, including its allegory, symbolism etc.
				Course Unit: IV	**Nabanna: Bijan Bhattacharya**: Critical evaluation of the drama and its historical significance

Name of the Academic Program: B.A HONOURS BENGALI
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P. R. Thakur Govt. College

		BNGACOR07T	**Bengali Prose and Essay**	**Course Unit: I**	**Bankim Chandra Chattopadhyay- Samyo**: Students are expected to know about the history of Socialist ideas and its principles
				Course Unit: II	**Rabindranath Thakur-Biswaporichoy**: Students gain a comprehensive idea of the universe and natural sciences with a literally perspective
				Course Unit: III	**Promotho Chowdhury-Probomdho Sangroho:** From selected pieces, students learn about the socio political and cultural aspects of society in his time.
				Course Unit: IV	**Abanindranath Thakur: Aponkotha :** The students can gain understanding of his life, starting from his childhood
	IV	**BNGACOR08T**	**Bangla Kabyo o kobita**	**Course Unit: I**	**Meghnad Badh Kabyo:** Students learn to evaluate this Bengali literary epic and its place in world literarure
				Course Unit: II	**Rabindranath Tagore: Sanchayita:** Students are expected to gain entry into the wondrous world of Rabindranath ‘s poetry
				Course Unit: III	**Jibonanondo Dash: Shresthao Kobita:** Students should get an idea about the poet and his universe-nature, history, love, philosophy and their surreal aspects

Name of the Academic Program: B.A HONOURS BENGALI
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				Course Unit: IV	**Ekaler kobita Sanchayan:** Students should get to know and evaluate selected pieces of modern Bengali poetry of 20th Century and the poets
		BNGACOR09T	**Rabindra Sahitya**	**Course Unit: I**	**Ghore-Baire- Rabindranath Thakur:** Students to gain understanding of the novel with political and psychological undercurrents.
				Course Unit: II	i. Rabindranath and his works on literary criticism ii. Prachin Sahitya, Rabindranath Thakur : students learn to understand Tagore's view on literary criticism.
				Course Unit: III	**The Biography of Rabindra Nath : "Chhelebela**" Students get acquainted with this Biography the ancient history of Jorashanko Thakurbari in the period of 19th Century.
				Course Unit: IV	"**Rabindra Patra - Sahitya"- "Russiar Chithi"**. Students have an idea to analyze these books from the perspective of the writter in Context of Russia.
		BNGACOR010T	**Sahityer Rupriti O Bharatiya Sahitya-tattwa**	**Course Unit: I**	Students know about the different genres of poetry & drama
				Course Unit: II	**Bangla Prabandha-Nibandha O KathaSahityer Rupabhed"** - Students learn about the different categories of Essays, Novel & Poetry.

Name of the Academic Program: B.A HONOURS BENGALI
Course Outcome (CO)
Department of Bengali
P. R. Thakur Govt. College

				Course Unit: III	**Kabya - Jiggasha - Atul Chandra Gupta**: The students learn from this book the way of knowing literature and the soul & structure of the Literature.
				Course Unit: IV	**Sahitya - Rabindranath Tagore:** Students gain the knowledge of criticism on Literature of Rabindranath .
	V	**BNGACOR011T**	**Bengali Novel**	**Course Unit: I**	**Rajsingha - Bankim Chandra Chattopadhyay.** The student learn the characteristics of historical Novel in Context with " Rajsingha".
				Course Unit: II	**Pather Dabi' - Sarat Chandra Chattopadhyay** The student will be able to analyze the definition & characteristics of Political Novel in Context with the Novel 'Pather Dabi'
				Course Unit: III	'**Ganadebata" - Tarashankar Bandyopadhyay**, The student can evaluate the Regional Novel - "Ganadevata in socio-economic-political aspects
				Course Unit: IV	"**Padma Nadir Majhi" - Manik Bandyopadhyay**: The student can get the characteristics of Regional Novel 'Padda Nadir Majhi" in broader sense.
		BNGACOR012T	**Bengali Short Story.**	**Course Unit: I**	**Rabindra Short Story/;** The student learn short stories in Context with Rabindra Nath Tagore's Creation in a broader sense.

Name of the Academic Program: B.A HONOURS BENGALI
Course Outcome (CO)
Department of Bengali
P. R. Thakur Govt. College

				Course Unit: II	**Subodh Ghosh - Short Story:** The student sanalyze and understand the Psychological problems of the Modern Society.
				Course Unit: III	Student will be able to analyze & evaluate the Pre-Independent Social, Economical, Political & Cultural position of Indian people.
				Course Unit: IV	**Swadhinata Paraborti Short Story:** Students will be able to have a comprehensive picture to compare with the Pre-Independent & after Independent Short Story.
		BNGADSE01T	**The Bengali Literature of Middle Age**	**Course Unit: I**	**Ramayan by Krittibus –** Students will have an idea on cultural background, the history of Bengali culture and cultural behaviour.
				Course Unit: II	**Manashamangal by Bipradas Piplai :** This paper enhance student's knowledge towards Bengali culture.
				Course Unit: III	**Mangalchandirgeet by Dwij:** The students have a comprehensive idea upon Bengali Tradition, Myth.
				Course Unit: IV	**Annadamangal by Roygunakar Bharatchandra :** Students will get examples of middle age through social, historical and cultural context .

Name of the Academic Program: B.A HONOURS BENGALI
Course Outcome (CO)
Department of Bengali
P. R. Thakur Govt. College

		BNGADSE02T	**Bengali Prose & Essay**	**Course Unit: I**	**Muchiramgurher Jibancharit by Bankim Chandra Chattapadhyay :** This text analyze the Social parameter of Pre-Independence Period.
				Course Unit: II	**Prachya O Paschat by Swami Vivekananda** - This text highlights the cultural difference of East & West.
				Course Unit: III	**Panchabhut by Rabindranath Thakur –** Students will be Introduced with some of Rabindranath's Literary works in this paper which provides philosophy of Rabindranath.
				Course Unit: IV	**Essays by Buddhadeb Basu –** Students can develop independent thinking of Buddhadeb Basu and his mythological, social, literary aspect highlighted in this unit.
		BNGADSE03T	**Bengali Poem after Rabindra Age**	**Course Unit: I**	Kobitar KOtha: Jjibanandan Das: Students will have a critical idea on poetry through the text book.
				Course Unit: II	Abu Syed Ayub: Texts: Students can analyze, the Concept, Language, Theories, Methodologies, Structure of Bengali Poem as per Abu Syed Aiyub.

Name of the Academic Program: B.A HONOURS BENGALI
Course Outcome (CO)
Department of Bengali
P. R. Thakur Govt. College

				Course Unit: III	Subhas Mukhopadhyay: Shrestho Kobita & Shakti Chattopadhyay er shrestho Kobita: Students will learn the poems of great Bengali poets.
				Course Unit: IV	Sankho Ghosh and Binoy Majumdar er Shrestho Kobita: Students will learn the poems and understand the perspective of poets.
	VI	**BNGACOR13T**	**History of Sanskrit, English, Hindi & Assamese Literature**	**Course Unit: I**	The course provides a brief introduction to the history of Sanskrit Literature. The beginning of the writing system in Sanskrit started from the ancient time B.C. 6th Hundred.
				Course Unit: II	The students will try to know the foreign Language English Literature elaborately
				Course Unit: III	The Students will learn the History of Hindi Literature & will be able to relate between the Hindi Literature & Bengali Literature.
				Course Unit: IV	The student will learn the history of Assamese Literature & will know the relation of Bengali & Assamese Literature
		BNGACOR14T	**Travel Literature**	**Course Unit: I**	The students will know the Travel Literature written by the first Bengali women & know the Social, Economical, Political, Cultural states of England in the 19th Century.

Name of the Academic Program: B.A HONOURS BENGALI
Course Outcome (CO)
Department of Bengali
P. R. Thakur Govt. College

				Course Unit: II	The students will realize from this travel literature the real & philosophical introspection of the written about Europe.
				Course Unit: III	The students will analyze from this travel literature to compare with the different Continent Asia & Europe
				Course Unit: IV	The students will realize from this travel literature how to dedicate herself / himself to the almighty by the magical representation of the writer.
		BNGADSE01T	**Bengali Drama & Dramatic Thought**	**Course Unit: I**	Acquired knowledge of Drama acting in context of Society culture
				Course Unit: II	Achieve knowledge about the History of Hindu and the beauty of diverse India.
				Course Unit: III	Get knowledge about British rule and the activity of revolutionary leaders
				Course Unit: IV	Evaluate the evolution of human Society in context with the Mangal Kabya.
		BNGADSE02T	**'Bangla Katha Sahitya: Monnontar, Danga O Desh-Bhag**	**Course Unit: I**	Students know the history of Famine & partition of a country & its effects.
				Course Unit: II	**Ashoni Songket - Bibhuti Bhusan Bandyopadhyay:** Students will get an acute famine picture of Bengal.

Name of the Academic Program: B.A HONOURS BENGALI
Course Outcome (CO)
Department of Bengali
P. R. Thakur Govt. College

				Course Unit: III	Agun Pakhi - Azizul Haque: Students knows the psychological & real effect for the partition of bengal.
				Course Unit: IV	Bengali Short Stories: Students analyze the real picture of the Society after Independence in Bengali.
		BNGADSE03T	**Rabindra Jibon, Karma O**	**Course Unit: I**	**Pravat Kumar Mukhopadhyay - Rabindra Jiban Katha**: This paper presents students know the biography of Rabindranath Tagore in wider & dipper sense.
				Course Unit: II	**Rabindranather Siksha Chinta O Proyog :** This paper presents the concept of education of Rabindranath Tagore and the application in the education system.
				Course Unit: III	**Rabindranather Karma Parikalpana : Pally Bhabna O Gramonnoyon**. This paper presents Rabindranath Tagore's planning of functions which is applied for the village development .
				Course Unit: IV	**Rabindranather Loko Sahitya Charcha.** The paper presents Rabindranath's Folk Literature which is accepted in the elite society in a wider sense.

P. R. THAKUR GOVT. COLLEGE, THAKURNAGAR

Department of Chemistry

Course outcome of core course and generic course

1. Core Course in Chemistry (B.Sc. Honours under CBCS)

Semester	Course code	Course details	Outcome of Course
I	CEMACOR01T	Organic Chemistry-I	Detailed understanding of basic knowledge on bonding in organic molecules and others physical parameters and stability factors. Students will also understate about aromaticity and delocalization. Additionally, concept of reaction mechanism will help students to build up knowledge about pathway of chemical conversion, types of reagents, reaction condition etc. Simultaneously study on reaction intermediates gives idea to find out a possible reaction path for an unknown reaction. Moreover, the stereochemistry part involves the study of the relative spatial arrangement of atoms that form the structure of molecules and their manipulation. The study of stereochemistry focuses on stereoisomers, which by definition have the same molecular formula and sequence of bonded atoms (constitution), but differ in the three-dimensional orientations of their atoms in space.
	CEMACOR01P	Organic Chemistry-I Lab	Students will experience hand on training regarding quantitative separation of organic compounds using several techniques. They will also get training on determination of boiling point with some common organic solvents. It will help to detect proper solvent for a particular reaction in their future. Moreover, they will experience hand on training regarding and skill development for identification of Organic Compounds by Chemical Tests which will help to detect the nature of compounds and their chemical behaviour.
	CEMACOR02T	Physical Chemistry-I	Students will achieve a clear concept on the kinetic theory of gases along with Maxwell speed and energy distribution and the behaviour of real gases. In general temperature-pressure concept, concept of some physical parameters and role of some physical factors viz., temperature, pressure etc. on collisions of gas molecules will be gained. Behaviour of real gases and the extent of their deviation from ideal behaviour is also clearly understood. A detailed understanding of thermodynamics with some important functions. An elaborated discussion of first, second and third law of thermodynamics is made. Chemical kinetics is an important aspect in physical chemistry. Students will get the experience on rate of chemical equation and allied parameters. How temperature and pressure play a significant role on chemical kinetics, will be understood

			clearly. Concept of reaction mechanism will achieved from the understanding of this aspect.
	CEMACOR02P	Physical Chemistry -I Lab	Students will experience a hands on training on both analytical and instrumentation techniques in carrying out physical experiments. pH determination and determination of heat of neutralization, heat of solution etc. kinetic studies on different reactions are very important areas of learning.
II	CEMACOR03T	Inorganic Chemistry-I	Understanding of different atomic models, and writing electronic configuration and ground state term symbol. Understanding of modern periodic law and periodic properties of elements, different theories of acids and bases, concept of pH, acid-base equilibrium, and neutralization titration. Getting the basic idea about redox reaction, redox potential, factors affecting redox potential, representation of redox potential diagram and basics of solubility product and its application on group separation.
	CEMACOR03P	Inorganic Chemistry-I Lab	Hands on experiences on acid base and redox titrations.
	CEMACOR04T	Organic Chemistry-II	This part offers basic knowledge on stereochemistry and fundamentals of chiral axis, atropisomers, pseudoasymmetry, conformational isomers etc. Also, from this portion students can get a clear idea about stereogenicity of simple as well as complex molecules having axial chirality, potential energy barriers of different conformers, preferred conformation of functional molecules in their ground state. From the reaction kinetics and thermodynamics portion students can acquire thorough background knowledge on reaction thermodynamics (How far?): free energy and equilibrium, enthalpy and entropy as well as Reaction kinetics (How fast?): rate constant and free energy of activation; concept of order and molecularity etc. Concept of organic acids and bases and tautomerism will help the students to build up knowledge about different molecules and their chemical nature. Idea about Substitution and Elimination Reactions may help regarding reaction of organic molecules, several aspects which affect the reaction mode, rate, products etc. This is extremely important to understand various chemical phenomena of organic molecules under different condition and reagents.

	CEMACOR04P	Organic Chemistry-II Lab	From this portion students can acquire thorough background knowledge about qualitative as well as quantitative synthesis of organic molecules. There will be a hand on experience of Yield calculation, Purification, Crystallization and MP detection which may help students to evaluate and characterize the synthesized products with rigorous literature survey
III	CEMACOR05T	Physical Chemistry-II	Transport properties of fluids and related phenomena are also very important areas of learning. Students will understand fluid flow in relation to viscosity and allied parameters. Understanding of conduction in electrochemistry and transport number and also equilibrium in ions. Students will also achieve their knowledge in various aspects of thermodynamics. They will learn partial properties and chemical potential along with application of thermodynamics in chemical reactions and equilibrium. They will also gain the basic concept of quantum mechanics viz., black body radiation, concept of operators, particle in a box, simple harmonic oscillator etc.
	CEMACOR05P	Physical Chemistry-II Lab	Students will experience a training on both analytical and instrumentation techniques in carrying out physical experiments. As a part of analytical experiments, students will determine some physical parameters viz., coefficient of viscosity, partition coefficient etc. They will also be trained on operation of conductometer and will do titration and other experiments using conductometer.
	CEMACOR06T	Inorganic Chemistry-II	Understanding of basics about ionic bonding, covalent bonding, metallic bonding, and different weak chemical forces related to bonding, Factors affecting bonding, shape of molecules and modern concept of covalent bonding, inner structure of atomic nucleus and theories related to its stability, radioactivity and its applications, isotope and its separations and applications, power generation using nuclear reactions.
	CEMACOR06P	Inorganic Chemistry-II Lab	Hands on experiences on some iodo/iodimetric titrations, and estimation of some metal ions in some important alloys/substances.
	CEMACOR07T	Organic Chemistry-III	This part aims to offer basic knowledge on reaction chemistry of alkenes and alkynes. How reagent jugglery causes different fictionalization on simple π-bonds is the main focus of our discussion.

			Moreover, the portion provides most important reactions in synthetic organic chemistry. Such reactions are used for the synthesis of important intermediates that can be used as precursors for the production of pharmaceutical, agrochemical and industrial products. They will also be able to explain the relative reactivity of carbonyl compounds toward various reactions. Moreover, organometallic compounds are widely used both stoichiometrically in research and industrial chemical reactions, as well as in the role of catalysts to increase the rates of such reactions (e.g., as in uses of homogeneous catalysis), where target molecules include polymers, pharmaceuticals, and many other types of practical products.
	CEMACOR07P	Organic Chemistry-III LAb	Students will experience hand on training regarding quantitative separation of organic compounds using several techniques. These classes may help students to develop their skills regarding laboratory experiments of various RNDs and research.
	CEMSSEC001	Basic Analytical Chemistry	Understanding of basics of analytical chemistry, analysis of soil, water, food products and cosmetics. Getting the basics of chromatographic separation technique s mainly thin layer, column and ion exchange.
IV	CEMACOR08T	Physical Chemistry-III	Students will learn the application of thermodynamics in colligative properties, viz., vapour pressure of solution, elevation of boiling point, depression of freezing point and osmotic pressure. They will understand phase rule and various aspects of electrical properties of molecules. They will get the detailed concept of Debye Huckel limiting law along with ionic atmosphere, mean ionic activity coefficients etc. They will also learn the application of quantum mechanics in angular momentum, hydrogen atom and hydrogen like ions etc.
	CEMACOR08P	Physical Chemistry-III Lab	Students will experience a training on determination of solubility product of some sparingly soluble salts. They will achieve hands on experience on experimentation with potentiometer, pH meter. etc. They will do the titration with the help of these equipments and will find out some important physical parameters which are very important in physical chemistry.
	CEMACOR09T	Inorganic Chemistry-III	Understanding of basic principles and methodologies used in extraction, purification of

			elements, chemistry of some s-and p -block elements, idea about noble gases and their compounds particularly based on xenon. Getting basic concept on inorganic polymer and applications of some inorganic polymers. Getting basic idea on coordination compounds, its theory, nomenclature and isomerism.
	CEMACOR09P	Inorganic Chemistry-III Lab	Hands on experiences based on complexometric titration and syntheses of some coordination compounds.
	CEMACOR10T	Organic Chemistry-IV	Detailed understanding of nitrogen compounds including their physical and chemical properties, synthesis, separation, and application in industries. Understanding the type of rearrangements to explain the mechanism for various organic reactions along with evidence and stereochemical features. The logic of organic synthesis will introduce them to the disconnection approach, asymmetric synthesis, and ring synthesis strategy. This knowledge will help them to find out proper pathway to synthesize large organic molecules with proper stereochemistry. Understanding organic spectroscopy will help them to identify or find the structure of unknown organic molecules from their spectroscopic data.
	CEMACOR10P	Organic Chemistry-IV Lab	Hands-on training on quantitative estimation of glycine, glucose, sucrose, vitamin-C, aniline, phenol, formaldehyde, acetic acid, urea, and saponification value of oil/fat/ester.
	CEMSSEC002	Analytical Clinical Chemistry	Understanding the structure, function, and biological importance of various biomolecules like carbohydrates, proteins lipids, lipoproteins, DNA, and RNA. Understanding on biochemistry of diseases by studying various diagnostic approaches by blood and urine analysis. Hands-on training on identification and estimation of carbohydrates, lipids, iodine number in oil, cholesterol, protein and nucleic acids.
V	CEMACOR11T	Inorganic Chemistry-IV	Understanding of different theories of Coordination compounds, and its application on explaining different properties. Understanding of trends in properties of transition elements, lanthanides and actinides.
	CEMACOR11P	Inorganic Chemistry-IV Lab	Hands on experiences on paper chromatographic separations of mixture of ions, gravimetric estimation of some ions, and spectrophotometric determination of 10Dq and λ_{max} values of some complexes.

	CEMACOR12T	Organic Chemistry-V	Detailed understanding of structures, stereochemistry, physical and chemical properties, synthesis and reactions of carbocycles, heterocycles, cyclic stereochemistry, pericyclic reactions, carbohydrates and biomolecules
	CEMACOR12P	Organic Chemistry-V LAb	Hands-on training on chromatographic separations by paper chromatography, thin layer chromatography, and column chromatographic techniques of a mixture containing amino acids, dyes and sugars.
	CEMADSE01T	Advanced Physical Chemistry	Students will learn crystal structure. An elaborated study on crystal lattice, types of solids, Bragg's law, crystal planes etc. will also be learnt. In statistical thermodynamics studies on molecular partition function, Boltzmann distribution , thermodynamic probability will enrich their knowledge in theoretical work in future.
	CEMADSE01P	Advanced Physical Chemistry Lab	Students will experience a training on both analytical and instrumentation techniques in carrying out physical experiments. As a part of analytical experiments, students will determine some physical parameters viz., coefficient of viscosity, partition coefficient etc. They will also be trained on operation of conductometer and will do titration and other experiments using conductometer.
	CEMADSE02T	Analytical Methods in Chemistry	Learning of computer programing based on numerical methods for root equation, numerical differentiation, numerical integration, matrix operations will make the students expert in computer world.
	CEMADSE02P	Analytical Methods in Chemistry Lab	Hands on experiences on separation of different mixtures based on chromatography, solvent extraction, analysis of soil sample, and determination of ion exchange capacity, and spectrophotometric determination of pK_a values of indicator, BOD and COD.
	CEMADSE03T	Instrumental Methods of Chemical Analysis	Understanding the role of spectroscopic methods in chemical analysis ; principle, instrumentation of IR, UV-Visible and near IR, NMR spectroscopies, chromatography, and their applications; principles of elemental analysis, atomic absorption, emission and fluorescence spectroscopies, potentiometry and voltammetry; basic idea on radiochemical methods of analysis and X-ray analysis and electron spectroscopy.
	CEMADSE03P	Instrumental Methods of Chemical Analysis Lab	Hands on experiences about analyses based on IR, UV-Visible, NMR, atomic absorption, emission and

			fluorescence spectroscopies, chromatography, potentiometry and voltammetry.
VI	CEMACOR13T	Inorganic Chemistry-V	Understanding of bioinorganic chemistry, basics of organometallic compounds and their applications, and Reaction mechanism kinetics of different types of inorganic reactions.
	CEMACOR13P	Inorganic Chemistry-V Lab	Hands on experience on qualitative analysis of mixtures containing four radicals.
	CEMACOR14T	Physical Chemistry-IV	Students will learn the spectroscopy of molecules. Different kinds spectroscopy viz., rotational, vibrational, Raman, NMR, ESR etc. are the important area where there is a major scope to learn. They will know the interaction of electromagnetic radiation with molecules and subsequent transition in between energetic states. Hence will try to find out the structure of molecules. They will also learn the detailed about the photochemistry and different photochemical process. The kinetics of some photochemical reactions will also be taught. Surface chemistry is also very important area where a lot of things may be learnt. Students will learn different surface phenomena in respect of solid and liquid. Study of surface tension and surface energy, adsorption of different kinds of molecules onto the surface and properties of colloids will also increase their knowledge.
	CEMACOR14P	Physical Chemistry-IV Lab	Hands on training on the determination of various parameters related to physical properties viz., surface tension, critical micelle concentration (CMC), etc. by analytical methods. They will also use instrument like spectrophotometer to study different photochemical reactions. By this way a concrete knowledge on experimentation will be gained.
	CEMADSE04T	Green Chemistry	Detailed understanding of need, goals, limitations, and principles of Green chemistry. Application and examples of green chemistry in designing a chemical synthesis.
	CEMADSE04P	Green Chemistry Lab	Hands-on training for various green chemistry related issues like the use of safer starting materials, avoiding waste, use of renewable resources, use of enzymes as catalysis, alternative green solvents, and alternative source of energy.
	CEMADSE05T	Inorganic Materials of Industrial Importance	

	CEMADSE05P	Inorganic Materials of Industrial Importance Lab	
	CEMADSE06T	Polymer Chemistry	Polymer Chemistry, polymer science have a major impact in industry. A basic knowledge at the undergraduate level is very essential. Here students will learn polymers, polymerization, different types of polymers and polymerization process along with kinetics of polymerization and various physical and chemical properties. They will know how to produce polymers used by industry and their properties and areas of applications.
	CEMADSE06P	Polymer Chemistry Lab	Hands-on training on preparation of various polymers, viz., polyethylene (PE), poly propylene (PP), polyvinyl chloride (PVC), Nylon, Phenol formaldehyde, urea formaldehyde resin etc. These training is believed to be extremely helpful if the students move for industrial assignments.

2.Generic Course in Chemistry (B.Sc. Generic under CBCS)

Semester	Course code	Course details	Outcome of Course
I	CEMHGEC01T	Inorganic Chemistry-I & Organic Chemistry-I	1. Understanding of extranuclear shell structure of an atom based on different atom model, and writing electronic configuration. Classification of elements based on modern periodic law and understanding of periodic properties. Understanding of different theory of acids and bases and factors affecting their strengths and understanding of different properties based on acids and basic nature of substances. Understanding of elementary idea about redox reaction and its balancing. 2. Detailed understanding of fundamental properties of organic chemistry, basic stereochemistry, reaction mechanism for substitution and elimination reactions, and aliphatic hydrocarbons.
	CEMHGEC01P	Inorganic Chemistry-I Lab & Organic Chemistry-I Lab	1. Hands on experience based on acid-base and redox titrations. 2. Hands-on training on qualitative analysis of solid organic samples.

II	CEMHGEC02T	Physical Chemistry-I & Inorganic Chemistry-II	1. A detailed understanding on the kinetic theory of gases and real gases. Viscosity of gases and subsequent dependence of the same with pressure and temperature. Studies on surface phenomena of liquids and in-depth study of solids and reaction kinetics will add the knowledge of the students. 2. Understanding the nature of chemical bonding and its effect on the properties of substances. Understanding of properties of elements of different groups.
	CEMHGEC02P	Physical Chemistry-I Lab & Inorganic Chemistry-II Lab	1. Hands on training of physical experiments like determination of surface tension, viscosity and kinetic study will make the students expert. 2. Systemic identification of ions in a given mixture of salts.
III	CEMHGEC03T	Physical Chemistry-II & Organic Chemistry-II	1. A detailed understanding on Chemical energetics, chemical and ionic equilibrium. Studies on chemical thermodynamics and inter relationship of various physical thermodynamic parameters will increase the knowledge. 2. Functional group app roach for the preparations & reactions to be studied in context to the structures of aromatic hydrocarbons, organometallic compounds, aryl halides, alcohols, phenols, ethers and carbonyl compounds. .
	CEMHGEC03P	Physical Chemistry-II Lab & Organic Chemistry-II Lab	1. Hands on training of physical experiments on calorimeter in order to determination of heat capacity, enthalpy of neutralization. Determination of pH of some unknown solutions. 2. Systemic identification of pure solid and liquid organic compounds.
IV	CEMHGEC04T	Physical Chemistry-III & Analytical and	1 Studies on solutions and phase equilibrium along with conductance and electromotive force will expand

		Environmental Chemistry	the level of knowledge which in the long run will be highly beneficial. 2.Understanding of basics of gravimetric, volumetric and chromatographic methods of analysis and few estimations based on these principles.
	CEMHGEC04P	Physical Chemistry-III Lab & Analytical and Environmental Chemistry Lab	1. Hands on experiments on conductometry and potentiometry will enable the skill of doing experimental work. 2. Hands on experience based on complexometric, redox, and acid-base titrations.

P. R. Thakur Govt. College

Department of Computer Science

Course Outcomes

for B.Sc. Honours and Generic in Computer Science offered by the Department Under
CHOICE BASED CREDIT SYSTEM

Session 2022-2023

SEMESTER – I	
Course name	Programming Fundamentals using C/C++ Programming Fundamentals using C/C++ Lab
Course code	CMSACOR01T , CMSACOR01P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Explain the basics of C and C++ programming
CO-2	Develop , classify and distinguish between the procedure-oriented and object-oriented programming
CO-3	Simplify and solve a problem with two different computer language
CO-4	Relate different operations with two different languages and select different features for various solution purpose to solve problems and also able to recognize the solution of any problem.
CO-5	Enhance the logical development of students to solve problems for carrier development in the software development domain

SEMESTER – I	
Course name	Computer System Architecture Computer System Architecture Lab
Course code	CMSACOR02T, CMSACOR02P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Describe the basics of boolean algebra, logic gates.
CO-2	Design and discuss on the different building blocks and logics of different combinational and sequential logic circuits.
CO-3	Analyze and illustrate different logic circuits using the existing logic and logic circuits.
CO-4	Relate and analyze the different data representations and computer arithmetic performed and its application
CO-5	Describe the different building blocks of computer system for computation and define the organization of Control unit, Memory unit, I/O unit and building blocks of CPU

SEMESTER – II	
Course name	Programming in Java Programming in Java Lab
Course code	CMSACOR03T, CMSACOR03P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Explain the structure of JAVA programming
CO-2	Describe the concept of object oriented programming language and compare with other languages
CO-3	Use different packages and classes
CO-4	Develop threading concept and apply exception handling and also analyze and execute GUI based applications using AWT
CO-5	Develop networking concept in JAVA and JDBC for database connectivity
CO-6	Understand and recognize the total responsibilities of different users and administrators

SEMESTER – II	
Course name	Discrete Structures
Course code	CMSACOR04T

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Develop and discuss on the logical thinking
CO-2	Classify the different mathematical structure
CO-3	Select and apply various logics to solve problems
CO-4	Design graph techniques for solve problems.
CO-5	Identify the logical idea behind any algorithm and develop algorithms and measure its performance

SEMESTER – III	
Course name	Data Structures Data Structures Lab
Course code	CMSACOR05T, CMSACOR05P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Describe the different data structures to store and process on data
CO-2	Describe and develop the concept of store data into the different data structures
CO-3	Classify of data structure and use different techniques to process on data
CO-4	Classify the different types of sorting and searching techniques with their performance
CO-5	Choose and recognize data structures to process on specific problems

SEMESTER – III	
Course name	Operating Systems Operating Systems Lab
Course code	CMSACOR06T, CMSACOR06P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Describe the performance of operating system in a computer
CO-2	Relate the different resources in computer system during execution of process.
CO-3	Use different algorithms to solve different problems occurs during execution
CO-4	Illustrate the performance of execution of process and also explain the reason
CO-5	Identify and use the existing algorithms to create new algorithm to solve different related problems.

SEMESTER – III	
Course name	Computer Networks Computer Networks Lab
Course code	CMSACOR07T, CMSACOR07P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Discuss the basic network structure
CO-2	Analyze the layered architecture of different models such as OSI, TCP/IP and also compare the different

	tasks performed by the different layers of the model
CO-3	Select and use the different network routing for connectivity
CO-4	List the basic network devices and their applications and also develop new ideas using this.

SEMESTER – IV	
Course name	Design and Analysis of Algorithms Design and Analysis of Algorithms Lab
Course code	CMSACOR08T, CMSACOR08P

After completion of this course the student will be able to

CO No.	**Course Outcomes:**
CO-1	Explain the different paradigms of algorithm
CO-2	Classify the algorithm depending upon the process of solving.
CO-3	Analyze and examine the performance of different algorithms and also compare the performance of different algorithms to solve a particular task
CO-4	Solve different problems with different algorithms
CO-5	Design new algorithms for solving problem and identify their performance

SEMESTER – IV	
Course name	Software Engineering Software Engineering Lab
Course code	CMSACOR09T, CMSACOR09P

After completion of this course the student will be able to

CO No.	**Course Outcomes:**
CO-1	Understand and identify the steps involved in designing a software
CO-2	Design a new software with good design and quality using the steps described
CO-3	Examine the performance of the software and also find out the quality of the software
CO-4	Classify the requirements of a software and use different techniques to design it
CO-5	Select the proper requirements of a software and analyze to design it

SEMESTER – IV	
Course name	Database Management Systems Database Management Systems Lab
Course code	CMSACOR10T, CMSACOR10P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Explain the advantages of database over file system
CO-2	Design the different ER models according to the requirements and also design database from it
CO-3	Analyze the queries with relational algebra and formulate it with that form and examine
CO-4	Determine and use SQL queries to solve different problems
CO-5	Identify the appropriate solution for solve the problem and use normalization to classify the requirements design

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Explain the ability to identify the object oriented programming
CO-2	Design and develop the problems using JSP, Java Beans and associate to each part
CO-3	Solve various problems with Java Scripts and select proper connectivity using JDBC
CO-4	Identify the different features of JSP and apply it to solve various problems
CO-5	Develop application with event driven and GUI environment

SEMESTER – V	
Course name	Theory of Computation
Course code	CMSACOR12T

Course Outcomes:
After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Explain and recognize the basic logic and operations behind every computations.
CO-2	Design different models using turing machine
CO-3	Evaluate the concept of PDA, language acceptability and select the grammar formation of a language
CO-4	Analyze the structure of language, automata, computability and complexity with problems
CO-5	Identify and use the concept of generate proper formulation of mathematical and logical problems

SEMESTER – VI	
Course name	**Artificial Intelligence** **:Artificial Intelligence Lab**
Course code	**CMSACOR13T, CMSACOR13P**

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Describe and identify the basic idea behind the machine's decision
CO-2	Understand and solve different problems using different algorithms
CO-3	Associate different problems as a part of a specific technique and examine how to fit it in a certain method
CO-4	Select the specific task and implement it with logic programming (PROLOG) to design and examine the task
CO-5	Construct new ideas with the existing and develop the logical idea into implementation reality

SEMESTER – VI	
Course name	Computer Graphics Computer Graphics Lab
Course code	CMSACOR14T, CMSACOR14P

Course Outcomes:
After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Discuss the basic knowledge behind computer graphics
CO-2	Classify and examine various graphical tools
CO-3	Use the methods to develop new design
CO-4	Select different methods to find out the quality design
CO-5	Identify different graphical designs to create interactive graphical structure.

DISCIPLINE SPECIFIC ELECTIVES (DSE)

SEMESTER – V	
Course name	Microprocessor Microprocessor Lab
Course code	CSMADSE01T, CSMADSE01P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Discuss of architecture and basic hardware behind computation

CO-2	Classify different instructions in assembly language programming to solve problems.
CO-3	Design different problems relate to memory, interfacing using the selected instructions
CO-4	Implement assembly language program to solve various problems.
CO-5	Identify and examine the different interfacing with microprocessor

SEMESTER – V	
Course name	Data Mining Data Mining Lab
Course code	CSMADSE02T, CSMADSE02P

CO No.	**Course Outcomes:**
CO-1	Describe the different techniques for learning
CO-2	Select the proper method to find the knowledge discovery in database
CO-3	Classify different data mining techniques to identify the proper one
CO-4	Illustrate different algorithms for data mining
CO-5	Design the different classifications and regression techniques for identify the efficiency

SEMESTER – V	
Course name	Cloud Computing Cloud Computing Lab
Course code	CSMADSE03T, CSMADSE03P

CO No.	**Course Outcomes:**
CO-1	Explain the fundamental of cloud computing and how it works
CO-2	Illustrate cloud based applications using different cloud services, tools, platforms
CO-3	Associate and compare different cloud solutions and select the best approach to meet a specific requirement
CO-4	Select the proper cloud architecture and security measure to identify potential risks
CO-5	Design and develop cloud based solutions

SEMESTER – VI	
Course name	Big Data Big Data Lab
Course code	CSMADSE04T, CSMADSE04P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Explain how big data work using HDFS, NoSQL
CO-2	Use to solve different problems with different tools like Hadoop, YARN, Hive.
CO-3	Classify and organize the data according to need and also examine the accuracy and reliability
CO-4	Identify and determine the big data solutions for suitability for different use cases
CO-5	Design and develop solutions with various tools

SEMESTER – VI	
Course name	Digital Image Processing Digital Image Processing Lab
Course code	CMSADSE05T, CMSADSE05P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Describe the basic principals of digital image processing such as image enhancement, segmentation, compression etc
CO-2	Use digital image processing technique to process and analyze digital images
CO-3	Identify and relate the impact of digital image processing on various applications
CO-4	Analyze the performance of different digital image processing techniques with their strength and weaknesses
CO-5	Design and develop different techniques such as object recognition

SEMESTER – VI	
Course name	Dissertation / Project work
Course code	CMSADSE06P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Discuss and classify basics structure of different problems
CO-2	Use different software or hardware to develop the problem
CO-3	Determined the impact of solutions of the problem
CO-4	Analyze the performance of different solutions of the problem
CO-5	Design and develop in house application and identify different methods to solve the problem

SKILL ENHANCEMENT COURSE (SEC)

SEMESTER – III	
Course name	Programming in Python
Course code	CMSSSEC01M

Course Outcomes:

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Explain and fundamental of programming logic with python such as control flow, functions etc.
CO-2	Use the syntax to solve the problems in python
CO-3	Analyze the correctness and errors generated
CO-4	Evaluate the performance of different algorithms and select most appropriate
CO-5	Design Python programs for various problems and also identify different solutions

SKILL ENHANCEMENT COURSE (SEC)

SEMESTER – IV	
Course name	R-Programming
Course code	CMSSSEC02M

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Explain fundamental concepts such as statistical analysis in R programming
CO-2	Use to solve R programming Techniques such as data cleaning, data visualization etc.
CO-3	Analyze and examine statistical results
CO-4	Evaluate the accuracy and identify the reliability of statistical models
CO-5	Develop advance concepts such as machine learning models, time series analysis etc

Credit Distribution across the Computer Science General Course

SEMESTER – I	
Course name	Problem Solving with Computer Problem Solving with Computer
Course code	CMSHGEC01T, CMSHGEC01P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Understand the fundamentals of computer and techniques for problem solving and describe the fundamental of programming logic with python such as control flow, functions etc.
CO-2	Use the syntax to solve the problems in python
CO-3	Analyze the correctness and errors generated
CO-4	Evaluate the performance of different algorithms and select most appropriate
CO-5	Design Python programs for various problems and identify alternate solutions

SEMESTER – II	
Course name	Database Management Systems Database Management Systems
Course code	CMSHGEC02T, CMSHGEC02P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Explain the advantages of database over file system
CO-2	Design the different ER models according to the requirements and also design database from it
CO-3	Analyze the queries with relational algebra and formulate it with that form and examine
CO-4	Determine and use SQL queries to solve different problems
CO-5	Identify the appropriate solution for solve the problem and use normalization to classify the requirements design

SEMESTER – III	
Course name	Operating Systems Software Lab based on Operating Systems
Course code	CMSHGEC03T, CMSHGEC03P

Course Outcomes:
After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Describe the performance of operating system in a computer
CO-2	Relate the different resources in computer system during execution of process.
CO-3	Use different algorithms to solve different problems occurs during execution
CO-4	Illustrate the performance of execution of process and also explain the reason
CO-5	Identify and use the existing algorithms to create new algorithm to solve different related problems.

SEMESTER – IV	
Course name	Computer System Architecture Computer System Architecture Lab
Course code	CMSHGEC04T, CMSHGEC04P

After completion of this course the student will be able to

CO No.	Course Outcomes:
CO-1	Describe the basics of boolean algebra, logic gates.
CO-2	Design and discuss on the different building blocks and logics of different combinational and sequential logic circuits.
CO-3	Analyze and illustrate different logic circuits using the existing logic and logic circuits.
CO-4	Relate and analyze the different data representations and computer arithmetic performed and its application
CO-5	Describe the different building blocks of computer system for computation and define the organization of Control unit, Memory unit, I/O unit and building blocks of CPU

P.R. Thakur Government College

B.A. English Hons. C.B.C.S

(Affiliated to West Bengal State University)

Course Outcomes

Dept. of English:

The undergraduate students of B.A. English Honours (C.B.C.S) learn about the different literatures written in English and the use of English as a language of communication. The choice- based system introduces them to Indian and European Classical Literature in translation, Indian Writing in English, Women's Writing, British Prose, Poetry and Drama, American and Popular Literature, which help them to gain a deeper appreciation of the poetry, novels, plays (including theatrical forms and performances) and short stories. The students also achieve a proficiency in the appreciation of a variety of literary genres, history of literature in English (of the Old English Period, Elizabethan Age, Romantic Age, Victorian Age and the Modern Age among others), philology, rhetoric and prosody, literary terms and types. The final semester students are expected to competently use literary criticism and theory while analysing Modern European Drama, Postcolonial and Partition Literatures. They are also taught to appreciate stylistic features in texts, comprehend various points of views, critically appreciate complex plot-structures and understand historical, socio-cultural and geo-political contexts of regional and world literatures written in English.

The curriculum is also aimed at providing the students with adequate knowledge and skill to use English as a language of communication and exchange of ideas in future professional fields as diverse as pedagogy, management, and research. In this regard it may be said that the Department of English teaches and trains every single student of the college through the AECC (English communication) courses. GE English course outcomes include analytical knowledge of short stories, novels and poetry from Indian Writing in English as well as British Literature. SEC courses such as English Language Teaching, Creative Writing and

Soft Skills, equip the students with methods of teaching and use of technology in language teaching; use of media and communication, academic writing and help in development of teamwork, problem-solving abilities, emotional intelligence and leadership skills.

Broader course outcomes:

- Appreciate the use of English language and stylistic features in literary texts.
- Comprehend literary points of views, and critically appreciate complex plot-structures and value-systems inherent in texts.
- Understand historical, socio-cultural and geo-political contexts of regional and world literatures written in English.
- Learn research methodology (including how to write a research paper, citation of sources and formulation of research questions) and develop academic writing skills.
- Logically and objectively evaluate a text, and communicate the same (both verbally and in writing) with clarity.
- Participate in class discussions, and share original ideas and arguments.

P. R. Thakur Govt. College
UNDER GRADUATE DEPARTMENT OF GEOGRAPHY
B.A. / B.Sc Geography (Hons) CBCS Syllabus
With effect from 2022-23

Programme Specific Outcomes

After successful completion of the UG course in Geography students will be able to:

- Gain basic theoretical and practical concepts on various fields of geography.
- Reveal the comprehensive and systematic knowledge of the subject.
- Deal with current geographical issues and their solutions.
- Evaluate critically various aspect of the subject in respect of spatial and temporal dimensions.
- Prepare and Interpret maps and diagrams to illustrate various facets of the subject from global to local level on various time scales.
- Acquire knowledge about various statistical methods, remote Sensing and GIS and can apply these knowledge in various application fields.
- Learn about research activities, can extract the ground level realities through survey work and will be able to prepare project report.
- Apply the acquired skills obtained from this discipline in their professional life in future.

P. R. Thakur Govt. College
Course Outcome or Learning Outcome
Three year B.A. /B.Sc. degree course
Under CBCS semester system
HONOURS COURSE IN GEOGRAPHY
With effect from 2022-23

Course Name:	Core Course-1
Course Code:	GEOACOR01T & GEOACOR01P
Topic Name:	Geotectonics and Geomorphology
Course Outcome:	After successful completion of this course students will be able to: 1. Understand the geological time scale, interior of the earth, isostasy, plate tectonics and various types of fold and faults 2. Students will able to know weathering, mass wasting, different types of structure, development of landforms, granite, basalt and lime stone. 3. Identify different minerals and rocks. 4. Interpretation of geological maps with unconformity and intrusions on uniclinal and folded Structures.Draw geological cross sections.

Course Name:	Core Course-2
Course Code:	GEOACOR02T & GEOACOR02P
Topic Name:	Cartographic Techniques
Course Outcome:	After successful completion of this course students will be able to: 1. Understand the components and types of a map. Learn about topographical maps. Delineate of drainage basin from Survey of India topographical map. Construct and interpret relief profiles and order streams on a drainage basin. 2. Learn about different types of scale and Graphically construct plain, comparative, diagonal and vernier scales 3. Know about map projection. Understand coordinate system, concept of UTM projection, system of measurement. Construct different map projections. 4. Learn about reference scheme of old and open series topographical map of Survey of India and also it's margin concept. Identify the correlation between physical and cultural features from Survey of India topographical maps

Course Name:	Core Course-3
Course Code:	GEOACOR03T
Topic Name:	Human Geography
Course Outcome:	After successful completion of this course students will be able to: 1. human civilization evolution, 2. population distribution 3. anthropological aspects of Geography.

Course Name:	Core Course-4
Course Code:	GEOACOR04T & GEOACOR04P
Topic Name:	Cartogram and Thematic Mapping
Course Outcome:	After successful completion of this course students will be able to: 1. learn the basic aspects of map drawing, techniques of map drawing, distribution of pattern of map and scale. 2. Draw thematic maps: choropleth, dots and spheres, pie. 3. Perform traverse survey using prismatic compass. 4. Perform profile survey using dumpy Level.

Course Name:	Core Course-5
Course Code:	GEOACOR05T & GEOACOR05P
Topic Name:	Climatology
Course Outcome:	After successful completion of this course students will be able to: 1. Understand the Nature, composition and layering of the atmosphere 2. Comprehend the elements of weather and climate and their impacts. 3. Learn different approaches to climate classification and the climatic regions. 4. Draw weather maps, hythergraph, climograph, and wind rose diagram.

Course Name:	Core Course-6
Course Code:	GEOACOR06T
Topic Name:	Geography of India
Course Outcome:	After successful completion of this course students will be able to: 1. Understand detailed physiographic, climatic, soil, vegetational features of India. 2. Understand about population of India. 3. Understand details of different tribes of India. 4. Learn about the agricultural regions and green revolution in India. 5. Know about the physical perspectives, forest, water, economic resources of West Bengal.

Course Name:	Core Course-7
Course Code:	GEOACOR07T & GEOACOR07P
Topic Name:	Statistical Methods in Geography
Course Outcome:	After successful completion of this course students will be able to: 1. Learn the significance of statistics in geography. 2. Understand the importance of the use of data in geography. 3.Detailed knowledge of statistical techniques to analyse the quantitative data 4. Gain knowledge about correlation, regression, and time series analysis. 5. Construct data matrix. 6. Compute and interpret frequency table, measures of central tendency and dispersion. 7. Compute and interpret scatter diagram, correlation and regression.

Course Name:	Core Course-8
Course Code:	GEOACOR08T
Topic Name:	Regional Planning and Development
Course Outcome:	After successful completion of this course students will be able to: 1. Understand types of region as an integral part of geographical study. 2. They can know about delineation of region 3. Gain knowledge about types, objectives, tools and needs of regional planning with special reference to India

Course Name:	Core Course-9
Course Code:	GEOACOR09T
Topic Name:	Economic Geography
Course Outcome:	After successful completion of this course students will be able to: 1. Assess the significance of Economic Geography, the concept of economic man 2. They will also gain knowledge about economic distance and transport cost 3. Understand the concept of economic activity 4. Analyse the factors of location of agriculture and industries

Course Name:	Core Course-10
Course Code:	GEOACOR10T & GEOACOR10P
Topic Name:	Environmental Geography
Course Outcome:	After successful completion of this course students will be able to: 1. They can know how prepare a questionnaire for perception survey on environmental problems 2. Develop concepts and skills regarding preparation of check list for Environmental Impact Assessment 3. Develop skills regarding interpretation of air quality using secondary data sources 4. Prepare questionnaire for perception survey on environmental problems. 5. Prepare check-list for Environmental Impact Assessment of an urban / industrial project. 6. Interpret of air quality data.

Course Name:	Core Course-11
Course Code:	GEOACOR11T & GEOACOR11P
Topic Name:	Field work and Research Methodology
Course Outcome:	After successful completion of this course students will be able to: 1. Learn the significance of field work and research in geographical studies. 2. Know about different types of field techniques and develop ideas about research design, problems. 3. Understand the field ethics and different tools of field study. 4. Conduct field work on physical and socio-economic aspects of geographical landscapes. 5. Learn the process to collect primary data from the field and to use secondary data. 6. Prepare field report with suitable tables, maps and diagrams based on collected data and to represent the realities of the study area. 7. Prepare different field maps and diagrams.

Course Name:	Core Course-12
Course Code:	GEOACOR12T & GEOACOR12P
Topic Name:	Disaster Management
Course Outcome:	After successful completion of this course students will be able to: 1. Have comprehensive knowledge on various disasters in India with special reference to the consequences and mitigation measures. 2. Write a report on disaster incorporating a preparedness plan. 3. Prepare one individual report based on case study on disasters that have occurred in West Bengal.

Course Name:	Core Course-13
Course Code:	GEOACOR13T
Topic Name:	Evolution of Geographical Thought
Course Outcome:	After successful completion of this course students will be able to: 1. Identify the evolution of the philosophical thoughts of Geography/Earth Sciences. 2. Escalate the contribution of the great thinkers in Geography/ Earth Sciences. 3. Discussing the evolution of geographical thought from ancient to modern to post modern times. 4. Changing scenario of man-environment relationships through time.

Course Name:	Core Course-14
Course Code:	GEOACOR14T & GEOACOR14P
Topic Name:	Remote Sensing and GIS
Course Outcome:	After successful completion of this course students will be able to: 1. Perform georeferencing of maps and images using open-source software. 2. Prepare FCC and identify features using standard FCC and other band combinations. 3. Digitise features and attach data. 4. Perform overlay analysis and prepare annotated thematic maps: choropleth, pie chart and bar graphs.

Course Name:	Discipline Specific Elective-1
Course Code:	GEOADSE01T
Topic Name:	Soil and Bio Geography
Course Outcome:	After successful completion of this course students will be able to: 1. Have knowledge of the soil formation processes, soil profiles. 2. Learn about the physical and chemical properties of soil. 3. Have comprehensive knowledge of soil erosion and degradation and soil classification.

Course Name:	Discipline Specific Elective-2
Course Code:	GEOADSE03T
Topic Name:	Population Geography
Course Outcome:	After successful completion of this course students will be able to: 1. Learn about the development of Population Geography. 2. Have comprehensive knowledge of population distribution and theories related to it. 3. Gain knowledge of various contemporary issues on population studies.

Course Name:	Discipline Specific Elective-3
Course Code:	GEOADSE04T
Topic Name:	Hydrology and Oceanography
Course Outcome:	After successful completion of this course students will be able to: 1. Understanding the concept of hydrological cycle 2. Assessing the physical and chemical properties of ocean water including T-S diagram 3. Concept of Sea Level Change: Global and Regional

Course Name:	Discipline Specific Elective-4
Course Code:	GEOADSE06T
Topic Name:	Resource Geography
Course Outcome:	After successful completion of this course students will be able to: 1. Understand the concept and classification of resources 2. Assessing different management practices of Energy Resources: Conventional and Non-Conventional 3. Appreciate the concept of Limits to Growth, resource sharing and sustainable use of resources.

Course Name:	Skill Enhancement Course-1
Course Code:	GEOSSEC01M
Topic Name:	REMOTE SENSING
Course Outcome:	After successful completion of this course students will be able to: 1. Understand the principles of remote sensing. 2. Classify Remote Sensing satellites and sensors. 3. Understand the principles of image rectification and enhancement. 4. Learn the principles of image interpretation and feature extraction. 5. Prepare inventories of land use land cover features from satellite images. 6. Develop an idea about satellite image interpretation.

Course Name:	Skill Enhancement Course-2
Course Code:	GEOSSEC02M
Topic Name:	Advanced Spatial Statistical Techniques
Course Outcome:	After successful completion of this course students will be able to: 1. Learn about probability theory and their application in geography. 2. Understand various sampling techniques and sampling estimates 3. Gain knowledge about correlation and regression

P.R. THKUR GOV. COLLEGE
DEPERTMENT OF HISTORY
B.A. History Honours
CBCS Syllabus with effect from 2018-2019
Programme Specific Outcomes

The under graduate course in History has given a strong grounding in the different areas of the subjects to the students. Graduates of this department are expected to branch out into different paths seeking spheres of knowledge and domains of professional work that they find fulfilling. After graduating with History Honours from P.R. Thakur Govt. College under West Bengal State University, they will be able to demonstrate comprehensive knowledge of scholarly research and professional literature relating to the discipline. This will establish a platform from which the student can pursue higher studies in History. Through skill enhancement course the students got acquainted with the functions of archives, which would help them to pursue research work in the future. They will have many career opportunities like a career in teaching, museums or the field of archaeology. They can also opt for administrative services in which their knowledge of History would be of great help. It is expected that besides the skills specific to the discipline, these wider life skills of argumentation and communication, attitudes and temperaments, and general values inherent in a discipline that studies human beings in their social context, in all its complexity, will ultimately enable learners to live rich, productive and meaningful lives

Course Outcome of B.A. History Honours
CBCS Syllabus with effect from 2018-2019

Course Name: Core Course I.
Course Code: HISACOR01T.
Paper I: History of India-I (From Earliest Times to C. 300 BCE)

Course Outcome: After completing this course the students will able to

1. Understand about history as a discipline.
2. Learn how to write history on the basis of sources and other historical artifacts found in archaeological excavations.
3. Analyse the way earlier historians interpreted the history of India and while doing so they can write the alternative ways of looking at the past.
4. List main features of prehistoric and proto-historic cultures.
5. Interpret the prehistoric art and mortuary practices.

6. Analyse the main features of Harappan Civilization and Aryan Civilization.
7. Trace cultures in transition settlement patterns, technological and economic developments, social stratification; political relations; religion and philosophy in India.

Course Name: Core Course II.

Course Code: HISACOR02T.

Paper II: Social Formations and Cultural Patterns of the Ancient World.

Course Outcome: After learning the basic ideas on historical knowledge and Indian Civilizations a student will learn

1. About the evolution of human kind, Paleolithic and Mesolithic cultures.
2. About Food production, beginnings of animal husbandry.
3. About Bronze Age civilizations of the worlds e.g. Egypt, Mesopotamia, China etc.
4. About Slave Society and Polis in Ancient Greece.

Course Name: Core Course III

Course Code: HISACOR03T.

Paper III: History of India C. 300 BC to 750 CE.

Course Outcome: After completing this course the students will able to

1. Learn about agrarian expansion urban growth in north India, central India and the Deccan and craft production and social stratification during 350 BC to 750 CE.
2. Learn about changing political formation from 300 BC to 300 CE.
3. Trace the ways in which historians have questioned the characterization of the Mauryan state.
4. Trace the processes of urbanization and de-urbanization & monetization and monetary crisis in early India.
5. Learn about religion, philosophy and society of the said period.
6. Learn also about cultural developments from 300 CE to 750 CE.
7. Analyse critically the changes in the varna/caste systems and changing nature of gender relations and property.

Course Name: Core Course IV

Course Code: HISACOR04T.

Paper IV: Social Formations and Cultural Patterns of the Medieval World.

Course Outcome: From this course students learn

1. About Roman Republic and Roman Empire.
2. About religion and culture in Ancient Rome.
3. About economic developments in Europe from seventh to fourteenth centuries and crisis of Feudalism.
4. About societies and religious developments of the Central Islamic Lands.

Course Name: Core Course V

Course Code: HISACOR05T.

Paper V: History of India-III (C.750 CE-1206 CE.)

Course Outcome: From this course a student learns

1. about the evolution of political structures.

2. About Agrarian structure and social changes especially proliferation of castes.
3. About trade and commerce and the process if urbanization.
4. About religious and cultural developments of the said period.

Course Name: Core Course VI
Course Code: HISACOR06T
Paper VI: Rise of the Modern West-I
Course Outcome: After completing this course the students will able to

1. Outline important changes that took place in Europe from the medieval period. Acquire an integrated approach to the study of economic, social, political and cultural developments in Europe About early Colonial expansion.
2. Explain the processes by which major transitions unfolded in Europe's economy, state forms, social structure and cultural life.
3. Examine elements of early modernity in these spheres.
4. Learn about European Reformation
5. Analyse emergence of European Sate System.

Course Name: Core Course VII
Course Code: HISACOR07T
Paper VII: History of India-IV (1206 CE.-1526 CE.)
Course Outcome: After completing this course the students will able to

1. Discuss different kinds of sources available for writing histories of various aspects of life during the thirteenth to the fifteenth centuries.
2. Learn about Sultanate political structures and theories of kingship.
3. Assesses Regional political structures
4. Critically evaluate the multiple perspectives from which historians have studied the politics, economic, religion and cultural developments and economic trends in India during the period of study

Course Name: Core Course VIII
Course Code: HISACOR08T
Paper VIII: Rise of the Modern West-II.

Course Outcome: After completing this course the students will able to

1. Explain major economic, social, political and intellectual developments in Europe during the 17th and 18th centuries.
2. Contextualize elements of modernity in these realms.
3. Assess the major issues of The English Revolution.
4. Analyse the relationship between trade, empire, and slavery and industrial capitalism.
5. Parliamentary monarchy and patters of European Absolutism.
6. Analyse Political and economic issues in American Revolution
7. Discuss the features of Europe's economy and origins of the Industrial Revolution

Course Name: Core Course IX
Course Code: HISACOR09T

Paper IX: History of India-V (1526 CE.-1757 CE.)

Course Outcome: After completing this course the students will able to
1. Outline about the Historiography of Mughal India.
2. Trace Political expansion of the Mughal rulers.
3. Learn about administrative and land revenue systems of the Mughals.
4. Analyse Mughal Art, Architecture and Paintings.
5. Outline key developments of the 18th century in the Indian subcontinent

Course Name: Core Course X
Course Code: HISACOR10T
Paper X: History of India-VI (1757 CE.-1857 CE.)
Course Outcome: After completing this course the students will able to

1. Explain the establishment of Company rule and important features of the early colonial regime
2. Outline Political expansion of the East India Company and the legitimization of the Company's rule in India.
3. Elucidate the impact of colonial rule on the economy.
4. Reactions against the British Rule: Popular Resistance Movements.
5. Discuss the social churning on questions of tradition, reform, etc. during first century of British colonial rule.

Course Name: Core Course XI
Course Code: HISACORIIT
Paper XI: History of Modern Europe-I (1789-1919)
Course Outcome: After completing this course the students will able to

1. learn about the French Revolution and its European repercussions.
2. Learn about Napoleonic Era, his conquests, reforms and his fall.
3. Outline Restoration and Revolution (1815-1848).
4. Analyse Industrialization and socio-economic transformation.
5. Trace First World War and its aftermath.

Course Name: Core Course XII
Course Code: HISACOR12T
Paper XII: History of India-VII (1858 CE.-1947 CE.)
Course Outcome: After completing this course the students will able to

1. Learn about the aftermath of Great Rebellion of 1857.
2. Outline the social and economic facets of colonial India and their influence on the national movement.
3. Explain the various trends of anti-colonial struggles in colonial India.
4. Trace the Gandhian Era especially Gandhian movements.
4. Identify the Peasant and Working Class Movements.
5. Analyse the complex developments leading to communal violence and Partition

Course Name: Core Course XIII

Course Code: HISACOR13T

Paper XIII: History of India-VIII (India since 1947 CE.)

Course Outcome: After successful completion of the course the students develop knowledge of

1. Reconstruction of Independent India under Nehru.
2. Drafting of the New Constitution.
3. Growth of Parliamentary Democracy.
4. Shaping up of India Foreign Policy through Non-Aligned Movement.

Course Name: Core Course XIV

Course Code: HISACOR14T

Paper XIV: Trends in World Politics (1919 CE.-2001 CE.).

Course Outcome: After successful completion of the course the students develop knowledge

1.About the trends in World Politics especially the challenges to the New European Order.
2. Circumstances leading to the outbreak of the Second World War and its impact.
3. Cold War and emergence of bipolar politics.
4. Globalization and its impact and the rise of Terrorism and its impact.

Course Name: Discipline Specific Elective-I

Course Code: HISADSE01T

Paper I: Aspects of the History of Modern South-East Asia-I

Course Outcome: From this course students learn about

1. The growth of Early European interests in South-East Asia.
2. Pre-Colonial polity, society, economy and culture in South-East Asia.
3. Economic impact of Colonialism.
4. Growth of Nationalism in South-East Asia.

Course Name: Discipline Specific Elective-II

Course Code: HISADSE02T

Paper II: Aspects of the History of Modern South-East Asia-II

Course Outcome: After completing this course the students will able to

1. Comprehend early nationalist protest movements against French Rule in Indo-China.
2. Analyse nationalism and religion in Burma.
3. Explain growth of anti-Spanish Nationalism in the Phillipines and anti-British Nationalism in Malaya.
4. Contextualise Decolonization and Cold War Politics.

Course Name: Discipline Specific Elective-IV

Course Code: HISADSE04T

Paper IV: History of Modern East Asia-I (1839 CE.–1919 CE.)

Course Outcome: After completing this course the students will able to learn about

1. Pre-Colonial China.
2. Anglo-Chinese Relations till the Opium War.

3. Pre-Meiji Japan and Meiji-Restoration.
4. Expansion of Japan up to the First World War.

Course Name: Discipline Specific Elective-V
Course Code: HISADSE05T
Paper V: History of Modern East Asia-II (1919-1939 CE.)
Course Outcome: After completing this course the students will able to
1. Trace the rise of Nationalism in China.
2. Comprehend the communist victory in China.
3. Develop an in-depth understanding of rise of modern Japan.
4. Locate and contextualise the history of Japan in world politics

Course Name: Skilled Enhancement Course-I
Course Code: HISSSEC01M
Paper I: Archives and Museum.
Course Outcome:
1. After successful completion of the course student learn about the preservation of documents.
2. They came to know how archival documents being used for writing history.
3. Student knows about different Museums about their history.
4. Students learn about the process of preservation of the artifacts.

Course Name: Skilled Enhancement Course-II
Course Code: HISSSEC02M
Paper I: Art and Architecture.
Course Outcome: After successful completion of the course students learn about
1. The evolution and development of the Indian art and architecture.
2. Art and architecture of the South India.
3. Art and architecture of the North India.
4. Mughal Art and architecture.
5. Trends of the art and architecture based on the different religious ideas.

Course Name: Generic Elective
Course Code: HISGCOR01T
Paper I: History of India from Earliest Times to 300 CE.
Course Outcome: After completing this course the students will able to

1. Learn about basic knowledge on Paleolithic, Mesolithic and Neolithic cultures.
2. Earn knowledge about Harappan and Vedic civilization.
3. Learn about spread of protestant religions like Jainism and Buddhism.
4. Outline the Mauryan Empire Satavahana State, Kushana Empire and about the Sangama Age.

Course Name: Generic Elective-II
Course Code: HISGCOR02T

Paper II: History of India from C.300 to 1206 CE.

Course Outcome: After completing this course the students will able to

1. Learn about the Gupta Empire especially its administration, society, economy, religion, art, literature, science and technology.
2. Analyse the evolution of political structures in the South Indian states.
3. Trace changes in the society, economy and culture during the rule of the Pallavas, Challukyas, Vardhanas, Palas, Pratiharas and Rastrakutas.
4. Critically discuss the struggle for power in northern India and establishment of the Sultanate.

Course Name: Generic Elective-III
Course Code: HISGCOR03T
Paper III: History of India from 1206-1707 CE.

Course Outcome: After completing this course the students will able to

1. Learn about the foundation, expansion and consolidation of the Delhi Sultanate.
2. Earn knowledge about Provincial kingdoms: Mewar, Bengal, Vijaynagar and Bahamani.
3. Trace the emergence and consolidation of the Mughal State.
4. Analyse Economy, society and culture under the Mughals.

Course Name: Generic Elective-IV
Course Code: HISGCOR04T
Paper II: History of India (1707-1950 CE.)

Course Outcome: After completing this course the students will able to

1. Trace the emergence of independent states and establishment of colonial power.
2. Develop an in-depth understanding of colonial administration, economy especially agriculture, trade and industry.
3. Analyse socio-religious movements in the 19th century.
4. Trace the emergence and growth of Nationalism and Communalism.
5. Comprehend the Advent of Freedom, Constituent Assembly and establishment of the Indian Republic.

Overall Course Outcome:

Upon successful completion of all the courses under CBCS system assigned to the Department of History, P.R Thakur Govt. College by the West Bengal State University, Barasat, History Honours students develop fundamental knowledge in the discipline of history and in the study of History of India and the World. Being a popular branch of Social Science History covers wide range of human activities of the past. Since historical events, human evolutions, migrations, social formations, wars, military alliances, creative urge of the

people etc. cannot be experimented in laboratories, a historian has to reconstruct the past through his reflective ability. After studying the above courses our students develop with a sense of how interconnected our present is with the past and how learning about the past provides them with the skills to understand the present. They also develop their reflective ability or thinking skill which enables them to interpret a historical incident to a logical conclusion. Building their solid base here our students pursue higher studies and research in different Universities of both public and private sectors. It opens up their carrier prospects in different fields.

P R Thakur Government College
Department of Mathematics
Course outcome for **B. Sc. (Hons)** Mathematics

At present two types of courses are running simultaneously --- CBCS system and NEP-2020 system. The NEP system has multiple exit for which each year's outcome should be mentioned separately.

Course outcome for CBCS system:

The following courses are taught as core courses:

- Algebra (Classical, Abstract and Linear)
- Real Analysis
- Analytical Geometry
- Differential Equation (both ordinary and partial)
- Multivariate Analysis
- Numerical Analysis
- Metric Spaces
- Complex Analysis

Besides these, two SECs (skill enhancement course) are also taught:

- C programming Language
- Set theory and Logic

The course has been designed to make a good foundation of Mathematics with an elementary knowledge of Computer Programming and Mathematical Logic. In addition to these courses, in the last two semesters, the following six DSE (discipline specific elective) courses are offered from which a student takes four courses:

- Linear Programming
- Number Theory
- Probability & Statistics
- Theory of Equations
- Boolean Algebra and Automata Theory
- Mechanics

A student takes any two from the first three and any two from the last three. The students can choose the subjects according to their future plan.

After completion of this course a student can move for higher education for the following programs:

- M. Sc. In Mathematics (either Pure Mathematics or Applied Mathematics or Mixed)
- M. Sc. In Statistics
- M. Stat programme
- M. Sc. in Theoretical Computer Science (in some universities)
- M. Sc. in Computational Mathematics
- MCA
- MBA
- Various courses in Data Analytics

In the job market, besides the regular Government services and Teaching jobs a Mathematics Honours graduate has the opportunity in many computer oriented jobs, specially in market survey, data analytics and trading strategies.

The NEP 2020 (National Education Policy 2020) course:

In the year 2023 the CBCS course has been discontinued and the National Education Policy Course was introduced in this institution by the affiliating University. Duration of this course is four years and offers multiple exit so that a student, if leaves in the midways, gets some affiliation according to his period of his study and will no longer be treated as “drop out”. The course is described below:

1. **NEP Year 1:**

   In the first two semesters a student has been taught the two major courses (i) Algebra and Number Theory and (ii) Calculus with Applications. Besides these, two SEC courses are also offered: (I) C Programming Language and (ii) Python Programming Language. The other courses are two Minor courses of their choice, a Multidisciplinary course, MIL (Modern Indian Language) and VAC (value added course) on Yoga.

   After first year a student acquires basic knowledge of Algebra and Calculus, also develops skill on computer programming with C and Python languages which helps him to get a computer oriented job. A student exits after successful completion of first year will be eligible to get certificate.

2. **NEP Year 2:**

   In the third semester (second year first half) a student has been taught a major course on Geometry and Vector Analysis along with two Minor courses and a multidisciplinary course of his choice. In the fourth semester (second year second half) there are only four Major courses (i) Ordinary Differential Equations-I (ODE-I) and Mechanics (ii) Real Analysis-I (iii) Group Theory-I and Number Theory (iv) Partial Differential Equations (PDE) and Integral Transform.

   A student exits after successful completion of second year will be eligible to get diploma.

3. **NEP Year 3:**

   In the third year each semester contains four major courses. In semester 5 the students have to go through the courses on (i) Real Analysis-II (ii) Ring Theory and Linear Algebra-I, (iii) Numerical Analysis (Theory and Practical) and (iv) Multivariate Calculus and Metric Space. In semester 6 the subjects of learning are (i) Operations Research and Game Theory (ii) Group Theory-II and ODE-II (iii) Probability & Statistics and (iv) Complex Analysis.

   After completion of three years of the course a student will have a good foundation in Higher Mathematics along with skills in Computational Mathematics, Optimization Theory, Statistics. A students exits at this level will get degree in Mathematics Major. With this qualification a student may go for higher studies in Mathematics, Statistics, Computer Science, Computer Application, Data Analytics, Environmental Studies, Meteorological Science, Business Administration, Market Analysis and many more branches of science or may get a job in the related fields.

4. **NEP Year 4:**

   The year 4 has two options either (i) Honours or (ii) Honours with Research. In semester 7 there are two major courses (i) Topology and (ii) Field Extension and Linear Algebra-II. Besides these there are two minor courses of their choice from other disciplines.

   In semester 8 if a student opts for Honours, he will have to go through the major courses (i) Functional Analysis (ii) Mechanics-II (iii) Discrete Mathematics and Differential Geometry (iv) Data Science. If a student opts for Honours with research, he will have to pursue a Research Project / Dissertation guided by a faculty member of the department.

   After successful completion of the course a student will be awarded a degree of Honours or Honours with Research according to the scheme he opted for. The design of the course year 4 is intended towards higher study in Mathematics or any related subject.

P. R. Thakur Government College

Department of Microbiology
Course Outcome

Semester I (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR01T	Introduction to Microbiology and Microbial Diversity (Theory)	**Unit 1 History of Development and scope of Microbiology**	1. To have a basic overview of e developmental history of Microbiology and the contributions made by different renowned scientists. 2. Understand the scopes and their opportunities of Microbiology in different fields.
		Unit 2 Microscopy: Basic principles & application	Define basic terms and understand principles of microscopy, recognize, illustrate and label various structural components of microscope and relate structure with function.
		Unit 3 Diversity of Microbial World A. Systems of classification. B. General characteristics of different groups:	1. To understand the basic classification system and general characteristics of prokaryotic and eukaryotic microbes. 2. Able to place a specific microorganism in the Universal Phylogenetic tree. 3. To understand the details of microscopic fungal, algal and protozoan characters, body structures and life cycles.
MCBACOR01P	Introduction to Microbiology and Microbial Diversity (Practical)		1. To have a basic overview of good laboratory practices of Microbiology. 2. To understand the basic working principle of different instruments used in Microbiology. 3. Able to learn the staining technique of fungi. 4. To enumerate and determine microbes and their cellular morphology. 5. Able to prepare culture media for cultivation of fungi.

Semester I (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR02T	BACTERIOLOGY (Theory)	**Unit 1 Cell organization**	To have an insightful understanding about the morphology and structure of Prokaryotic (bacterial and archaeal) cells.
		Unit 2 Bacteriological techniques	State nutritional requirements, different types of culture media and growth of bacteria.
		Unit 3 Staining methods	Learn different (both simple and differential) types of staining techniques of bacterial and fungal cells.
		Unit 4 Microbial Growth and Effect of Environment on Microbial Growth	1. To understand the effect of environment on microbial growth. 2. To understand the nutritional requirements, different types of culture media and growth of bacteria.
		Unit 5 Important archaeal and eubacterial groups	1. Able to learn the general characteristics, phylogenetic overview and important features of archaeal and bacterial groups. 2. Compare the different groups of archaea and bacteria.
MCBACOR02P	BACTERIOLOGY (Practical)		1. To Cultivate bacteria under laboratory conditions and learn the staining techniques. 2. To understand the basic working principle of different instruments used in Microbiology. 3. Able to isolate pure culture of bacteria. 4. To enumerate and determine microbes.

Semester II (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR03T	BIOCHEMISTRY (Theory)	**Unit 1 Bioenergetics**	To understand the basic of thermodynamics and energy molecules
		Unit 2 Carbohydrates	1. To understand the basic structures and characteristics of carbohydrates. 2. Able to compare different type sugars and their properties.
		Unit 3 Lipids	Know about the basic structures and characteristics of lipids.
		Unit 4 Proteins	To understand the structural and functional details of proteins.
		Unit 5 Enzymes	1. To have the knowledge of structure and nomenclature of enzymes. 2. Gain profound knowledge about the mechanisms of action of enzymes and the effect of various factors on enzyme activity.
MCBACOR03P	BIOCHEMISTRY (Practical)		1. To identify different biomolecules by qualitative and quantitative analyses. 2. To understand the enzyme kinetics. 3. To study the effect of the effects of temperature, pH and heavy metals on enzyme activities.

Semester II (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR04T	ENVIRONMENTAL MICROBIOLOGY (Theory)	**Unit 1 Microorganisms and their Habitats**	1. To understand the environmental aspects of microbial sustainability. 2. To have the knowledge about the distribution pattern of certain species of microorganisms in various different places of human body as well as the environment. Know about the microbial association with plants and animals
		Unit 2 Microbial Interactions	1. Know about the microbial association with plants and animals. 2. Able to know and compare different type interactions between micro-organisms and macro-organisms also among the microorganisms.
		Unit 3 Biogeochemical Cycling	Learn about the principles of microbial ecology, illustrate, compare and contrast the biogeochemical cycles and their significance.
		Unit 4 Waste Management	To understand the different type and level of modern and advanced techniques of waste management.
		Unit 5 Microbial Bioremediation	Gain profound knowledge about the beneficial role of microbes and their usage for the remedial purposes of the environment.
		Unit 6 Water Potability	To have the idea of the quality control techniques for drinking water
MCBACOR04P	ENVIRONMENTAL MICROBIOLOGY (Practical)		1. Able to isolate microbes and detect microbial enzymes from different soil sources. 2. Able to isolate microbes from rhizosphere and phyllosphere. 3. To understand the microbiological quality of water from different sources.

Semester III (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR05T	MICROBIAL PHYSIOLOGY AND METABOLISM (Theory)	**Unit 1 Nutrient uptake and Transport**	Learn about the basics of microbial nutrient uptake and transport and their significance.
		Unit 2 Chemoheterotrophic Metabolism - Aerobic Respiration	To understand and analyse the types of aerobic respiration in microbes.
		Unit 3 Chemoheterotrophic Metabolism- Anaerobic respiration and fermentation	1. To understand and analyze the types of anaerobic respiration in microbes.
		Unit 4 Chemolithotrophic and Phototrophic Metabolism	1. Analyse and explain the basic of catabolism and anabolism of microorganism, specifically, chemolithotrophic and phototrophic microorganism.
		Unit 5 Nitrogen Metabolism - an overview	To have an overview about the nitrogen metabolism the environment.
MCBACOR05P	MICROBIAL PHYSIOLOGY AND METABOLISM (Practical)		1. Able to estimate the effects of pH, temperature, carbon and nitrogen sources on a specific model bacteria, E.coli 2. Able to demonstrate alcoholic fermentation in the laboratory using normal substrates.

Semester III (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR06T	CELL BIOLOGY (Theory)	**Unit 1 Structure and organization of Eukaryotic Cell**	To understand the structural and functional aspects of different components of eukaryotic cells.
		Unit 2 Nucleus	To understand the details of nuclear organization.
		Unit 3 Basics of Protein Sorting and Transport	Gain advanced knowledge of the basic mechanisms of protein sorting and transport in living cells.
		Unit 4 Introduction to Cell Signaling	1. To have a basic overview on the components involved, molecular mechanism and importance of cell signaling both in microbial and eukaryotic system.
		Unit 5 Cell Cycle	1. To have a basic idea on cell cycle regulation, cancer biology and stem cell biology. 2. Able to know about apoptosis and necrosis.
MCBACOR06P	CELL BIOLOGY (Practical)		1. To study the structure of cell organelles. 2. Able to identify the different phases of eukaryotic cell division and compare and contrast mitosis and meiosis. 3. Able to perform the cytochemical staining technique of DNA.

Semester III (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR07T	MOLECULAR BIOLOGY (Theory)	**Unit 1 Structures of DNA and RNA / Genetic Material**	1. To understand the basic structure and organization of nucleic acids. 2. To learn about the structures of DNA and RNA, compare different forms of DNA.
		Unit 2 Replication of DNA (Prokaryotes and Eukaryotes)	1. To understand eukaryotic and prokaryotic replication mechanisms with the enzymes involved. 2. Able to compare eukaryotic and prokaryotic replication.
		Unit 3 Transcription	1. To understand eukaryotic and prokaryotic transcription mechanisms with the enzymes involved. 2. Able to compare eukaryotic and prokaryotic transcription.
		Unit 4 Basic concept of Post-Transcriptional Processing	1. To understand the basic ideas of post-transcriptional processing. 2. Lean about various molecules (with their significance) involved in post-transcriptional processing.
		Unit 5 Translation	1. To have the knowledge of eukaryotic and prokaryotic translation. 2. Able to compare and contrast between eukaryotic and prokaryotic translation.
		Unit 6 Regulation of gene Expression	To have the knowledge about molecular mechanism of regulation of gene expression in prokaryotic and eukaryotic.
MCBACOR07P	MOLECULAR BIOLOGY (Practical)		1. Able to measure DNA and RNA through quantitative analysis. 2. Able to isolate, visualize, purify the genomic DNA. 3. To purify the isolated DNA and visualize both DNA and protein through different gel types

Semester III (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBSSEC01M	FOOD FERMENTATION TECHNIQUES	**Unit 1 Fermented Foods**	To understand different types fermented foods and their benefits.
		Unit 2 Milk Based Fermented Foods	Gain profound knowledge about the preparation of inoculums, types of microorganisms involved and production process of milk based fermented foods.
		Unit 3 Grain Based Fermented Foods	To understand the preparation of inoculums, types of microorganisms involved and production process of grain based fermented foods.
		Unit 4 Vegetable Based Fermented Foods	To know about the preparation of inoculums, types of microorganisms involved and production process of vegetable based fermented foods.
		Unit 5 Fermented Meat and Fish	To understand the involvement of microorganisms in meat and fish based fermented foods.
		Unit 6 Probiotic Foods	To have a knowledge about different beneficial health aspects of probiotics.

Semester IV (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR08T	MICROBIAL GENETICS (Theory)	**Unit 1 Genome Organization, Mutation & DNA repair**	1. To study the genomic organization of different organisms as well as brief idea of mutation and different kinds of agents causing mutation (mutagens). 2. To understand the effects of molecular mutagens on microbial cells and mechanisms of DNA repair.
		Unit 2 Plasmids	1. To learn about the type and characteristics of plasmid. 2. Able to know about regulation of copy number, curing of plasmids.
		Unit 3 Mechanisms of Genetic Exchange	Know about extrachromosomal inheritance of microbial cells and the advantages to inherit those molecules.
		Unit 4 Transposable elements	To understand the transposable genetic elements of microbial cells and the mechanism of transposition.
MCBACOR08P	MICROBIAL GENETICS (Practical)		1. To understand the preparation of master and replica plates. 2. To understand the effect of the exposure of UV (as a mutagen) on bacterial cells through the survival curve as well as standard methods. 3. To know the process to isolate and visualize different plasmids. 4. To have the ideas about bacterial genetic exchange through different methods.

Semester IV (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR09T	VIROLOGY (Theory)	**Unit 1 Nature and Properties of Viruses**	1. To understand the basic properties, diversity, architecture, classification and nomenclature of viruses.
		Unit 2 Bacteriophages & phage genetics	1. To understand the basic ideas and life cycle regulation of bacteriophages. 2. Able to know about mechanism of viral entry and multiple mode of multiplication in host cells.
		Unit 3 Viral Transmission, Salient features of viral nucleic acids and Replication	To understand the viral transmission and genomic variations as well as multiplication and replication strategies of viruses.
		Unit 4 Viruses and Cancer	To understand the basic ideas oncogenic virus and their pathophysiology.
		Unit 5 Prevention & control of viral diseases	1. To understand the basics of treatment against viral diseases.
MCBACOR09P	VIROLOGY (Practical)		1. Able to isolate and enumerate bacteriophages.

Semester IV (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR010T	FOOD & DAIRY MICROBIOLOGY (Theory)	**Unit 1 Foods as a substrate for microorganisms**	1. To understand the significance and activities of microorganisms in food. 2. To understand the role of intrinsic and extrinsic factors on growth and survival of microorganisms and attain information on microbial food spoilage..
		Unit 2 Microbial spoilage of various foods	1. To understand the principles, spoilage of vegetables, fruits, meat, eggs, milk and butter, bread, canned Foods.
		Unit 3 Principles and methods of food preservation	1. To understand principles, physical and chemical methods of food preservation.
		Unit 4 Fermented foods	Able to analyze various types of starter cultures, fermented milk products, probiotics, SCP and edible mushrooms.
		Unit 5 Food borne diseases	To have the knowledge of food intoxications and food infections.
		Unit 6 Food sanitation and control	1. To have the basic ideas related to control microbiological quality of foods and the quality systems. 2. To have the knowledge about food sanitary quality and sanitizers.
MCBACOR010P	FOOD & DAIRY MICROBIOLOGY (Practical)		1. Able to perform MBRT of milk samples and their standard plate count. 2. Able to check the efficiency of pasteurization of milk by Alkaline phosphatase test. 3. Isolate food borne bacteria from food products. 4. Isolate spoilage microorganisms from spoiled vegetables, fruits and bread.

Semester IV (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBSSEC02M	MICROBIOLOGICAL ANALYSIS OF AIR AND WATER	**Unit 1 Aeromicrobiology**	1. Understand the concept of Bioaerosols, fate of Bioaerosols and different inactivation mechanisms of Bioaerosols. 2. To understand different types of airborne microbes and their impacts on the environment and human health.
		Unit 2 Air Sample Collection and Analysis	To study different methods for the collection and analyses of microbes from air.
		Unit 3 Control Measures	To have a knowledge to control airborne microbes through different physical methods.
		Unit 4 Water Microbiology	To know about the water borne pathogens and water borne diseases.
		Unit 5 Microbiological Analysis of Water	To understand the different methods for the collection and analyses of microbes from water.
		Unit 6 Control Measures	To have a knowledge to control waterborne microbes through different physical methods.

Semester V (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR011T	INDUSTRIAL MICROBIOLOGY (Theory)	**Unit 1 Introduction to industrial microbiology**	To understand the history and developments in industrial microbiology.
		Unit 2 Isolation of industrially important microbial strains and fermentation media	1. To understand the various physical and chemical requirements to isolate and maintain industrially important microbes. 2. Know the concepts of inoculum development and media sterilization for fermentation process.
		Unit 3 Types of fermentation processes, bio-reactors and measurement of fermentation parameters	1. Understand the basics of fermentation technology, screening techniques, microbial culture preservation techniques. 2. Learn about the typical structure of fermenter and its parts, types of fermentation processes and synchronous growth.
		Unit 4 Down-stream processing	To understand the different downstream techniques in industries.
		Unit 5 Microbial production of industrial products	To have the knowledge of the methods implemented in the industry to get specific fermentation products e.g., ethanol, citric acid, vit.B12, penicillin, amylase, wine.
		Unit 6 Enzyme immobilization	To have the idea of enzyme immobilization and its recovery in industries.
MCBACOR011P	INDUSTRIAL MICROBIOLOGY (Practical)		1. Able to perform Microbial fermentations for the production and estimation of ethanol, citric acid, amylase. 2. To experience the industrial fermentation and other downstream processing operations by visit to any industry.

Semester V (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR012T	IMMUNOLOGY (Theory)	**Unit 1 Introduction**	To understand the basic concepts of immunology, properties of immune system and types of immunity.
		Unit 2 Immune Cells and Organs	To understand the types, structures and functions of immune cells and organs in human body.
		Unit 3 Antigens	1. Learn the definition and characterizations of antigen and immunogen. 2. Distinguish and characterize antibody isotypes, development, and functions.
		Unit 4 Antibodies	To understand the different characters and aspects of antibody.
		Unit 5 Major Histocompatibility Complex	Gain the brief idea of major histocompatibility complex as well as antigen processing and presentation.
		Unit 6 Complement System	1. To have the basic ideas related to components of the complement system. 2. To have the knowledge about three main pathways and biological consequences of complement activation.
		Unit 7 Generation of Immune Response	1. To understand the basic ideas about generation of immune response. 2. Compare and contrast the innate versus adaptive immune systems and humoral versus cell-mediated immune responses.
		Unit 8 Immunological Disorders and Tumor Immunity	1. To have the knowledge about immunological disorders like Autoimmunity and Hypersensitivity 2. To understand about different immunodeficiencies and cancer immunology and therapy
		Unit 9 Immunological Techniques	Gain a profound knowledge on different modern immunological techniques like ELISA, ELISPOT, western blotting, precipitation, agglutination, flow cytometry.
MCBACOR012P	IMMUNOLOGY (Practical)		1. Able to detect human blood groups. 2. Able to perform Single Radial Immuno Diffusion, Immunoelectrophoresis. 3. Able to perform Immunodiffusion by Ouchterlony method. 4. Able to demonstrate DOT ELISA.

Semester V (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBADSE01T	ADVANCES IN MICROBIOLOGY (Theory)	**Unit 1 Evolution of Bacterial Genomes**	To understand the basic concept of bacterial genome evolution, horizontal gene transfer and evolution of bacterial.
		Unit 2 Metagenomics	1. To learn about the Development of metagenomics. 2. To understand the bacterial diversity using metagenomic approach. 3. Gain basic knowledge of viral metagenome, metatranscriptomics, metaproteomics and metabolomics. .
		Unit 3 Molecular Basis of Host-Microbe Interactions	1. To know about the virulence factors of pathogens. 2. To understand growth regulators and disease development of pathogens. 3. To gain intense knowledge on biofilms.
		Unit 4 Systems and Synthetic Biology	1. To understand about networking in biological systems. 2. To have a brief idea about of synthetic biology with respect to bacteria and viruses.
MCBADSE01P	ADVANCES IN MICROBIOLOGY (Practical)		1. Able to extract and purify genomic DNA from E.coli by phenol chloroform method. 2. Able to perform PCR amplification by using suitable DNA. 3. Able to isolate of antibiotic resistant bacteria from soil and study of multiple antibiotic resistance, using antibiotics.

Semester V (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBADSE03T	INHERITANCE BIOLOGY (Theory)	**Unit 1 Introduction to Genetics**	To understand the basic concepts of heredity and genetics.
		Unit 2 Mendelian Principles	1. To understand the different aspects of mendel's laws and its deviation. 2. To understand the complex concepts of multiple allele and different types of genetic interactions, incomplete dominance, co-dominance, Epistasis, penetrance, expressivity.
		Unit 3 Linkage and Crossing over	1. To understand linkage and recombination of genes, 2. To know cytological basis of crossing over. 3. To understand the molecular mechanism of crossing over.
		Unit 4 Extra-Chromosomal Inheritance	1. To have the knowledge of extra nuclear inheritance in bacteria and organelle heredity.
		Unit 5 Characteristics of Chromosomes	1. To know the structural organization of chromosomes. 2. To have the knowledge about packaging of DNA molecules. 3. To know about the euchromatin and heterochromatin, chromosome banding.
		Unit 6 Recombination	To have the knowledge about Homologous and non-homologous recombination.
		Unit 7 Human genetics	1. To gain knowledge about pedigree analysis, lod score for linkage testing, karyotypes, 2. To know the variations in chromosome structure and variation in chromosomal number and structural abnormalities.
MCBADSE03P	INHERITANCE BIOLOGY (Practical)		1. To understand the use of statistics to solve different gentical issues. 2. To analyze pedigree and conclude the relation of a disease with gene. 3. To study of polytene chromosomes using temporary mounts of salivary glands of Chiromonas / Drosophila larvae.

Semester VI (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR013T	MEDICAL MICROBIOLOGY (Theory)	**Unit 1 Normal microflora of the human body and host pathogen interaction**	1. To have the knowledge of human anatomy and diverse array of microorganisms present under normal condition in different parts of human body. 2. To understand the normal human microflora and their importance.
		Unit 2 Sample collection, transport and diagnosis	To understand the various processes of microbiological sample collection and transportation for diagnostic purposes.
		Unit 3 Bacterial diseases	1. To understand diseases of various organ systems and their causative agents. 2. To know about symptoms, mode of transmission, prophylaxis and control of some specific bacterial diseases.
		Unit 4 Viral diseases	1. To understand diseases of various organ systems and their causative agents. 2. To know about symptoms, mode of transmission, prophylaxis and control of some specific viral diseases..
		Unit 5 Protozoan diseases	1. To understand diseases of various organ systems and their causative agents. 2. To know about symptoms, mode of transmission, prophylaxis and control of some specific protozoal diseases.
		Unit 6 Fungal diseases	1. To understand diseases of various organ systems and their causative agents. 2. To know about symptoms, mode of transmission, prophylaxis and control of some specific fungal diseases.
		Unit 7 Antimicrobial agents: General characteristics & mode of action	To have the preliminary ideas about different types of antimicrobial agents and their mode of action.
MCBACOR013P	MEDICAL MICROBIOLOGY (Practical)		1. To identify different bacteria by various physical and chemical methods. 2. To study the different techniques to detect antibiotic sensitivity.

Semester VI (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBACOR014T	RECOMBINANT DNA TECHNOLOGY (Theory)	**Unit 1 Introduction to Genetic Engineering**	To understand the milestones of genetic engineering and biotechnology.
		Unit 2 Molecular Cloning- Tools and Strategies	To understand the different basic tools and strategies used in recombinant DNA technologies.
		Unit 3 Methods in Molecular Cloning	1. To understand the basic ideas, methods and analyses of techniques for gene cloning.
		Unit 4 DNA Amplification and DNA sequencing	To have the knowledge of nucleic acid sequencing methods and amplification techniques like, PCR, RT-PCR and Real Time PCR.
		Unit 5 Construction and Screening of Genomic & cDNA libraries	To have the knowledge of genomic library construction of organisms.
		Unit 6 Applications of Recombinant DNA Technology	To introduce basic ideas about applications of RDT in different fields.
MCBACOR014P	RECOMBINANT DNA TECHNOLOGY (Practical)		1. Able to prepare competent cells for transformation. 2. Able to perform bacterial transformation and calculate transformation efficiency. 3. Able to digest DNA using restriction enzymes and analysis by agarose gel electrophoresis. 4. Able to perform ligation of DNA fragments and cloning of DNA insert and Blue white screening of recombinants.

Semester VI (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBADSE04T	MICROBES IN SUSTAINABLE AGRICULTURE AND DEVELOPMENT (Theory)	**Unit 1** **Soil Microbiology**	1. To understand the various beneficial effects of soil microorganisms on soil health. 2. To know about microbial diversity of soil.
		Unit 2 Microbial Activity in Soil and Green House Gases	1. To understand the different activities of microorganisms in soil. 2. To understand the microbial production and control in soil.
		Unit 3 **Microbial Control of Soil Borne Plant Pathogens**	Learn the use of soil microorganisms to fight against plant pathogens and sustainable development.
		Unit 4 **Biofertilization, Phytostimulation, Bioinsecticides**	To have the knowledge of plant growth promoting bacteria, biofertilizers and phosphate solubilizers.
		Unit 5 **Secondary Agriculture Biotechnology**	To know the – general concepts and advantages of biomanure, biogas, biofuels.
		Unit 6 **Genetically Modified crops**	To have the knowledge about genetically modified agricultural products and their advantages, social and environmental aspects.
MCBADSE04P	MICROBES IN SUSTAINABLE AGRICULTURE AND DEVELOPMENT (Practical)		1. To isolate and characterise phosphate solubilizing bacteria and Nitrogen fixing bacteria from soil. 2. To study the microflora of rhizospheric soils and isolate Rhizobium from root nodules. 3. To perform soil dehydrogenase assay.

Semester VI (H)			
Course Code	**Paper Title**	**Unit No.**	**Course Outcome**
MCBADSE06T	INSTRUMENTATION AND BIOTECHNIQUES (Theory)	**Unit 1 Microscopy**	To understand the working principles and usage of different types of microscopes.
		Unit 2 Chromatography	To understand the working principles and usage of different types of chromatography
		Unit 3 Electrophoresis	To understand the working principles and usage of different types of electrophoresis.
		Unit 4 Spectrophotometry	To understand the working principles and usage of different types of Spectrophotometr.y
		Unit 5 Centrifugation	To understand the working principles and usage of different types of Centrifuge.
MCBADSE06P	INSTRUMENTATION AND BIOTECHNIQUES (Practical)		1. Able to perform number of techniques to separate biomolecules from mixtures. 2. To determine λmax for an unknown sample and pedigree and able to calculate the extinction coefficient.

Department of Philosophy

Program Specific Outcomes (PSO)

History of Ideas (PSO-1): After completion of the three-year honors course in Philosophy students are expected to have a general but clear outlook of different and diverse traditions of philosophical thought. This is very much helpful for widening the philosophical knowledge, to create enthusiasm and interest to do progress in research works and to write small articles on various philosophical topics.

Skill of Analysis and Synthesis (PSO-2): This program develop proficiency in analyzing information, concepts and context from diverse perspective. Develop the ability to synthesize different viewpoints without being critical of or without utterly rejecting any of the viewpoints.

Moral Awareness and Sustainable living (PSO-3): Flourish the ability for systematizing, defending and recommending concepts of right and wrong both from human behavioral and civilizational perspective. The civilizational perspective of morality is very much crucial for sustainable living.

Epistemic Tolerance (PSO-4): Academic philosophy is the battlefield of ideas. A careful and sincere learning enhance cognitive and conative tolerance to "other's viewpoint" as well as to different intellectual and socio-cultural traditions. This gradually develop the virtue of epistemic tolerance.

Logical Thinking (PSO-5): Logic brings the clarity in our thought process and logic is also the unitary feature of our thought. This program develops the ability to think logically will all nuances.

Critical Thinking (PSO-6): Develop in students the ability to apply critical thinking tools developed in philosophical theorising to handle issues and problems in ethics, social sciences and problems that arise out of the technological effects of natural sciences.

Creative Thinking (PSO-7): Logical analysis and synthesis is the virtue of all creative thinking. The undergraduate program in Philosophy enables a student to think creatively on the basis of logical analysis and synthesis of various philosophical concepts and ideas.

Effective Communication (PSO-8): - Enhances in a way no other activity does, one's problem-solving capacities, contributes uniquely to the development of expressive and communicative powers, persuasive powers, writing skills.

Course Outcomes (CO) for Advance/Honours Course in CBCS System

All courses in Philosophy are divided into three types – Core Course (CC), Discipline Specific Elective (DSE) and Skill Enhancement Course (SEC). There are different objectives behind this differentiation.

Objectives for Core Course (CC): These courses have been devised to introduce to the students the very basics of philosophy – its subject matter as well as its structural framework. The students are also expected to acquaint themselves with the various branches and traditions of philosophy, different conceptual tools.

Objectives of Discipline Specific Electives (DSE): These courses are designed in such a way so that students can acquire an in depth understanding of some areas of philosophy. They can obtain a research outlook of the topics.

Objectives of Skill Enhancement Course (SEC): The Skill Enhancement Course, based on UGC guidelines, have the common goal of developing specific skills of students of the discipline for better employment opportunities.

Semester-I

CC-1 : History of Western Philosophy – I

Students will be acquainted with the historical development of western philosophy. Beginning with Pre- Socratic Philosophers they will become acquainted with theories of Knowledge and that of metaphysics of Plato and Aristotle. Students will have critical understanding of the doctrines of some well-known western philosophers like that of Thomas Aquinas (a famous philosopher of the Medieval period) and that of Descartes, Spinoza, Leibnitz the pioneers of Modern Rationalist school.

The students will be able to demonstrate the knowledge of the main thinkers and theories of Western philosophy from antiquity up to the modern era. They will be able to understand the continuities as well as the ruptures in the Western philosophical narrative.

CC-2 : Western Logic – I

After learning this course student will be able to demonstrate the knowledge of the basic skills and knowhow of deductive and inductive logic. Learning outcomes of this course are as follows:

- To learn identifying different types of arguments as well as their premises and conclusions.
- To be able to evaluate arguments and identify mistakes in reasoning.
- To learn how to prove the validity and invalidity of arguments using method of Rules and Fallacies and also by Truth Table method.
- To develop the overall reasoning skills of the students which are useful in various competitive exams.
- They will be able to understand the primary concepts and theories of Inductive logic. They will also be able to understand the difference between Inductive and Deductive reasoning.
- Helps in good scoring for a better rank in form of result

Semester-II

CC-3 : Outlines of Indian Philosophy – I

Students will gain detailed knowledge about the history of Indian Philosophy and the main two different tradition of Indian Philosophy - āstika & nāstika. They will acquire elaborate knowledge about the various theories, beliefs and opinions of Cārvāka, Buddhism, Jainism, Naiyāyikas and Vaiśeṣikas with critical understanding from both epistemological and metaphysical perspectives.
The students will be able to demonstrate their understanding of the main concepts and theories within the broad framework of Indian philosophy. They will be able to demonstrate their knowledge of the distinctions as well as the commonalities between the various schools of Indian philosophy, and will be able to demonstrate their understanding of the chief metaphysical and epistemological standpoints in Indian Philosophy.

CC-4 : Western Logic – II

An orientation of Symbolic Logic is given here. Students will have an understanding of

- ❖ Value of special symbols like that of conjunction, disjunction, negation, material implication and material equivalence and Stroke / dagger functions.
- ❖ They will comprehend distinction between argument and argument forms, statement and statement forms.
- ❖ They will gain knowledge of different kinds of statement forms.
- ❖ They will be able to test validity of arguments through different methods like Truth table, Formal Proof of Validity and Methods of Resolution; Test of Invalidity by method of assigning Truth value is also taught

The students will be able to demonstrate the knowledge of the basic skills and knowhow of the discipline of deductive symbolic logic. They will be able to understand the different logical concepts and will be able to demonstrate the knowledge of the application of these concepts in the philosophical discourse.

Semester-III

CC-5 : History of Western Philosophy – II

Students will develop detailed knowledge about the modern Empiricist school through the philosophies of Locke, Berkeley, Hume & Kant, their beliefs and doctrines regarding Knowledge, God and World as also their ethical views; and thus will be enriched with the complete understanding of the similarities and the differences between Rationalism and Empiricism in Modern Western Philosophy.

CC-6 : Outlines of Indian Philosophy - II

Students will learn and will develop critical assessment of the theories of Astika Indian philosophers like Samkhya, Yogā and Mimāṁsā philosophers. Students will develop elaborate and evaluative knowledge the schools of Vedanta, their key concepts, beliefs, arguments and doctrines from both the standpoints of great Vaidāntiks like Śaṁkara and Rāmanuja.

CC-7: Ethics (Western)

Students will have an over-view of the different theories of western ethics (what makes an action right or wrong), whether they should ever act only in line with self-interest or take an altruistic attitude. Apart from this, the course will enable the students about how philosophical work in ethics can inform decisions that we regularly make in our lives.

SEC 1 : Media Ethics

Students will be oriented about the definition, nature, scope and methods of media ethics. Students will develop elaborate knowledge regarding what is media ethics, roles and impact of media, media and democracy, functions and responsibilities of media etc. and will be benefitted to apply their knowledge in critical thinking of everyday life. They will gain an insight into theories of Learning and theories regarding relation between people in general, state and media.

Semester-IV

CC-8: Social and Political Philosophy-Western

Students will acquire comprehensive knowledge of different socio–political terms, concepts and doctrines of eminent thinkers like Marx, Gandhi, Montesquieu etc. and can apply their philosophical knowledge in socio–political affairs in future.

This course will enable the students to have an understanding of the fundamentals of socio-political philosophy. The students will be able to understand its interdisciplinary nature. They will also understand the significance of the political concepts that are at play within the society.

CC-9: Psychology and Philosophy of Mind

Students will be oriented about the definition, nature, scope and methods of Psychology. Students will develop elaborate knowledge regarding philosophy of mind, different psychological concepts and doctrines of the eminent psychological thinkers like Freud, Thorndike, Skinner etc. and will be benefitted to apply their knowledge in critical thinking of everyday life. They will gain an insight into theories of Learning and theories regarding relation between mind and body.

CC-10 : Classical Indian Text

Students will be familiar with Indian Logic & epistemology through the classical Indian text - *Tarkasamgraha,* written by Navya Naiyayika Sri Annambhatta Acharya. Students will be familiar with the laksana (definition) and classification of typical Indian philosophical terms & concepts like Buddhi, Smriti, Prama, Aprama, Karana (general causal condition), Karana (special causal condition), Karya, Anyathasiddhi etc .and also develop the detailed knowledge about Pratyaksha pramana, Sannikarsa, classification of Pratyaksha, Anupalabdhi etc. from Nyāya Vaiśeṣika standpoint.

Students will learn in particular to distinguish between different kinds of reasoning and informal fallacies, to recognize the basic psychological impediments to good reasoning, to identify and clarify ambiguities in language and to show how tools of logic may be applied to issues in everyday life and enhance our grasp over empirical knowledge.

SEC 2 : Business Ethics

Students will explore the scope of ethics in professional field, introduce the purpose of Business Ethics. They will build an idea of the relation between Business Ethics and Environment. Students will learn the role of ethics in Management. Students will be oriented about the definition, nature, scope and methods of business ethics. Students will develop elaborate knowledge regarding what is business ethics, environmental ethics related to business, advertising ethics related to business etc. and will be benefitted to apply their knowledge in critical thinking of everyday life. They will gain an insight into theories of Learning and theories regarding relation between people in general, state and business.

Semester-V

CC-11 : Philosophy of Language (Indian and Western)

Students will be acquainted with the basic concepts of rich Indian tradition of the philosophy of language. The acquire a comprehensive knowledge of śabda pramāna/verbal testimony as discussed in Indian Philosophy with the special emphasis on Nyāya and Mimāmsā to elucidate word-meaning relation. In the western part students will be acquainted with the basic concepts of Western tradition of the philosophy of language with the special emphasis on word, meaning, ambiguity, vagueness, speech acts as discussed by John Hospers.

This course offers some western theories of word meaning and sentence meaning. From this course students will learn how to analyze the meaning of word or sentence without any vagueness or ambiguity. They also learn the useful tools and methods of effective communication.

CC-12 : Ethical and Social Philosophy of India

The students will be able to demonstrate their knowledge of the broad themes and issues at work in Indian Ethics. They will be able demonstrate their knowledge and understanding of the ethical theories in Indian Heterodox traditions, as well as of the ethics of the Bhagavad Gita.

DSE-1 : Elective Logic

The students will be able to demonstrate the knowledge of the basic skills and knowhow of deductive and inductive logic. They will be able to understand the different logical concepts and methods. As a learning outcome students will be able to demonstrate the knowledge of the application of these concepts in the philosophical as well as legal discourse. Students will gain further knowledge of the various Methods of Logic in this elective course. As a result, students will be able to compare the different tools and processes of logical thinking. Logical techniques of four Modern Logicians are discussed as follows:

- I.M. Copi - Methods of Conditional Proof and Indirect Proof and their application
- R. Jeffrey- Method of Truth tree is learnt and applied in testing validity/ Invalidity of arguments and sentences
- W.V.O. Quine- Method of resolution- Full Sweep, fell Swoop is learnt
- P. Suppes – Set Theory

DSE-2 : Practical Ethics

The students will be able to demonstrate their understanding of the practical applications of the discipline of Ethics. They will be able to inculcate skills in identifying the ethical dilemmas and paradoxes at work within contemporary ethical debates. This course includes some ongoing discourse in philosophy to acquaint students with the current philosophical thought. Students will learn some popular serious debate so that they can easily participate in the discourse with their existing philosophical knowledge. Students will develop elaborate and detailed knowledge regarding environmental philosophical doctrines like Anthropocentrism, Biocentrism, Ecocentrism, Deep-Shallow ecology, Social ecology, Land ethics, Ecofeminism, Intrinsic, Extrinsic and Inherent values, Moore's concept of intrinsic value, Kinship ethics, Environmental thinking in Indian Perspective etc. and can apply their philosophical knowledge in practical applications & future study of environment. As a learning outcome this course enhance the debating skill of students, the skill of contextualizing philosophical issues. There are following emerging debates in this course –

- Killing
- Environmental Ethics
- Human Rights
- War, Violence and Terrorism
- Feminist Ethics

DSE-3 : Philosophy of Religion

Students will develop detailed knowledge regarding various religious terms, concepts, and doctrines in both western as well as Indian philosophical perspectives. They will be familiar with famous religious thinkers like St. Anselm, Thomas Aquinas and Jesus Christ in the Western World and Mohammad, Buddha, Mahavira in India and can apply their methodological tools in the future study of religion. Students will obtain critical knowledge about the religious views of Hindus, Bauddha and Jaina, Islam and Christianity.

Semester-VI

CC-13 : Western Epistemology and Metaphysics

Students are introduced to philosophical analysis or analytic philosophy. Deep investigation into philosophical terms like Concepts, Truth, Knowledge etc. is done for better comprehension and to remove ambiguity. They attain clarity about Cause and Causal principles, Realism, Idealism, Phenomenalism, Substance and Universal. This is also a text-based course. Students will have a textual analysis of the celebrated text *An Introduction to Philosophical Analysis* by John Hospers.

CC-14 : Some Modern Indian Thinkers

In this course students will study the Philosophical thinking of Great Indian Philosophers like Swami Vivekananda, Sri Aurobindo, M.K. Gandhi and B. R. Ambedkar.

DSE-4 : Rabindranath Tagore, *Sadhana*

This course includes a valuable philosophical text, Sadhana, written by the great Indian philosopher Rabindranath Tagore. As a learning outcome students will acquire the skill and methods of reading a philosophical text. They will also learn Tagore's philosophy in detail.

DSE-5 : Bertrand Russell, *The Problems of Philosophy*

This course includes a valuable philosophical text from Western tradition, which is The Problems of Philosophy, written by Bertrand Russell. As a learning outcome students will acquire the skill and methods of reading a philosophical text. They will be trained on Russell's philosophy.

DSE-6 : David Hume, *An Enquiry Concerning Human Understanding*

This course includes a valuable philosophical text from Western tradition, which is *An Enquiry Concerning Human Understanding*, written by David Hume. As a learning outcome students will acquire the skill and methods of reading a philosophical text. They will learn Hume's philosophy in detail.

Course Outcomes (CO) for General Course in CBCS System

Semester I

GE-1: Western Logic

Students first learn the introductory topics - Sentence, proposition, argument, truth and validity and comprehend the details of
Aristotelian classification of categorical propositions, distribution of terms, Existential Import, Boolean interpretation of categorical propositions; details of immediate inference.
Categorical syllogism
Symbolic Logic
Tautology, Contradiction, Contingent statement forms. Construction of truth-tables and using them for testing validity of arguments and statement forms.
Mill's methods of experimental inquiry.

Semester II

GE-2: Western Epistemology and Metaphysics

Students obtain insights on
Different senses of 'Know'
Theories of the origin of Knowledge
Realism, Idealism, Causality Theories
The Mind- Body Problem: Interactionism, Parallelism and the Identity Theory

Semester III

GE-3: Indian Epistemology and Metaphysics

Student get an in depth understanding of

Cārvāka Epistemology
Nyāya Epistemology
Vaiśeṣika Metaphysics: Categories – dravya, guna, karma, sāmānya,
Advaita Metaphysics: Brahman, māyā, The relation between jīva and Brahman

Semester IV

GE-4: Ethics – Indian and Western

The students will be able to understand the basic theoretical aspects of the discipline of ethics. They will also be able to understand the ethical framework of Western as well as Indian philosophy and will be able to demonstrate the knowledge of the main ethical theories in philosophy.

Department Of Physics

Course Name: Core Course - 01
Course Code: PHSACOR01T & PHSACOR01P
Topic Name: Mathematical Physics - I

Course Outcome: Upon successful completion of this course

- students will gain a better understanding of Calculus of a real variable and subsequently the Calculus of more than one variable.
- students will learn to solve first order differential equations.

students will learn Vector Calculus and related fundamental theorems.

In the practical component

- Python language is introduced to the students.
- students will learn to write basic Python codes and to draw simple graphs using Qtiplot.
- students will learn the implement logical and loop structure in programming.
- students will learn how to define functions in Python.
- students will learn to solve algebraic and transcendental equations by Bisection and Newton- Raphson method.
- students will learn to handle quadratic equations with complex roots.

Course Name: Core Course - 02
Course Code: PHSACOR02T & PHSACOR02P
Topic Name: Mechanics

Course Outcome: Upon successful completion of this course

- students will learn about Gravitation and its impact on the dynamic Universe.
- students will understand about elastic properties of matter and its application and how to measure different types of elastic constant.
- students will learn about Fluid motion, Oscillations etc.
- students will acquire basic knowledge about Special Theory of Relativity.
- students will understand different techniques for measuring different physical properties like (i) flexure method (ii) Searle's method (iii) Poiseuille's method etc
- students will know the uses of different apparatus like (i) Ttorsional Pendulum (ii) Sextant (iii) Bar Pendulum (iv) Kater's Pendulum
- students will know how to make systematic experimental observation, data collection, recording of data and other basic laboratory practices in this course.
- students will know the technique of plotting the graphs and will able to determine the different parameters from the graph.
- Students will able to estimate the errors in experimental data.

Course Name: Core Course - 03
Course Code: PHSACOR03T & PHSACOR03P
Topic Name: Electricity & Magnetism

Course Outcome: Upon successful completion of this course

- students will learn how to find the electric and magnetic field under certain special conditions.
- students will have an understanding of electrostatic potential and vector potential being important mathematical construct in computing corresponding fields.
- students will learn electro-magnetic induction along with the theory of simple electrical circuits.
- Students will able to know about various electrical components, power supply, multimeter and various other measuring instruments like (i)Potentiometer (ii) Carey Foster's Bridge (iii) Anderson's bridge (iv) Galvanometer etc
- students will able to perform experiments on various topics of electricity and magnetism associated with the course.
- Students will know about precautions to be taken during performing an experiment and will be able to identify different sources of error.

Course Name: Core Course - 04
Course Code: PHSACOR04T & PHSACOR04P
Topic Name: Waves and Optics

Course Outcome: Upon successful completion of this course

- students will understand the fundamental principles of wave motion.
- students will able to understand Huygen's wave theory.
- students will able to understand various optical phenomena, for example interference, diffraction etc.
- Students will able to analyze and solve problems involving wave propagation.
- students will know about different instruments/parts like (i) Spectrometer (ii) EDF Prism (iii) Sodium source and Sodium Vapour Lamp, Mercury Vapour Lamp (iv) Diffraction Grating (v)wedge-shaped Film etc
- students will able to determine the frequency of an electric tuning fork by Melde's experiment.
- students will understand about different experimental set up like (i) Fresnel Biprism (ii) Newton's Rings (iii) Michelson's interferometer etc.

Course Name: Core Course - 05
Course Code: PHSACOR05T & PHSACOR05P
Topic Name: Mathematical Physics - II

Course Outcome: Upon successful completion of this course

- students will learn the expansion of a function in Fourier series.
- students will learn a special class of second order differential equation yielding special functions.
- students will learn calculus of variation and subsequently Classical Mechanics.
- students will get a first exposure to some physically important partial differential equations using separation of variables.

In the practical component (implemented in Python language)

- students will learn how to use numpy to simplify program code.
- students will learn matplotlib, a very useful module to draw graphs and plots in 2 and 3 dimensions.
- students will learn certain sorting algorithm and how to calculate different statistic out of a data set.
- students will learn numerical method for interpolation, differentiation and integration and the solution of first order differential equation using Euler method.

Course Name: Core Course - 06
Course Code: PHSACOR06T & PHSACOR06P
Topic Name: Thermal Physics

Course Outcome: Upon successful completion of this course

- students will understand the fundamental principles of thermodynamics and laws of thermodynamics.
- students will understand the concepts of entropy, various thermodynamic potentials and their applications in various systems.
- students will able to understand the microscopic behavior of the systems to explain pressure, transport phenomena, viscosity, diffusion etc.
- Students will to interpret and visualize thermodynamic concepts: Understand the physical significance of thermodynamic quantities (e.g., temperature, entropy)
- students will get the idea of measuring various physical parameters related to the thermal properties of matter.
- students will able to verify Stefan's law.
- Students will to determine the Coefficient of Thermal Conductivity of a bad conductor by

Lee and Charlton's disc method.

- students will able to determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT) using constant current source.

- students will able to perform experiments on various topics associated with the course.

Course Name: Core Course - 07
Course Code: PHSACOR07T
Topic Name: Digital Systems and Applications
60 Lectures 4 Credits

Course Outcome:

Here's a structured course outcome for each section of your electronics course, which spans several key areas from basic electronic components to complex computer organization. This breakdown should help in clearly defining what students are expected to learn from each part of the course.

1. Course Outcome for "Introduction to Electronic Components and Measuring Devices" (4 Lectures)

Objective: Provide students with foundational knowledge of electronic components and measuring devices, focusing on their functions, characteristics, and applications with an emphasis on Cathode-Ray Oscilloscope (CRO).

Outcomes:

- Understand basic electronic components such as resistors, capacitors, and transistors, and their roles in circuits.

Learn the operational fundamentals and applications of the CRO including waveform analysis and electrical measurements (voltage, current, frequency, phase).

Analyse block diagrams of CROs, focusing on key components like the electron gun, deflection system, and time base.

Apply knowledge of CRO to measure and interpret electronic signals.

2. Course Outcome for "Integrated Circuits" (5 Lectures)

Objective: Explore the technology, advantages, and types of integrated circuits (ICs), including their classification and scale of integration.

Outcomes:

- Differentiate between active and passive components, and discrete components.

Understand the concepts of wafer and chip fabrication.

Comprehend the scale of integration from SSI to VLSI and the respective applications.

Classify ICs into linear and digital categories and provide examples of each.

3. Course Outcome for "Digital Circuits" (16 Lectures)

Objective: Delve into the fundamentals and complexities of digital circuits, covering binary numbers, logic gates, and Boolean algebra.

Outcomes:

- Differentiate between analog and digital circuits.

Master conversions between decimal, binary, BCD, octal, and hexadecimal systems.

Apply De Morgan's Theorems and Boolean Laws to simplify logic circuits.

Design and analyze logic circuits using different simplification methods including Karnaugh Maps.

Understand the function and application of XOR and XNOR gates, particularly in parity checking.

4. Course Outcome for "Arithmetic Circuits" (5 Lectures)

Objective: Study the fundamental arithmetic operations performed by digital circuits, focusing on their design and implementation.

Outcomes:

- Understand and design simple arithmetic circuits like binary adders and subtractors.

Develop half and full adders and subtractors.

Construct complex arithmetic circuits like 4-bit binary adder/subtractors.

5. Additional Course Outcomes:

- **Data Processing Circuits** (5 Lectures): Gain a basic understanding of multiplexers, demultiplexers, decoders, and encoders.

Sequential Circuits (6 Lectures): Learn about various flip-flops and their applications in designing sequential logic circuits.

Timers (4 Lectures): Understand the IC 555 timer and its applications in creating astable and monostable multivibrators.

Registers (4 Lectures): Master the different types of shift registers and their applications in data handling and processing.

Counters (4 Lectures): Understand different types of counters and their applications in digital circuits.

Computer Organization (7 Lectures): Gain insights into the architecture and organization of computers, including memory, I/O devices, and interfacing.

General Learning Outcomes:

By the end of this course, students will:

- Have a comprehensive understanding of both theoretical and practical aspects of electronics and digital circuits.

Be capable of designing and troubleshooting basic to moderately complex electronic circuits.

Be prepared for further studies or careers in electronics, digital design, and related fields.

These outcomes should provide a clear guide for both teaching staff and students on what knowledge and skills are expected to be developed throughout the course.

Course Name: Core Course - 07
Course Code: P H S A C O R 0 7 P
Topic Name: Digital Systems and Applications Lab
60 Class Hours 4 Credits

For a course focused on practical applications of electronic principles and devices, clear course outcomes that define specific skills and competencies students are expected to gain are essential. Below is a structured breakdown of the course outcomes based on the practical labs and tasks outlined:

Course Outcomes

Outcome 1:

- a) Efficiently use a Cathode-Ray Oscilloscope (CRO) to:

(i) Measure voltage levels in different parts of electronic circuits.

(ii) Determine the time period of periodic waveforms, enabling frequency calculation.

b) Use a multimeter to test the functionality and characteristics of diodes and transistors.

Outcome 2:

- a) Design and implement a transistor-based switch (NOT gate), understanding the role of transistors in logic inversion.

b) Utilize NAND gates to create and verify the operation of AND, OR, NOT, and XOR logic gates, demonstrating the versatility of NAND gates in digital circuit design.

Outcome 3:

- Analyze a given truth table to derive the corresponding logic equation, simplify it, and then design and implement the circuit using appropriate logic gate ICs.

Outcome 4:

- Construct and test different types of adders:

Design a Half Adder.

Design a Full Adder.

Design and implement a 4-bit binary Adder, integrating multiple Full Adders.

Outcome 5:

- Develop Flip-Flop circuits using NAND gates, specifically:

RS Flip-Flop

D-type Flip-Flop

JK Flip-Flop

Outcome 6:

- Design and build an astable multivibrator using the 555 Timer IC to specifications, demonstrating the ability to generate continuous oscillating outputs.

Outcome 7:

Design and construct a monostable multivibrator using the 555 Timer IC, to generate a single pulse of adjustable duration based on given specifications.

Outcome 8:

Implement arithmetic circuits using ICs:

Construct a Half Subtractor.

Construct a Full Subtractor.

Construct an Adder-Subtractor combination using a Full Adder IC.

Outcome 9:

Build and test a JK Master-Slave Flip-Flop circuit using Flip-Flop ICs, understanding its operation and the solution to the "race condition".

Outcome 10:

Develop a 4-bit counter using D-type or JK Flip-Flop ICs and analyze the timing diagram to understand the sequence and timing of operations.

Outcome 11:

Construct a 4-bit Shift Register using:

Serial-in and Serial-out configuration.

Serial-in and Parallel-out configuration.

Parallel-in and Serial-out configuration.

Parallel-in and Parallel-out configuration.

General Learning Outcomes:

By the end of this course, students will be able to:

Apply theoretical concepts in practical scenarios, enhancing understanding of digital and analog circuitry.

Design, build, and troubleshoot basic to moderately complex electronic circuits.

Use a variety of electronic measuring and testing tools effectively.

Analyse and interpret electronic circuit behaviour through experimental data.

This structure gives a clear indication of what students are expected to learn and accomplish, directly aligning practical activities with learning goals, thereby enhancing both the teaching and learning experience in the course.

Course Name: Core Course - 08
Course Code: PHSACOR08T & PHSACOR08P
Topic Name: Mathematical Physics - III

Course Outcome: Upon successful completion of this course

- students will learn the theory of functions of a single complex variable. This approach turns out to be of importance in studying advanced subjects like Quantum Field Theory, two-dimensional Conformal Field Theory etc.
- students will learn one type of integral transform, viz., the Fourier Transform which is essential to study Quantum Mechanics. It is used to determine Green function of some differential operators having profound physical significance, viz., Laplacian etc.
- students will learn to tackle boundary value problems occurring in electrostatic, wave mechanics, theory of heat conduction etc.
- students will have a clear understanding of how to deal with various matrices representing abstract linear operators.

In the practical component (implemented in Python language)

- students will learn matrix manipulation viz. Diagonalization, triangulation, computation of determinant, inverse etc. by elementary row operations.
- students will learn different numerical techniques, viz., Gauss elimination method, Gauss-Jordan method and Gauss-Seidal iterative method for approximate solutions of a system of linear equations.
- students will learn to solve heat equation, Laplace equation, Poisson equation and wave equation as boundary value problems by discretizing derivatives.

Course Name: Core Course - 09
Course Code: PHSACOR09T & PHSACOR09P
Topic Name: Elements of Modern Physics

Course Outcome: Upon successful completion of this course

- students will get the idea of relativistic dynamics, that is study of dynamics under relativistic view point. They will also know the 4-vectors and their applications
- students will know how the quantum theory has been emerged and why. The students will get the essence how ultraviolet catastrophe was elegantly removed by the famous hypothesis of Planck. The particle and wave-dual nature inherent in quantum theory is

the most important as well as interesting part towards understanding the properties of small particles.

- students will get the idea of LASER and its applications.
- students will also be able to get the basic knowledge in nuclear and particle physics. This is important to understand the fundamental forces existing in nature and also the properties of atomic nucleus and the existing particles in the universe.
- Students will learn about Nuclear structure and various models.
- students will learn about the nuclear radiation and nuclear reactors.
- students will understand about the basic properties of nuclear reaction.
- students will know about different instruments like (i) Spectrometer, (ii) photo detector etc.
- students will understand about different experimental set up like (i) Millikan oil drop apparatus, (ii) wavelength of laser source using diffraction of single slit etc.

Course Name: Core Course - 10
Course Code: P H S A C O R 10 T
Topic Name: Analog Systems and Applications
60 Lecture 4 Credits

Course Outcome:

Here are the course outcomes for each topic:

History of the Development of Electronics (3 Lectures):

Understand the historical progression of electronics from valve circuits to modern semiconductor devices.

Analyze the advantages of semiconductor devices over valve circuits in modern electronic systems.

Semiconductor Diodes (7 Lectures):

Explain the characteristics of P and N type semiconductors and their energy level diagrams.

Understand the fabrication of PN junction diodes and the formation of the depletion region.

Analyze the static and dynamic resistance of diodes and their current flow mechanisms under forward and reverse bias.

Derive equations for barrier potential, barrier width, and current for step junction diodes.

Two-terminal Devices and their Applications (7 Lectures):

Describe the operation of rectifier diodes in half-wave, full-wave, center-tapped, and bridge configurations.

Calculate ripple factor and rectification efficiency for different rectifier circuits.

Understand the principle and structure of LEDs, photodiodes, and solar cells.

Explain the working principle of Zener diodes and their application in voltage regulation.

Bipolar Junction Transistors (8 Lectures):

Understand the construction and operation of n-p-n and p-n-p transistors.

Analyze the characteristics of common base (CB), common emitter (CE), and common collector (CC) configurations.

Explain the physical mechanism of current flow in transistors and derive relations between current gains α and β.

Analyze transistor circuits using load line analysis and determine operating points in active, cutoff, and saturation regions.

Field Effect Transistors (3 Lectures):

Explain the basic principle of operation of junction field-effect transistors (JFETs).

Describe JFET parameters and characteristics of common source (CS) configurations.

Amplifiers (8 Lectures):

Understand transistor biasing and stabilization circuits.

Analyze single-stage common emitter (CE) amplifier circuits using hybrid model and determine input/output impedance, gains, and stability.

Classify amplifiers into Class A, B, and C based on their operation.

Coupled Amplifier (3 Lectures):

Understand the configuration and frequency response of two-stage RC-coupled amplifiers.

Feedback in Amplifiers (4 Lectures):

Explain the concept of feedback and its effects on amplifier parameters such as impedance, gain, stability, distortion, and noise.

Sinusoidal Oscillators (4 Lectures):

Apply Barkhausen's criterion to determine conditions for self-sustained oscillations.

Understand the operation and frequency determination of RC phase shift, Hartley, and Colpitts oscillators.

Operational Amplifiers (4 Lectures):

Describe the characteristics of ideal and practical operational amplifiers (Op-Amps).

Analyze open-loop and closed-loop gain, frequency response, common mode rejection ratio (CMRR), and slew rate.

Applications of Op-Amps (7 Lectures):

Explain various linear and non-linear applications of operational amplifiers, including amplifiers, adders, subtractors, integrators, differentiators, comparators, and oscillators.

Conversion (2 Lectures):

Describe resistive network conversion techniques such as weighted and R-2R ladder networks.

Understand the principles of A/D conversion, particularly successive approximation, and analyze accuracy and resolution.

Course Name: Core Course - 10
Course Code: P H S A C O R 10 T
Topic Name: Analog Systems and Applications
60 Lecture 4 Credits

Course Outcome:

Here are the course outcomes for each topic:

History of the Development of Electronics (3 Lectures):

Understand the historical progression of electronics from valve circuits to modern semiconductor devices.

Analyze the advantages of semiconductor devices over valve circuits in modern electronic systems.

Semiconductor Diodes (7 Lectures):

Explain the characteristics of P and N type semiconductors and their energy level diagrams.

Understand the fabrication of PN junction diodes and the formation of the depletion region.

Analyze the static and dynamic resistance of diodes and their current flow mechanisms under forward and reverse bias.

Derive equations for barrier potential, barrier width, and current for step junction diodes.

Two-terminal Devices and their Applications (7 Lectures):

Describe the operation of rectifier diodes in half-wave, full-wave, center-tapped, and bridge configurations.

Calculate ripple factor and rectification efficiency for different rectifier circuits.

Understand the principle and structure of LEDs, photodiodes, and solar cells.

Explain the working principle of Zener diodes and their application in voltage regulation.

Bipolar Junction Transistors (8 Lectures):

Understand the construction and operation of n-p-n and p-n-p transistors.

Analyze the characteristics of common base (CB), common emitter (CE), and common collector (CC) configurations.

Explain the physical mechanism of current flow in transistors and derive relations between current gains α and β.

Analyze transistor circuits using load line analysis and determine operating points in active, cutoff, and saturation regions.

Field Effect Transistors (3 Lectures):

Explain the basic principle of operation of junction field-effect transistors (JFETs).

Describe JFET parameters and characteristics of common source (CS) configurations.

Amplifiers (8 Lectures):

Understand transistor biasing and stabilization circuits.

Analyze single-stage common emitter (CE) amplifier circuits using hybrid model and determine input/output impedance, gains, and stability.

Classify amplifiers into Class A, B, and C based on their operation.

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Understand the configuration and frequency response of two-stage RC-coupled amplifiers.

Feedback in Amplifiers (4 Lectures):

Explain the concept of feedback and its effects on amplifier parameters such as impedance, gain, stability, distortion, and noise.

Sinusoidal Oscillators (4 Lectures):

Apply Barkhausen's criterion to determine conditions for self-sustained oscillations.

Understand the operation and frequency determination of RC phase shift, Hartley, and Colpitts oscillators.

Operational Amplifiers (4 Lectures):

Describe the characteristics of ideal and practical operational amplifiers (Op-Amps).

Analyze open-loop and closed-loop gain, frequency response, common mode rejection ratio (CMRR), and slew rate.

Applications of Op-Amps (7 Lectures):

Explain various linear and non-linear applications of operational amplifiers, including amplifiers, adders, subtractors, integrators, differentiators, comparators, and oscillators.

Conversion (2 Lectures):

Describe resistive network conversion techniques such as weighted and R-2R ladder networks.

Understand the principles of A/D conversion, particularly successive approximation, and analyze accuracy and resolution.

Course Name: Core Course - 10
Course Code: P H S A C O R 10 P
Topic Name: Analog Systems and Applications Lab
60 Class Hours 2 Credits

Course Outcome:

Here are the course outcomes corresponding to each topic:

To study V-I characteristics of PN junction diode and Light Emitting Diode (LED) (using both current and voltage source):

Understand the behavior of PN junction diodes and LEDs under different biasing conditions.

Analyze the V-I characteristics of diodes using both current and voltage sources.

To study the V-I characteristics of a Zener diode and its use as a voltage regulator:

Understand the breakdown behavior of Zener diodes and their characteristics.

Analyze the V-I characteristics of Zener diodes and their use as voltage regulators.

Study of V-I & power curves of Solar Cells and find maximum power point and efficiency:

Understand the operation of solar cells and their V-I characteristics.

Analyze the power curves of solar cells to find the maximum power point and **efficiency.**

To study the characteristics of a Bipolar Junction Transistor (BJT) in CE configuration:

Understand the common emitter (CE) configuration of BJTs.

Analyze the characteristics of BJTs in CE configuration including input and output characteristics.

To study the frequency response of voltage gain of an RC-coupled transistor amplifier:

Understand the frequency response characteristics of RC-coupled transistor amplifiers.

Analyze the voltage gain variation with**a) To investigate the use of an op-amp as an Integrator. b) To investigate the use of an op-amp as a Differentiator:**

Understand the principles and applications of op-amp integrators and differentiators.

Design and analyze integrator and differentiator circuits using operational amplifiers.

To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias:

Understand the principles of voltage divider biasing in CE transistor amplifiers.

a) To investigate the use of an op-amp as an Integrator. b) To investigate the use of an op-amp as a Differentiator:

Understand the principles and applications of op-amp integrators and differentiators.

Design and analyze integrator and differentiator circuits using operational amplifiers.

To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias:

Understand the principles of voltage divider biasing in CE transistor amplifiers.

Design and analyze CE transistor amplifier circuits for a specified gain using voltage divider biasing.

To study the various biasing configurations of BJT for normal class A operation:

Understand different biasing configurations such as base bias, collector bias, and emitter bias for BJT amplifiers.

Analyze the characteristics and stability of BJT amplifiers operating in class A mode under different biasing conditions.

To design a Phase Shift Oscillator of given specification using Op-Amp:

Understand the principle of operation of phase shift oscillators.

Design and analyze phase shift oscillator circuits using operational amplifiers to meet specified specifications.

To study the Colpitt's Oscillator:

Understand the principle of operation of the Colpitt's oscillator.

Analyze the characteristics and frequency stability of the Colpitt's oscillator circuit.

To design a digital-to-analog converter (DAC) of given specifications:

Understand the principles of digital-to-analog conversion.

Design and analyze DAC circuits to meet specified resolution and accuracy requirements.

To study the analog-to-digital converter (ADC) IC:

Understand the principles of analog-to-digital conversion.

Analyze the characteristics and operation of ADC integrated circuits.

To design a precision Differential amplifier of given I/O specification using Op-Amp:

Understand the principles and applications of precision differential amplifiers.

Design and analyze precision differential amplifier circuits using operational amplifiers to meet **specified input/output requirements.**

To design a circuit to simulate the solution of a 1st/2nd order differential equation:

Understand the principles of analog computing.

Design and analyze analog circuits to simulate the solutions of first and second-order differential equations.

To design inverting amplifier using Op-amp (741/351) and study its frequency response:

Understand the principles of inverting amplifier configuration.

Design and analyze inverting amplifier circuits using operational amplifiers, and study their frequency response.

To design non-inverting amplifier using Op-amp (741/351) & study its frequency response:

Understand the principles of non-inverting amplifier configuration.

Design and analyze non-inverting amplifier circuits using operational amplifiers, and study their frequency response.

To study the zero-crossing detector and comparator:

Understand the principle of operation of zero-crossing detectors and comparators.

Analyze the characteristics and applications of zero-crossing detectors and comparators.

Using Schmitt trigger and associated circuit (with OPAMP) generate different waveforms:

Understand the operation and characteristics of Schmitt triggers.

Design and analyze Schmitt trigger circuits to generate different waveforms based on input signal characteristics.

Design and analyze CE transistor amplifier circuits for a specified gain using voltage divider biasing.

To study the various biasing configurations of BJT for normal class A operation:

Understand different biasing configurations such as base bias, collector bias, and emitter bias for BJT amplifiers.

Analyze the characteristics and stability of BJT amplifiers operating in class A mode under different biasing conditions.

To design a Phase Shift Oscillator of given specification using Op-Amp:

Understand the principle of operation of phase shift oscillators.

Design and analyze phase shift oscillator circuits using operational amplifiers to meet specified specifications.

To study the Colpitt’s Oscillator:

Understand the principle of operation of the Colpitt's oscillator.

Analyze the characteristics and frequency stability of the Colpitt's oscillator circuit.

To design a digital-to-analog converter (DAC) of given specifications:

Understand the principles of digital-to-analog conversion.

Design and analyze DAC circuits to meet specified resolution and accuracy requirements.

To study the analog-to-digital converter (ADC) IC:

Understand the principles of analog-to-digital conversion.

Analyze the characteristics and operation of ADC integrated circuits.

To design a precision Differential amplifier of given I/O specification using Op-Amp:

Understand the principles and applications of precision differential amplifiers.

Design and analyze precision differential amplifier circuits using operational amplifiers to meet **specified input/output requirements.**

To design a circuit to simulate the solution of a 1st/2nd order differential equation:

Understand the principles of analog computing.

Design and analyze analog circuits to simulate the solutions of first and second-order differential equations.

To design inverting amplifier using Op-amp (741/351) and study its frequency response:

Understand the principles of inverting amplifier configuration.

Design and analyze inverting amplifier circuits using operational amplifiers, and study their frequency response.

To design non-inverting amplifier using Op-amp (741/351) & study its frequency response:

Understand the principles of non-inverting amplifier configuration.

Design and analyze non-inverting amplifier circuits using operational amplifiers, and study their frequency response.

To study the zero-crossing detector and comparator:

Understand the principle of operation of zero-crossing detectors and comparators.

Analyze the characteristics and applications of zero-crossing detectors and comparators.

Using Schmitt trigger and associated circuit (with OPAMP) generate different waveforms:

Understand the operation and characteristics of Schmitt triggers.

Design and analyze Schmitt trigger circuits to generate different waveforms based on input signal characteristics.

frequency in RC-coupled amplifiers.

To design inverting, non-inverting, and buffer amplifiers using Op-amp (741/351) for DC voltage:

Understand the principles of inverting, non-inverting, and buffer amplifiers using operational amplifiers.

Design and analyze these amplifier circuits for DC voltage applications.

To design a Wien bridge oscillator for a given frequency using an Op-Amp:

Understand the principle of operation of the Wien bridge oscillator.

Design and analyze the Wien bridge oscillator circuit using an operational amplifier for a specified frequency.

To add DC voltages using Op-amp in inverting and non-inverting mode:

Understand the principles of adding DC voltages using operational amplifiers in both inverting and non-inverting configurations.

Design and analyze circuits for adding DC voltages.

a) To investigate the use of an op-amp as an Integrator. b) To investigate the use of an op-amp as a Differentiator:

Understand the principles and applications of op-amp integrators and differentiators.

Design and analyze integrator and differentiator circuits using operational amplifiers.

To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias:

Understand the principles of voltage divider biasing in CE transistor amplifiers.

Design and analyze CE transistor amplifier circuits for a specified gain using voltage divider biasing.

To study the various biasing configurations of BJT for normal class A operation:

Understand different biasing configurations such as base bias, collector bias, and emitter bias for BJT amplifiers.

Analyze the characteristics and stability of BJT amplifiers operating in class A mode under different biasing conditions.

To design a Phase Shift Oscillator of given specification using Op-Amp:

Understand the principle of operation of phase shift oscillators.

Design and analyze phase shift oscillator circuits using operational amplifiers to meet specified specifications.

To study the Colpitt's Oscillator:

Understand the principle of operation of the Colpitt's oscillator.

Analyze the characteristics and frequency stability of the Colpitt's oscillator circuit.

To design a digital-to-analog converter (DAC) of given specifications:

Understand the principles of digital-to-analog conversion.

Design and analyze DAC circuits to meet specified resolution and accuracy requirements.

To study the analog-to-digital converter (ADC) IC:

Understand the principles of analog-to-digital conversion.

Analyze the characteristics and operation of ADC integrated circuits.

To design a precision Differential amplifier of given I/O specification using Op-Amp:

Understand the principles and applications of precision differential amplifiers.

Design and analyze precision differential amplifier circuits using operational amplifiers to meet **specified input/output requirements.**

To design a circuit to simulate the solution of a 1st/2nd order differential equation:

Understand the principles of analog computing.

Design and analyze analog circuits to simulate the solutions of first and second-order differential equations.

To design inverting amplifier using Op-amp (741/351) and study its frequency response:

Understand the principles of inverting amplifier configuration.

Design and analyze inverting amplifier circuits using operational amplifiers, and study their frequency response.

To design non-inverting amplifier using Op-amp (741/351) & study its frequency response:

Understand the principles of non-inverting amplifier configuration.

Design and analyze non-inverting amplifier circuits using operational amplifiers, and study their frequency response.

To study the zero-crossing detector and comparator:

Understand the principle of operation of zero-crossing detectors and comparators.

Analyze the characteristics and applications of zero-crossing detectors and comparators.

Using Schmitt trigger and associated circuit (with OPAMP) generate different waveforms:

Understand the operation and characteristics of Schmitt triggers.

Design and analyze Schmitt trigger circuits to generate different waveforms based on input signal characteristics.

Course Name: Core Course - 11
Course Code: PHSACOR11T & PHSACOR11P
Topic Name: Quantum Mechanics & Applications

Course Outcome: Upon successful completion of this course

- students will get acquainted with the axiomatic structure of Quantum Mechanics.
- students will learn how to compute discrete energy levels for certain quantum mechanical systems admitting bound state solutions and the associated normalized eigen functions.
- students will learn how to compute the reflection and transmission coefficients in the theory of scattering by certain potentials. As an important application of this, they learn the quantum origin of radioactive disintegration.
- students will learn how to tackle systems in higher (two and three) dimensions with the introduction of angular momentum operator and thereby study the exact solution of hydrogen atom problem.
- students will learn how to apply the quantum theory to Atomic and Molecular Physics, Nano-Physics etc. to predict the behaviour of a wide variety of systems.

In the practical component (implemented in Python language)

- students will learn to solve graphically transcendental equations while determining the bound state energy levels of a finite potential well.
- students will learn a numerical technique to discretize derivatives and thereby solve Schroedinger equation (which is a differential equation) after converting it to a system of algebraic equations. This is known as Finite Difference Method.
- students will learn another popular numerical technique to solve Schroedinger equation in an iterative way, known as the 'Shooting Method'.
- students will learn how to numerically estimate the energy levels and the s-wave solution of the hydrogen atom.
- students will learn how to numerically estimate the ground state of the Yukawa potential, an harmonic oscillator and the Morse potential (used to model the vibrational modes of a diatomic molecule).

Course Name: Core Course - 12
Course Code: P H S A C O R 12 T
Topic Name: Solid State Physics
60 Lectures 4 Credits

Course Outcome:

Here are the proposed course outcomes for each section of the course:

Crystal Structure (12 Lectures):

Understand the distinction between amorphous and crystalline materials.

Ability to describe lattice translation vectors and lattice with a basis.

Proficiency in determining unit cells and Miller indices.

Comprehend reciprocal lattice and its significance.

Identify different types of lattices and their characteristics.

Apply Brillouin zones concept to understand the behavior of crystals.

Explain the principles of X-ray diffraction by crystals, including Laue's condition and Bragg's Law.

Analyze the concept of structure factor and its role in crystallography.

Elementary Lattice Dynamics (10 Lectures):

Describe lattice vibrations and phonons in solids.

Differentiate between linear monoatomic and diatomic chains.

Explain the qualitative description of the phonon spectrum in solids.

Understand Dulong and Petit's Law and its limitations.

Discuss Einstein's theories of specific heat of solids and their constraints.

Magnetic Properties of Matter (8 Lectures):

Classify materials based on their magnetic properties.

Explain the Classical Langevin Theory and Quantum Mechanical Treatment of magnetism.

Apply Curie's law and Weiss's Theory of Ferromagnetism.

Analyze the B-H Curve, Hysteresis, and Energy Loss in magnetic materials.

Dielectric Properties of Materials (8 Lectures):

Understand polarization and its effects.

Describe the concept of electric susceptibility and polarizability.

Apply the Clausius-Mosotti Equation and understand its implications.

Discuss the Classical Theory of Electric Polarizability.

Analyze the phenomenon of normal and anomalous dispersion.

Explain the Langevin-Debye equation and the concept of complex dielectric constant.

Ferroelectric Properties of Materials (6 Lectures):

Understand structural phase transition and classification of crystals.

Describe various effects like piezoelectric, pyroelectric, and ferroelectric.

Apply Curie-Weiss Law and analyze ferroelectric domains and hysteresis loop.

Drude's Theory (6 Lectures):

Explain the behavior of free electron gas in metals.

Discuss concepts such as effective mass, drift current, mobility, and conductivity.

Understand the Hall effect in metals and its applications.

Analyze thermal conductivity and limitations of Drude's theory.

Elementary Band Theory (10 Lectures):

Describe the Kronig-Penney model and understand band gap.

Classify materials as conductors, semiconductors (P and N type), and insulators.

Analyze conductivity of semiconductors, mobility, and Hall Effect.

Discuss the measurement of conductivity using the 4-probe method and Hall coefficient.

Superconductivity (6 Lectures):

Interpret experimental results related to superconductivity.

Understand critical temperature and critical magnetic field.

Explain the Meissner effect and differentiate between Type I and Type II superconductors.

Apply London's Equation and understand Penetration Depth.

Discuss the isotope effect on superconductivity.

These outcomes are designed to ensure students have a comprehensive understanding of each topic covered in the course and are able to apply the concepts to solve problems and analyze real-world phenomena.

Course Name: Core Course - 12

Course Code: P H S A C O R 12 P
Topic Name: Solid State Physics Lab
60 Class Hours 2 Credits

Course Outcome:

Here are the course outcomes corresponding to each of the specified topics:

To determine the Coupling Coefficient of a Piezoelectric crystal:

Understand the principles of piezoelectricity.

Perform experimental techniques to measure the coupling coefficient of a piezoelectric crystal.

Analyze the results to determine the effectiveness of the crystal for piezoelectric applications.

To measure the Dielectric Constant of a dielectric Material with frequency:

Understand the concept of dielectric constant and its dependence on frequency.

Utilize experimental methods to measure the dielectric constant of materials across different frequencies.

Analyze the data to understand the frequency-dependent behavior of dielectric materials.

To study the characteristics of a Ferroelectric Crystal:

Identify the distinctive characteristics of ferroelectric crystals.

Perform experiments to study the polarization-electric field hysteresis loop and domain structure of ferroelectric crystals.

Analyze the results to understand the ferroelectric behavior and domain dynamics.

To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis:

Understand the principles of magnetic hysteresis and BH curves.

Conduct experiments to draw the BH curve of iron using a solenoid.

Calculate the energy loss from the hysteresis loop and analyze the magnetic behavior of iron.

To measure the resistivity of a semiconductor (Ge) with temperature by reverse bias characteristics of Ge diode (room temperature to 80 oC) and to determine its band gap:

Perform experiments to measure the resistivity of germanium semiconductor at various temperatures using reverse bias characteristics.

Analyze the data to determine the temperature dependence of resistivity and calculate the band gap of germanium.

To determine the Hall coefficient of a semiconductor sample:

Understand the Hall effect and its applications in determining semiconductor properties.

Conduct experiments to measure the Hall coefficient of a semiconductor sample.

Analyze the results to understand the charge carrier concentration and mobility in the semiconductor.

To study the temperature coefficient of a semiconductor (NTC thermistor):

Perform experiments to measure the temperature coefficient of a semiconductor using an NTC thermistor.

Analyze the data to understand the temperature dependence of the semiconductor's resistance.

Measurement of susceptibility of paramagnetic solution (Quinck's Tube Method):

Understand the principles of paramagnetism and susceptibility.

Perform experiments using the Quinck's tube method to measure the susceptibility of a paramagnetic solution.

Analyze the results to determine the magnetic properties of the solution.

To measure the Magnetic susceptibility of Solids:

Conduct experiments to measure the magnetic susceptibility of solid materials.

Utilize appropriate experimental techniques such as Gouy method or Faraday method.

Analyze the data to understand the magnetic behavior of the solid materials.

To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR):

Understand the principles of surface plasmon resonance (SPR) and its applications.

Perform experiments to determine the complex dielectric constant and plasma frequency of a metal using SPR.

Analyze the SPR curves to extract the desired parameters.

To determine the refractive index of a dielectric layer using SPR:

Perform experiments using SPR to determine the refractive index of a dielectric layer.

Analyze the SPR curves to extract the refractive index information.

Understand the relationship between SPR and the optical properties of the dielectric layer.

Course Name: Core Course - 13
Course Code: PHSACOR13T & PHSACOR13P
Topic Name: Electromagnetic Theory

Course Outcome: Upon successful completion of this course

- students will learn abouut Maxwell’s equations, gauge transformations,Poynting,s theorem, moentum density & field energy density.
- Students will unstarstand about the Electromagnetic wave propagation in Bounded & Unbounded media.
- students will learn about the Polarization of EM waves.
- students will know about Wave guides & Optical Fibres -concepts and applications.
- students will understand about Optical communication and Wave propagation along with Transmission theory.
- students will able to verify the law of Malus for plane polarized light.
- students will understand about different experimental set up like (i) Polarimeter, (ii) Babinet’s compensator (iii) Dipole antenna etc.

Course Name: Core Course - 14
Course Code: PHSACOR14T & PHSACOR14P
Topic Name: Statistical Mechanics

Course Outcome: Upon successful completion of this course

- students will understand the fundamental principles of statistical mechanics: (i) Microstates, macrostates and the concept of entropy (ii) probability distributions (e.g., Maxwell- Boltzmann, Fermi-Dirac, Bose-Einstein)
- students will able to understand statistical properties of matter and connections with thermodynamics.
- students will understand the behaviour of a thermodynamic system in the quantum regime occurring at low temperature and high density.

In the practical component (implemented in Python language)

- students will learn how to compute the partition function and the grand partition function for a thermodynamic system. Computation of them is central in all of Statistical Mechanics.
- students will learn how to generate the plot showing the temperature variation of specific heat predicted by different models.

Course Name: Discipline Specific Elective - 1
Course Code: PHSADSE01T & PHSADSE01P
Topic Name: Advanced Mathematical Physics - I

Course Outcome: Upon successful completion of this course

- students will have their first exposure to Abstract Algebra in the form of linear Vector Space, the knowledge of which is essential to learn Quantum Mechanics.

students will learn a very useful integral transform, viz. The Laplace transform needed to solve a wider class of Partial Differential Equations.

students will learn the basics of tensor formulation and its omnipresence in physical theories.

In the practical component (implemented in Python language)

- students will learn how to estimate quantum mechanical ground state of a quartic potential, the corresponding Schrodinger equation of which is not amenable to exact treatment, with the help of a numerical method, viz., the variational principle.
- students will learn how to graphically estimate energy levels by numerically operating the Hamiltonian on its stationary states.
- students will learn how to draw phase space trajectories

- students will have an understanding of special functions as the eigenfunctions of a class of hermitian operators known as the Sturm-Liouville operators.

Course Name: Discipline Specific Elective-2
Course Code: PHSADSE03T
Topic Name: Nuclear and Particle Physics

Course Outcome: Upon the completion of course

- students will understand the fundamental of nuclear physics : (i) Nuclear structure and properties (e.g., binding energy, spin, parity etc.) (ii) Nuclear reactions
- students will understand fundamental of particle physics: (i) Elementary particles and their interactions
- students will lea

Course Name: Discipline Specific Elective - 3
Course Code: PHSADSE04T
Topic Name: Advanced Mathematical Physics - II

Course Outcome: Upon successful completion of this course

- students will have their exposure to Abstract Algebra in the form of Group Theory, a major stepping stone to learn recent developments in Theoretical Physics.
- Students will learn about the Nuclear models (e.g., Liquid drop model, Fermi gas model, shell model)
- students will understand the systematic classification of Partial Differential Equations governing the physical world.
- students will learn about Particle Accelerators (e.g., Linear accelerator, Cyclotron, Synchrotrons)

Course Name:Discipline Specific Elective-4
Course Code: PHSADSE06P
Topic Name: Communication Electronics Lab
60 Class Hours 2 Credits

Here are the course outcomes for the specified topics:
Designing an Amplitude Modulator using Transistor:
Understand the principles of amplitude modulation (AM).
Design and implement an amplitude modulator circuit using transistors.

Analyze the performance of the designed modulator in terms of modulation index and output characteristics.

Studying Envelope Detector for Demodulation of AM Signal:

Understand the concept of envelope detection in demodulating AM signals.
Study the operation and characteristics of envelope detector circuits.
Analyze the demodulated output and its fidelity compared to the original modulating signal.

Studying FM Generator and Detector Circuit:

Understand the principles of frequency modulation (FM).
Study the circuits for generating and detecting FM signals.
Analyze the frequency deviation, modulation index, and bandwidth characteristics of FM signals.

Studying AM Transmitter and Receiver:

Understand the design and operation of amplitude modulation (AM) transmitters and receivers.
Analyze the performance parameters such as power efficiency, signal-to-noise ratio, and bandwidth in AM transmission and reception.

Studying FM Transmitter and Receiver:

Understand the design and operation of frequency modulation (FM) transmitters and receivers.
Analyze the performance parameters such as frequency deviation, signal-to-noise ratio, and frequency response in FM transmission and reception.

Studying Time Division Multiplexing (TDM):

Understand the concept of time-division multiplexing (TDM).
Study the design and operation of TDM systems for multiplexing multiple signals onto a single transmission medium.
Analyze the time slots allocation and synchronization techniques in TDM.

Studying Pulse Amplitude Modulation (PAM):

Understand the principles of pulse amplitude modulation (PAM).
Study the generation and demodulation techniques for PAM signals.
Analyze the performance in terms of signal-to-noise ratio and bandwidth efficiency.

Studying Pulse Width Modulation (PWM):

Understand the principles of pulse width modulation (PWM).
Study the generation and demodulation techniques for PWM signals.
Analyze the performance in terms of distortion, noise, and efficiency.

Studying Pulse Position Modulation (PPM):

Understand the principles of pulse position modulation (PPM).
Study the generation and demodulation techniques for PPM signals.
Analyze the performance in terms of timing accuracy and bandwidth efficiency.

Studying ASK, PSK, and FSK Modulators:

Understand the principles of amplitude shift keying (ASK), phase shift keying (PSK), and frequency shift keying (FSK).
Study the design and operation of modulators for ASK, PSK, and FSK signals.
Analyze the performance in terms of modulation index, spectral efficiency, and noise immunity.

Course Code: PHSADSE045T
Topic Name: Astronomy and Astrophysics

Course Outcome: Upon successful completion of this course

- students will have their exposure to astronomical scales.
- students will understand the astronomical techniques.

- students will learn about the milky way, galaxies, large scale structure and expanding universe.

Course Code: PHSADSE06P
Topic Name: Communication Electronics Lab
60 Class Hours 2 Credits

Here are the course outcomes for the specified topics:

Designing an Amplitude Modulator using Transistor:
Understand the principles of amplitude modulation (AM).
Design and implement an amplitude modulator circuit using transistors.
Analyze the performance of the designed modulator in terms of modulation index and output characteristics.

Studying Envelope Detector for Demodulation of AM Signal:
Understand the concept of envelope detection in demodulating AM signals.
Study the operation and characteristics of envelope detector circuits.
Analyze the demodulated output and its fidelity compared to the original modulating signal.

Studying FM Generator and Detector Circuit:
Understand the principles of frequency modulation (FM).
Study the circuits for generating and detecting FM signals.
Analyze the frequency deviation, modulation index, and bandwidth characteristics of FM signals.

Studying AM Transmitter and Receiver:
Understand the design and operation of amplitude modulation (AM) transmitters and receivers.
Analyze the performance parameters such as power efficiency, signal-to-noise ratio, and bandwidth in AM transmission and reception.

Studying FM Transmitter and Receiver:
Understand the design and operation of frequency modulation (FM) transmitters and receivers.
Analyze the performance parameters such as frequency deviation, signal-to-noise ratio, and frequency response in FM transmission and reception.

Studying Time Division Multiplexing (TDM):
Understand the concept of time-division multiplexing (TDM).
Study the design and operation of TDM systems for multiplexing multiple signals onto a single transmission medium.
Analyze the time slots allocation and synchronization techniques in TDM.

Studying Pulse Amplitude Modulation (PAM):
Understand the principles of pulse amplitude modulation (PAM).
Study the generation and demodulation techniques for PAM signals.
Analyze the performance in terms of signal-to-noise ratio and bandwidth efficiency.

Studying Pulse Width Modulation (PWM):
Understand the principles of pulse width modulation (PWM).
Study the generation and demodulation techniques for PWM signals.
Analyze the performance in terms of distortion, noise, and efficiency.

Studying Pulse Position Modulation (PPM):
Understand the principles of pulse position modulation (PPM).
Study the generation and demodulation techniques for PPM signals.
Analyze the performance in terms of timing accuracy and bandwidth efficiency.

Studying ASK, PSK, and FSK Modulators:

Understand the principles of amplitude shift keying (ASK), phase shift keying (PSK), and frequency shift keying (FSK).
Study the design and operation of modulators for ASK, PSK, and FSK signals.
Analyze the performance in terms of modulation index, spectral efficiency, and noise immunity.

Course Name: Skill Enhancement Course-1
Course Code: PHSSSEC01M
Topic Name: Basic Instrumentation Skills

Course Outcome: Upon successful completion of this course

- students will get hands-on skill in different instruments.
- students will understand the basics of CRO, construction of CRT, Electron gun, electrostatic focusing and acceleration, screen phosphor, visual persistence & chemical composition. Time base operation, synchronization.
- students will able to use CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes)
- students will learn the principle and working of digital meters, comparison of analog and digital instruments, working principles of digital voltmeter.
- students will able to use this knowledge in their future careers.

Course Name: Skill Enhancement Course-2
Course Code: PHSSSEC02M
Topic Name: Computational Physics

Course Outcome: Upon successfulcompletion of this course

- students will understand applications of some fundamental Linux commands.
- students will understand LaTeX word processor, preparing a basic LaTeX file, document, preparing an input file for LaTeX, compiling LaTeX file, LaTeX tags for creating different environments, defining LaTeX commands and environments, changing the type style, equation representation: (formulae and equations), figures and other floating bodies, generating table of contents, bibliography and citation, different fonts, picture environment and colors etc.
- students will learn graphical analysis and its limitations, importance of visualization of computational and computational data, basic gnu plot commands: simple plots, plotting data from a file, saving and exporting etc
- students will understand basic of F90 programming.
- students will learn about GNUPLOT in 1D and 2D.

P.R. Thakur Government College

Three year B.A. degree course

Under CBCS semester system

Honours Course in Political Science (2018-2023)

Course Name : Core Course-1

Course Code : PLSACOR01T

Topic Name : Understanding Political Theory

Course Outcome : This course would provide the students with the elementary knowledge about the exhaustive discipline of political science and its evolution spanning across several years. It offers a window to the students to learn myriad approaches to political science- Traditional, Marxist, Behavioural and Post-Behavioural. The course enables the students to get a basic idea about the interplay between Power, Authority and Politics with a detailed study of Max Weber's authority models. At the end of the course, students will develop a solid foundational knowledge about the political system, its different components, challenges and opportunities confronting the same.

Course Name : Core Course-2

Course Code : PLSACOR02T

Topic Name : Constitutional Government and Democracy in India

Course Outcome : Students will get a clear idea of the nitty gritty of the huge body of the Indian Constitution- right from its making to its relevant provisions dealing with the major aspects of the Indian democracy. The course offers a detailed account of the functioning of three pillars of government both at the union and state level- legislature, executive, judiciary. It also shapes the young minds with a contextual analysis of the functioning of the parliamentary democracy- its challenges and prospects.

Course Name : Core Course-3

Course Code : PLSACOR03T

Topic Name: Political Theory : Concepts and Debates

Course Outcome: This particular course is designed to inculcate in the students, the fundamental concepts of Political Science like Nationalism and Sovereignty. It also comes with a promise to train the young minds into the very basic concepts like rights, liberty, equality and

justice and their relations with each other. Students , by the end of the course, will get well versed in the main theories regarding the Nature of the State.

Course Name : Core Course-4

Course Code : PLSACOR04T

Topic Name : Political Process in India

Course Outcome : It delves deep into the functioning of the Indian political system – right from the nature, evolution and major features of the Indian party system to the recent trends in the same with special reference to the gradual development of coalition politics in India. The course would offer the students an insight into impact of factors like caste, religion, regionalism, gender that shaped the trajectory of Indian politics. Students would also have a window to learn the impact of factors like Media and Corruption on politics.

Course Name : Core Course-5

Course Code : PLSACOR05T

Topic Name : Introduction to Comparative Government and Politics

Course Outcome: The course enables the students to develop detailed and cross-cultural outlook through the exhaustive study of the functioning of political systems in different countries. Students learn to outgrow the prolonged Eurocentric bias that characterized the discipline of Comparative Politics for a very long time. It also seeks to delve into the basics of modern government – with special emphasis on the origin and evolution of Capitalism, Socialism, Colonization and Decolonization. And finally the course focuses on the evolution and functioning of three different types of political economy i.e. Britain, China and Brazil.

Course Name : Core Course- 6

Course Code : PLSACOR06T

Topic Name : Perspectives on Public Administration

Course Outcome: It gives a much needed clarity about Administration as a whole and Public Administration in particular including its origin, nature, scope, evolution and the recent trends in the discipline. Students will get a solid foundational knowledge through the study of theoretical approaches to public administration- Classical, Neo-Classical and contemporary theories. The theoretical knowledge will help them figure out the flaws in the existing structure and functioning of the Indian administration and contemplate the remedies for the same. The course would also enhance their understanding of the major changes that caused ripples in the discipline- like New Public Administration, New Public Management, Good Governance etc. and see Public Administration in a completely new light.

Course Name : Core Course-7

Course Code : PLSACOR07T

Topic Name : Perspectives on International Relations and World History

Course Outcome : This course is designed to lucidly impart both the foundational and advanced knowledge of International Relations, embracing both theoretical and historical aspects. Students get an opportunity to experience contextual learning, through topics like Levels of Analysis, Evolution of the International State System, Pre and Post- Westphalian World Order and so on. It includes major theories of International Relations, which act like building blocks for further understanding of more complex aspects of global politics. And it also comes with a brief yet comprehensive overview of the most important landmarks of world history ranging from the WWI to Cold war and the Post-Cold War shifts and Challenges.

Course Name : Core Course-8

Course Code : PLSACOR08T

Topic Name : Political processes and Institutions in Comparative Perspective

Course Outcome : Students will develop a cosmopolitan outlook through the study of the diverse political systems across the world and analysis of the evolution of different political culture and its impact on the functioning of the political systems. They will have a better understanding of the complexities associated with the post- colonial notions of 'Nation', 'State' and the debates revolving around these concepts. The course chooses to compare the two defining traits of the political system i.e. party system and federalism, across different typologies of government like Parliamentary, Presidential and Socialist systems. It will help in the development of a more holistic view of the political system embracing its major components, its functioning, and the whole range of variables influencing its functioning.

Course Name : Core Course-9

Course Code : PLSACOR09T

Topic Name : Public Policy and Administration in India

Course Outcome : Students will get the much needed clarity about the formulation and implementation of public policies in India, the nitty gritty of the whole policy making process, and the factors impacting the same. It will help them develop analytical skills needed to understand the existing challenges in the Indian administration and dwell upon the measures to be taken to address public interest and make it sustainable. Students will also learn how the administration works at the very grassroot level in India with special reference to west Bengal and the different facets of citizen-administration interactions including the Lokpal, RTI, E-governance etc. The course also includes a detailed study of Budget in India, including the Budget cycle and different types of Budget.

Course Name : Core Course-10

Course Code : PLSACOR010T

Topic Name : Global Politics

Course Outcome : It offers a holistic view of Global Politics with a detailed take on globalization, its different dimensions and alternative perspectives. Students will have a fair idea about how Global Economy works through quick glimpses of composition and functions of the main anchors of global economy – the Bretton Woods System (the IMF and World Bank), the GATT, WTO and their overall performance over the years. They will also learn about the alternative undercurrents in the global political economy i.e. the global social movements and the role of NGOs in seeking to reverse the evils globalization has unleashed. The course enhances their understanding about the contemporary global issues like Environmental Degradation, Nuclear Proliferation, Terrorism, Migration, Human security etc. that demand global solutions as well. Students are enlightened about the changing power dynamics in the post-Cold War world and its manifestations and the challenges it brings.

Course Name : Core Course-11

Course Code : PLSACOR011T

Topic Name : Classical Political Philosophy

Course Outcome : This particular course will train the young minds into the exhaustive body of classical political philosophy of different stalwarts ranging from Plato, Aristotle to Machiavelli, and the Social Contract theorists- Hobbes, Locke and Rousseau. It helps them build up the foundational ideas like liberty, equality, justice, authority, nature and origin of state etc.

Course Name : Core Course-12

Course Code : PLSACOR012T

Topic Name : Indian Political Thought I

Course Outcome: Students will get to know the different dimensions of Pre-colonial and Ancient Indian political thought. They will also have a clear idea about the essence of the Islamic and Syncretic thought.

Course Name : Core Course-13

Course Code : PLSACOR013T

Topic Name : Modern Political Philosophy

Course Outcome : The course offers detailed study of the ideas of the most remarkable modern political philosophers like Kant and Hegel. A quick look through the feminist discourse especially the ideas of the two Feminist stalwarts like Mary Wollstonecraft and Betty Friedan is very important to understand the contemporary strands of Feminism and its manifestation through different social movements fighting for Women Rights across the world. It is important to study the past well to understand the further developments in the discipline better.

Course Name : Core Course-14

Course Code : PLSACOR14T

Topic Name : Modern Indian Political Thought

Course Outcome : It introduces students to the ideas of the modern Indian political thinkers across a broad spectrum – from Rammohan Roy, Vivekanda, Gandhi, Ambedkar, Tagore to Nehru and Lohia with special emphasis on their main strands of thought.

Course Name : Discipline Specific Elective -1

Course Code : PLSADSE01T

Topic Name : Reading Gandhi

Course Outcome : Students get to learn about some intricate areas of Indian society, and Gandhi's take on resolving or at least addressing the existing social evils and working for the overall betterment of the society. It seeks to offer some of the most popular ideas of Gandhi like Satyagraha, Sarvodaya, Trusteeship, Women empowerment etc.

Course Name : Discipline Specific Elective -2

Course Code : PLSADSE03T

Topic Name : Understanding Global Politics

Course Outcome: It offers a holistic view of Global Politics with a detailed take on globalization, its different dimensions and alternative perspectives. Students will have a fair idea about how Global Economy works through quick glimpses of composition and functions of the main anchors of global economy – the Bretton Woods System (the IMF and World Bank), the GATT, WTO and their overall performance over the years. They will also learn about the alternative undercurrents in the global political economy i.e. the global social movements and the role of NGOs in seeking to reverse the evils globalization has unleashed. The course enhances their understanding about the contemporary global issues like Environmental Degradation, Nuclear Proliferation, Terrorism, Migration, Human security etc. that demand global solutions as well. Students are enlightened about the changing power dynamics in the post-Cold War world and its manifestations and the challenges it brings.

Course Name : Discipline Specific Elective -3

Course Code : PLSADSE05T

Topic Name : Human Rights in Comparative Perspective

Course Outcome: Students through this course get to see Human Rights in a completely new light with a comparative perspective. Human Rights is one of most pertinent global issue that demands a detailed study of the subject right from its origin , evolution and typologies, the main components of the global human rights regime to the comparative analysis between two countries on diverse themes. Some controversial but relevant issues like torture, censorship and terrorism are compared across certain political systems to get a more comprehensive view. Te course will prepare them for further study or research on Human Rights or associated issues like Human Security, Refugee Crisis, Conflict Management etc.

Course Name : Discipline Specific Elective -4

Course Code : PLSADSE06T

Topic Name : Governance : Issues and Challenges

Course Outcome: Students will get a clear idea of governance and government and the changing role of state in the context of globalization. They are introduced to the idea of environmental governance and good governance.

Course Name : Skill Enhancement

Course Code : PLSSSEC01M

Topic Name : Democratic Awareness with Legal Literacy

Course Outcome : Students will get acquainted with the important provisions of the Indian Constitution and the major components of the Indian legal system. It gives a detailed idea about the most important laws and rights in India, which are meant for the redressal of the grievances of the people. Students get aware of their rights and the injustice they confront in their daily lives and learn to question the existing legal and political system, ask for rights and justice leading to remarkable increase in the degree of political participation in India.

Course Name : Skill Enhancement

Course Code : PLSSSEC02M

Topic Name : Public Opinion and Survey Research

Course Outcome : Students will be introduced to different elements of public opinion and survey research. It works as a foundational course for training the students with a research mindset.

Course Name : Generic Elective- 1

Course Code : PLSHGEC01T

Topic Name : Introduction to Political Theory

Course Outcome: It is an introductory course for students of other disciplines and gives quick glimpses of the fundamental concepts like liberty, equality, democracy, justice etc. They develop a fair understanding of some of the fundamental problem areas i.e. the major debates of political science.

Course Name : Generic Elective- 2

Course Code : PLSHGEC02T

Topic Name : Indian Government and Politics

Course Outcome : Students of other disciplines will get quick glimpses of the major provisions of the Indian Constitution and the functioning of the parliamentary democracy in the country. They will get a fair knowledge about the functioning of three wings of government both at the union and state level- legislature, executive, judiciary.

Course Name : Generic Elective- 3

Course Code : PLSHGEC03T

Topic Name : Comparative Government and Politics

Course Outcome : The course is designed for students of other disciplines. It enables the students to develop detailed and cross-cultural outlook through the exhaustive study of the functioning of political systems in different countries. Students learn to outgrow the prolonged Eurocentric bias that characterized the discipline of Comparative Politics for a very long time. It also seeks to delve into the basics of modern government – with special emphasis on the origin and evolution of Capitalism, Socialism, Colonization and Decolonization. And finally the course focuses on the evolution and functioning of three different types of political economy i.e. Britain, China and Brazil.

Course Name : Generic Elective- 4

Course Code : PLSHGEC04T

Topic Name : Introduction to International Relations

Course Outcome : This course is designed to lucidly impart both the foundational and advanced knowledge of International Relations, embracing both theoretical and historical aspects. Students get an opportunity to experience contextual learning, through topics like Levels of Analysis, Evolution of the International State System, Pre and Post- Westphalian World Order and So On. It includes major theories of International Relations, which act like building blocks for further understanding of more complex aspects of global politics. And it also comes with a brief yet comprehensive overview of the most important landmarks of world history ranging from the WWI to Cold war and afterwards.

P.R.THAKUR GOVT. COLLEGE
COURSE OUTCOMES (COs)
B.A Sanskrit Honours (CBCS)
Department Of Sanskrit

POs are statements about what the students should know, be able to do, and think by the end of the plan (a six-semester B.A. Honours course). POs look at the big picture of a program's graduation and the skills and information that a graduate will have after the course is over.
Students of Sanskrit at the undergraduate level had the opportunity to learn about India's ancient heritage, which has developed over the last four thousand years and has had an ineffable impact on Indian life and culture. The program aimed to inspire and improve everyone's life.

Core Course I
CO1: The purpose of this paper is to enhance students with the works of the legendary poet, Kālidāsa.
CO2: The purpose of this paper is to enrich students with the works of the eminent poet, Bhāravi.
CO3: Students would be familiar with the literary style and social structure reflected in these famous epics.
CO4: Through a few verses from Bhāravi'sKirātārjunīyaṃ, the course is intended to teach students about morality and principles.
CO5:Through some selected verses from Nītiśatakaṃ of Vartṛhari, the course is meant to teach students about morality and ethics.

Core Course 2
CO1: Through the Saṃhitās of the four Vedas, students will be exposed to various forms of Vedic wisdom.
CO2: Students will be exposed to various forms of Vedic belief systems and spiritual manifestations.
CO3: Students will be exposed to several forms of Vedic social aspirations as well.
CO4: The course intends to expose the students the two most celebrated Indian epics, the Rāmāyana the Mahābhārata, source texts of the subsequent literary works representing the Indian value systems, socio-cultural conditions and philosophical expressions as well.
CO5: Students also learn literary criticism of six major Schools of Indian Poetics – Rasa, Alaṃkāra, Rïti. Dhvani, Vakrokti and Aucitya.

Core Course 3
CO1: The purpose of this paper is to introduce students to the prose-romance masterpiece, Kādambarī by Bānabhatta.
CO2: This paper is to introduce students to the prose-romance masterpiece, Daśakumāracarita by Dandin.
CO3: Students would have extensive knowledge of Classical Sanskrit literature.
CO4: Students would have broad knowledge of Sanskrit technical literature as well.
CO5: Through Sanskrit literature, they will also become acquainted with the origin and evolution of various expressions of ancient Indian culture and civilizations.

Core Course 4

CO1: The students will be exposed to Bhagavad-Gïtā's concepts of the divine and demoniac natures.

CO2: Students can be inspired and learn good values by getting to the heart of the Bhagavad-Gïtā.

CO3: Even though the Gïtā was written a long time ago, it is still a good guide because it is full of wisdom and knowledge.

CO4: Understanding the Bhagavad-Gïtā's timeless rules can give us a deep understanding of how and why things work in everyday life.

CO5: Students and regular people alike can gain from reading the Bhagavad-Gïtā for a variety of reasons.

Core Course 5

CO1: Students would know about **Abhijn̄ānaśakuntala**, three of the best classical Sanskrit plays ever written.

CO2: They will also know how the society and administration were at that time.

CO3: Students would know about **Svapnavāsavadatta**, three of the best classical Sanskrit plays ever written.

CO4: Students will also understand society and government at the period.

CO5: In addition, students would know other classical plays of that time.

Core Course 6

CO1: Students would understand Indian petrology.

CO2: Students would understand the definitions and examples of BiswanathKavirāja'sArthālaṇkāras.

CO3: Students would recognize the definitions and examples of Manmatah'sArthālaṇkāras.

CO4: The course would provide advanced knowledge of the fundamental elements of Kavyaprakāśah by Manmatah.

CO5: They will also be acquainted with how the society and administration were at that time.

Core Course 7

CO1: Students would study about the ancient Indian administration.

CO2: Students would know about traditional laws at that time.

CO3: Students would study about the ancient Indian society, including their nature, way of life.

CO4: Through the Dharmaśāstra and Arthaśāstra texts, they were able to comprehend the ancient Indian legal system.

CO5: Students would also know about the political and religious institutions.

Core Course 8

CO1: From a historical point of view, the Indian students would know how important Indian epigraphy, paleography, dating, and writing were.

CO2: Students will learn in this paper how writing on stone, pillars, cave walls, and other surfaces has changed over time.

CO3: Students could learn about the political, economic, cultural, social, religious, and governmental practices of the Aśokā era by looking at certain inscriptions.

CO4: Students would also know about the political, economic, cultural, social, religious, and governmental practices of the Rudradāman, Samudragupta etc. era by observing at certain inscriptions.
CO5: They would be able to tell the difference between the different Indian calendars from the past.

Core Course 9

CO1: The course intends to survey of modern Sanskrit Literature in Bengal.
CO2: Students will learn about ancient Sanskrit prose writing and drama.
CO3: Students will learn about ancient Sanskrit prose writing drama (GadyaKāvya and Rūpaka), where it came from and how it changed over time.
CO4: The purpose of this paper is to introduce students to the prose-romance masterpieces Kādambarī and Daśakumāracarita by Bānabhatta and Dandin respectively.
CO5: Through Sanskrit literature, they will also become acquainted with the origin and evolution of various expressions of ancient Indian culture and civilizations.

Core Course 10

CO1: This course is designed to introduce students to the Sanskrit Studies in West.
CO2: This course is designed to introduce students to the Sanskrit studies in East.
CO3: The course intends to survey of modern Sanskrit Literature in Bengal.

Core Course 11

CO1: Through the Saṃhitās of the four Vedas, students will be exposed to various forms of Vedic wisdom, belief systems, spiritual manifestations, and social aspirations.
CO2: Students would be able to comprehend the Vedic message and acquire knowledge of Vedic mantras, their applications.
CO3: Students would be able to know about socio-cultural life at that time.
CO4: They would understand Vedic grammar and the distinction between Vedic and Classical Sanskrit.
CO5: To comprehend the message of the Vedas requires a thorough understanding of etymological science and Vedic grammar.

Core Course 12

CO1: This paper helps students learn about the rules of Sanskrit grammar. This paper teaches students about the grammatical traditions of Sanskrit.
CO2: This course would enable students to learn and acquire advanced knowledge of the derivational process of Sanskrit verbal morphology based on Siddhānta-koumudī, a commentary on Pāṇini'sAṣṭādhyāyī.
CO3: This paper introduces students to the fundamental concept of general linguistics.
CO4: This paper introduces students to develop their proficiency in Sanskrit's phonology, morphology, syntax and semantics.
CO5: With Linguistics knowledge, students would be able to understand the origin and relationships of languages.

Core Course 13

CO1:Students would be familiarized with the Indian Philosophy.
CO2: They would know ĀstikaDarśana'.
CO3:They would know NāstikaDarśana'.
CO4:They would also be able to know all the six theories of Indian Philosophy.
CO5: The purpose of this study is to learn the foundations of Nyāya-Vaiśeṣika theory, the two orthodox schools of Indian philosophy, with regards to Indian logic and metaphysics.

Core Course 14

CO1: This paper helps students learn about the rules of Sanskrit grammar.
CO2: In addition, fundamental topics of Sanskrit grammar are intended to be covered in this paper.
CO3: Students would be able to translate simple Bengali or English sentences into Sanskrit.
CO4: They would also be able to write essays in Sanskrit.
CO5: And their language skills would improve over time.

DSE 1

CO1: Students would be familiarized with the Vedic texts, Saṃhitā.
CO2: Students would be familiarized with the Vedic texts, Brāhmana.
CO3: Students would be familiarized with Vedic texts, ,Āraṇyaka.
CO4: Students would be familiarized with the sacrosanct Vedic texts, Upaniṣads and exposed to the various forms of Vedic knowledge.
CO5: This course would enable students to learn and acquire advanced knowledge of the derivational process of Sanskrit verbal morphology based on Siddhānta-koumudī, a commentary on Pāṇini'sAṣtādhyāyī.

DSE3

CO1: Students of *Sāhityadarpaṇa* would gain an understanding of the fundamental components and characteristics of literary and dramatic criticism if they read the book.
CO2: The purpose of this paper is to give students a taste of Māgha's great writing Śiśupālavadham(Canto-I ,Verse: 1-30).
CO3: Students would know how this great epic were written. This paper helps students learn about the rules of Sanskrit grammar.
CO4: Students would also know how they showed the social structure of that time.
CO5: They would know about the administration were at that time as well.

DSE4

CO1: Through Sanskrit literature, they will also become acquainted with the origin and evolution of various expressions of ancient Indian culture and civilizations.
CO2: If Bhattikavya students read the book, they would learn Sanskrit grammar also.
CO3: Students would be familiarized with the Upanishad's and exposed to the various forms of Vedic knowledge.

CO4: The book teaches Bhattikavya students about literary and theatrical critique.
CO5: Students of Bhattikāvyaṃ (2nd Sarga) might benefit from reading this book because it explains of literary and grammar analysis.

DSE6

CO1: The book teaches Bhattikavya pupils Sanskrit grammar.
CO2: The book teaches Bhattikavya students about literary and theatrical critique.
CO3: Students of Bhattikāvyaṃ (2nd Sarga) might benefit from reading this book because it explains of literary and grammar analysis.
CO4: By the study of Kāvyālaṃkārsutravritti the students would learn about the basic parts and traits of literary and dramatic criticism.
CO5: Students would get acquainted with the core components of dramatic literature and kavya.

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P.R.Thakur Govt. College

Department of Sociology
Course Objective and Outcome
New syllabus, CBCS (SOCA)

PROGRAMME OUTCOME

Introduction

Sociology is the most contemporary and versatile of the Social Sciences. It trains students to grasp social structures, understand social processes, map the dynamics of social change, decipher social interactions and make sense of individual and collective experiences in their social, historical and cultural context. Sociology is at once critical and constructive; conceptual and applied; theoretical and empirical. It is a science that cohabits comfortably with literary flair, speculative sensibility, historical imagination and statistical rigour. It is incessantly reflexive about its methods, exacting about its research techniques and standards of evidence. Sociology is ever so subtle about the conceptual distinctions it draws and ardent about its disciplinary boundaries and identity. At the same time, Sociology is the most open and interdisciplinary of social sciences. The pursuit of Sociology is a systematic effort at recovering, mapping and making sense of our kaleidoscopic collective self under the sign of modernity. It is both historical and comparative. Sociology as an academic discipline is committed to the ideal of generating public knowledge and fostering public reason. It embodies the best of enlightenment virtues: scientific reason, tolerance of diversity, humanistic empathy and celebration of democratic ideals. It is the science of our times.

Sociology is a deeply self-reflexive discipline with an inter-disciplinary orientation. A graduate would be capable of describing and embodying the mandate and perspective of Sociology as a discipline, how it differs from cognate social sciences and be able to engage productively with them without losing disciplinary perspective.

A Sociology graduate is exposed to a significant quantum of concepts, conceptual writing, theories and theoretical reasoning throughout the three years across all the courses.

Hence she/ he has an ability to grasp and generate a conceptual conversation in general and within the discipline of Sociology in particular. She/he is also familiar with well-defined, critical and evolving multiplicity of theoretical perspectives.

A Sociology graduate would be well versed with the basic tenets of these perspectives and capable of generating versions of social world from these perspectives.

Sociology is a worldly science that incessantly draws students beyond class rooms and harnesses the productive tension between library work, field work and a call to interventionist action.

A Sociology graduate is ideal for employment needs where a graduate from liberal arts would fit in for this rare blend. They are a perfect fit for the areas (but not limited to them alone) such as law, development studies,development practice, social work, bureaucracy and

public institutions, women's studies, gender studies, area studies, international relations, policy studies, policy implementation, advocacy, management, marketing, social psychology, v industrial organization, election studies, data sciences, journalism, criminology, and careers in fine and performing arts.

Sociology is both a profession and a vocation. A lifelong commitment to learning, critical thinking and to the cause of the collective well-being rather than narcissistic self-indulgence. It is a cosmopolitan science that is positive and normative at once. A Sociology graduate would make an enlightened leader and an informed follower.

Structure, and Programme of BA (Hons.) Sociology

To graduate with Honours in Sociology student has to successfully complete fourteen Core Courses (CC), four Discipline Specific Electives (DSE), two Skill Enhancement Courses (SEC), two Ability Enhancement Courses and four Generic Elective courses (GE) spread across six semesters.

Course Learning Outcomes

B.A. (Honours) Sociology Introduction to Sociology – I Core Course 01

Course Objectives 1. The mandate of the course is to introduce the discipline to students from diverse academic and social backgrounds, trainings and capabilities. The course is intended to introduce the students to a sociological way of thinking. They learn how to apply sociological concepts to the everyday life.

2. Illustrations through popular stories for instance help students understand more cogently how even children's literature and fiction is a reflection of the times. The student by the end of the course realises that the individual choices are impacted by the social structure of which we are a part. A person's individual biography is a reflection of the times in which they live. They develop reflective thinking skills of both self and society. They develop a sense of how common sense is actually limited to those who share the same spatial- geographical, social and cultural location.

3. The students are able to demonstrate the ability to apply the theoretical concepts learned to all kinds of societies whether simple or complex. They understand various aspects of society and how these are interlinked with each other. These include understanding the relationship of individuals with groups. By understanding these relationships, the student develops a sense of how closely the lives of individuals are intertwined and impact each other.

4. The course also introduces the students to the emergence of Sociology as a systematic and scientific field of study. The emergence of sociology as a science also helps them understand the changing conceptualisation of what it means to be scientific. They are also for the first time exposed to the interdisciplinary nature of the social sciences like social anthropology, history and psychology. They learn how these relate to each other while maintain their disciplinary boundaries.

5. The students also learn about the basics of doing field work. This is important since field work based projects are often assigned in various papers across the semesters. By doing projects the students learn to apply sociological concepts to understand various aspects of society.

6. The course is designed in a manner that for each topic there are multiple readings. The students learn how to read complex texts and to express thoughts and ideas effectively in writing. They also learn how to frame arguments cogently. The course also provides a foundation for the other more detailed and specialized courses in sociology.

Course Learning Outcomes

1. The students learn to apply the sociological perspective in understanding how society shapes our individual lives.

2. It also provides a foundation for the other more detailed and specialized courses in sociology.

3. Classifying social process, Social Control, Social Change and Mobility.

4. The students learn how to read and interpret complex ideas and texts and to present them in a cogent manner.

Core Course 02 Sociology of India I

Course Objectives:

1. To understand the modes of knowledge-construction of Indian history, society, Culture and politics.

2. To examine how multiple social processes, forces and ideologies shaped the terrain of the nation.

Course Learning Outcomes:

1. The course adds to the sociological interpretation of Indian history and society. The India-specific themes of the course – discourse/knowledge-making, mobilization, transformation, ideology, identity and politics, for example – are treated, moreover, by drawing from sociological concepts and theories. The course connects the practical and conceptual in terms of both substance and relevance.

2. By focusing on the nuanced character of historical and social ideas and processes, the course sharpens the faculties of critical and analytical thinking and doing.

3. The adoption of an inter-disciplinary framework, without losing sight of the sociological, makes the course wider in scope and scale. It broadens viewpoints and encourages students to reflect deeply on the multicultural reality which is the defining feature of India.

4. The course, in terms of both high quality syllabus-content and innovative teachinglearning techniques, matches global standards. Consequently, it adequately trains students to compete in global academia

B.A. (Honours) Sociology Introduction to Sociology II Core Course 03

Course Objectives

1. The course aims to provide a general introduction to sociological thought. The focus is on studying from the original texts to give the students a flavour of how over a period of time thinkers have conceptualized various aspects of society. This paper also provides a foundation for thinkers in the other papers. The course teaches the students how to read the original works by the various thinkers. 2. The course is designed in a manner that for each topic there are multiple readings. The students learn how to read original works of various thinkers and to understand the central argument. They also learn how to present complex ideas of a particular thinker effectively in writing. They also learn how to frame arguments cogently.

3. The sequence in which the theoretical perspectives are introduced to the students reflects the way in which sociological thought has evolved and emerged. The focus is also on understanding how the development of theory is not in vacuum but is an outcome of the changing times. For example, the theories of Marx, Weber and Durkheim are all in some ways related to the Industrial Revolution and the emergence of capitalism. Their theories also reflect the impact of large-scale urbanization and industrialization on the lives of individuals. The impact is not just limited to individuals but is also reflected in the emergence of a new way of life and new institutions. They also learn about industrialization as a social phenomenon and the emergence of modern society as an outcome of industrialization.

4. The students will be able to understand since theories are a reflection of changes taking place in society thus each subsequent set of theoretical approaches will either support, critique identify logical flaws and gaps in the preceding arguments.

5. A student learns that social theories are inherently multicultural in nature. They cannot be limited by the boundaries of any one society or culture. They learn how to use theory for the other courses that they will be doing in the subsequent semesters. The course intends to equip students with tools to understand and appreciate the impact of globalization in an overall perspective instead of specific instances. The study of theory helps the students realize the impact of social, political, economic and technological processes on the world as a whole and their responsibility as global citizens.

Course Learning Outcomes:

1. The students are introduced to the relationship between theory and perspectives.

2. The students are introduced to sociological theories which they learn in greater detail during the later semesters.

3. This paper also provides a foundation for sociological theories that are a part of papers in the subsequent semesters.

4. The students learn critical thinking skills. They learn how to read, interpret and critique original works of various thinkers.

BA (H) Sociology Core Course 04 Sociology of India II

Course Objectives:

1. Introduction to images and ideas of India.

2. Understanding key concepts and institutions of Indian society.

Course Learning Outcomes:

1. The course lays the foundation of viewing images and ideas of India through a sociological lens. It further investigates sociological concepts and institutions in the Indian context.

2. Through informed interrogation of images, ideas, concepts and institutions of India, the course contributes to the development of critical and analytical thinking.

3. The course, supported by an inter-disciplinary approach, facilitates learning and reflecting about the multiple – and contextual – socio-cultural registers of Indian society.

4. Given the high standard/quality of the syllabus and use of innovative teaching-learning methods, the course prepares students to successfully compete in global academia.

B. A. (H) Sociology Core Course 05 Political Sociology

Course Objectives:

1. Political Sociology is one of the core areas of sociology. It is a thriving subfield of sociology with important theoretical and practical consequences. The endeavor in this course is to render it compact, contemporaneous and make it contextual for Indian students, while familiarizing them with enduring conceptual and theoretical concerns. It is rigorously theoretical yet relatable.

2. The course offers a judicious mix of classical and contemporary texts in political sociology that examines the bases of social power and the relationship between politics and society both analytically as well as in specific empirical contexts. The course is an intensive introduction to the theoretical debates extant in the sub-field and equips students to learn both classical and contemporary arguments about age old questions of power, authority and resistance and their manifestations in political institutions and political systems.

3. The course equips students to grasp the essential historicity of political processes, political institutions and political change to facilitate an understanding of the dynamic nature of political phenomena. The first two sections of the course deals with theoretical and analytical aspects of examining the interface between politics and society, while the third section seeks to provide an understanding of political processes in India.

Course Learning Outcomes:

1. An ability to comprehend the embeddedness of political and the social in each other.

2. Familiarity with different theoretical and conceptual issues in political sociology and a capacity to use them to grasp political phenomena in a cross-cultural and comparative perspective

3. Be able to understand and appreciate the diversity of ways in which politics operates historically and spatially to generate a more expansive notion of the realm of the political.

4. Be able to understand the relationship between state and society in shaping politics in India both historically and analytically.

5. Be able to generate hypotheses and research questions within the theoretical perspectives and ethnographic contexts in political sociology.

BA (H) SOCIOLOGY CORE COURSE -06 SOCIOLOGY OF RELIGION

COURSE OBJECTIVE

1. This course exposes students to the distinctiveness of the sociological approach to the study of religion.

2. The individual and the group encounter religion and/or religious phenomenon in myriad ways be it through custom, ritual, beliefs or other practices. Students will be familiarized with the basic theoretical and methodological perspectives on the study of religion and also exposed to ethnographic texts on various aspects of religious phenomenon.

3. The last section of the course touches upon some aspects of religion in contemporary times such as secularization and multiculturalism.

COURSE LEARNING OUTCOMES:

1. Students will be acquainted with representative texts that symbolize the development of knowledge in the field of Sociology of Religion. They will be able to identify different theories, approaches and concepts that make up the study of religion, distinguish between them and also use terms specific to the field in specific context.

2. Students will be able to make a link between texts and paraphrase their arguments and use these to communicate their ideas in research papers, projects and presentations.

3. By encompassing contemporary developments, the course enables students to think about linkages between religion and society at various levels.

B.A (H) Sociology Core Course 07 Sociology of Gender

Course Objective:

The course introduces gender as a critical sociological lens of enquiry in relation to various social fields. It also interrogates the categories of gender, sex, and sexuality.

Course Learning Outcomes: 1. An understanding of concepts such as sex and gender by problematising common-sensical notions of gender.

2. Raising key issues of power and subordination within the purview of gender and the need for and solutions resorted to as measures to initiate change through gender-based movements.

3. Understanding issues relating to gender both at a national and global level.

4. Places gender in juxtaposition with other forms of stratification and identity such as caste, class, family and work.

B.A (H) Sociology Core Course 08 ECONOMIC SOCIOLOGY

Course Objective:

The linkages between the economy and its socio-cultural environment are so many and so complex that it has become almost an imperative need of the hour as to understand the ways in which the key elements of economy are situated and conditioned in a socio-cultural context. This course offers an introduction to the key concepts and theoretical foundations of Economic Sociology as a specialized branch of Sociology. Students learn socio-cultural bases of various dimensions of economy such as production, distribution, exchange, consumption and markets while emphasizing the impact of norms, social structure, and institutions on economy. It also highlights the significance of sociological analysis for the study of economic processes and institutions in local and global contexts by drawing insights from both theoretically and empirically grounded studies.

Learning Outcomes:

1. Develops familiarity with different theoretical and conceptual aspects of economic sociology as a specialized branch of knowledge.

2. Develops background knowledge about the diverse ways in which economy is interlinked with other aspects of society and culture.

3. Acquire capacities to understand and analyse the transformations of economy and its key processes in a historical and comparative perspective.

4. Develops abilities to generate research questions and arguments about the intersections of economy and society.

BA (H) Sociology Core Course 09 Sociology of Kinship

Course Objectives

1. Impart a comprehensive study of the concepts relevant for understanding kinship, marriage and family.

2. Evolve a better understanding of family, marriage and kinship both in historical and evolutionary perspective.

3. Look beyond the surface of issues to discover the "why" and "how" of kinship. 4. Explores the new possibilities and critical insights offered by reproductive technologies in revisiting kinship.

Course Learning Outcomes

1. Grasp the historical evolution of kinship theories from a biological deterministic approach to culture of relatedness

2. Develop an analytical perspectives on concepts relevant for understanding kinship

3. Comprehend the coexistence of multiple perspectives in the study of family, marriage and kinship

4. Acknowledge the significance of the emergence of new reproductive technologies on recasting kinship

BA (H) Sociology Core Course 10 Social Stratification

Course Objectives:

1. This course introduces students to Sociological Study of Social Inequalities.

2. It acquaints students with principal theoretical perspectives on and diverse forms of social inequality in articulation with each other.

Course Learning Outcomes:

1. Students will learn about the socio-historical context of stratification theoretical concerns and problems and contemporary issues related to inequalities s and its forms.

2. Inculcate in them a truly inter-disciplinary approach in the study of society especially stratification in all its manifestations.

3. Understanding of stratification and theories would sensitize students to its various sociological aspects, providing ample scope for applied learning and application.

4. Examining forms of stratification, understanding the relevance of caste, race and ethnic identities in contemporary world.

B.A. (H) Sociology Core Course 11

Sociological Thinkers –

I Course Objectives Objective of teaching sociological Thinkers to undergraduate students is to enable them to apply theory to their own everyday life experiences. This requires that students develop their sociological imagination and the capacity to read each situation sociologically and then to think about it theoretically. To this end, it is imperative that sociological theory courses demonstrate the applicability of theory to students.

Course Learning Outcome

1. Understanding the grand foundational themes of sociology.

2. Application of theories and concepts from classical sociological theories to develop intellectual openness and curiosity.

3. Appreciation of the classical concepts and theories to develop awareness of the limits of current knowledge.

BA (H) Sociology Core Course 12 Sociological Research Methods-I

Course Objective: 1. The course is a general introduction to the methodologies of sociological research. It will provide the student with elementary knowledge of the complexities and philosophical underpinnings of research.

COURSE LEARNING OUTCOMES 1. Students are introduced to sociological research both from a theoretical and methodological perspective. They understand the importance of research in social science.

2. Students develop the ability to evaluate the methodological validity of the claims made by theory.

3. The course enables students to evaluate a piece of research and move towards designing a simple research project.

4. Identify the difference between quantitative and qualitative methods.

5. Students will learn to identify ethical and practical issues in research. They also engage with the ideals of objectivity and reflexivity.

6. Students learn that research methods are universal and not bound by cultural location.

B.A. (H) Sociology Core Course 13 Sociological Thinkers –II

Course Objectives: Objective of teaching Sociological Thinkers to undergraduate students is to enable them to apply theory to their own everyday life experiences. This requires that students develop their sociological imagination and the capacity to read each situation sociologically and then to think about it theoretically. To this end, it is imperative that sociological theory courses demonstrate the applicability of theory to students.

Learning Outcomes: Understanding the characteristics and dynamics of the social world, and how post-classical sociologists attempt to understand the social world.

1. Appreciating the relevance and limits of the contemporary theories or theoretical approaches to make sense of social reality.

2. Understanding the basic methodological approaches of the thinkers, through some original texts and their role in building sociological knowledge.

B. A. (H) Sociology Core Course 14 RESEARCH METHODS II

Course Objectives

1. The course provides an introductory, yet comprehensive engagement with social research. 2. Through theoretical and practical knowledge students are acquainted with the different stages of the research process like creation of research design, methods of data collection and analysis.

3. The imparted knowledge and training will enable students to develop a sound understanding of both quantitative and qualitative research.

Course Learning Outcomes

1. Students are introduced to the concept of conducting research, which is inclusive of formulating research designs, methods and analysis of data. Some knowledge of elementary statistics is also provided to the students to acquaint them with quantification of data.

2. The thrust of the course is on empirical reasoning, understanding and analysis of social reality, which is integral to the concepts of quantitative research. Students learn to differentiate between qualitative and quantitative aspects of research in terms of collection and subsequent analysis of data.

3. Through the competing theoretical perspectives and methodologies, students are able to understand that social reality is multi-faceted, heterogeneous and dynamic in nature.

4. By imparting the knowledge of theory and praxis of research, students are prepared to arrive at a critical understanding of the course. It also equips them with necessary skills for employment in any social research organisation.

BA (H) Sociology Discipline Specific Elective 01 Urban Sociology

Course Objectives:

1. Urbanisation is an important aspect of modern society. This course is will provide an exposure to key theoretical perspectives for understanding urban phenomena in historical and contemporary contexts.

2. It also reflects on vital concerns of urban living while narrating the subjective experiences of urban communities. With case studies from India and other parts of the world this course will help students understand and relate to the complexities of urban living.

3. The course seeks to evolve critical thinking and develop a policy perspective on the urban.

Course Learning Outcomes:

1. To appreciate the significance of the city and the process of urbanisation and its consequences across the globe, through cross disciplinary texts and ethnographic studies.

2. To understand the urban in the historical as well as modern contexts - the idea of urbanism and urban space and the intersections in these of institutions, processes and identities. This is to be achieved by exposing students to critical theoretical debates which help them to gain a deeper understanding of city life and urban environment which can also help them understand their own social environment better.

3. To learn about key urban processes such as migration, displacement and urban slums, as well as critical contemporary issues such as resettlement and rehabilitation and also engage in issues of public policy, urban transformation and change. Knowledge of such themes will help students pursue further studies in academic areas such as development and also engage in research on public policy, urban transformation and change.

4. To develop critical thinking and a reflective perspective through exposure to multicultural thought; to enhance disciplinary knowledge, research-related skills and develop a problem-solving competence.

BA (H) Sociology Discipline Specific Elective 02 Agrarian Sociology

Course Objectives:

1. To communicate Agriculture as the foundational material and cultural practice at the heart of the formation of social collectivities and make sense of South Asian societies agrarian formations.

2. To familiarize students with agrarian situation past and present with the help of necessary theories and categories.

3. To make sense of agrarian communities, their structure, transformation and trials and tribulations in modern world.

4. To introduce students to the rich legacy of theoretical and empirical work in agrarian sociology and its continued relevance.

Course Learning Outcomes:

1. An empathy for and ability to engage agrarian communities as living societies and understand grasp they condition as human condition.

2. An appreciation of agrarian world and familiarity with the trajectory of theoretical conversation on agrarian issues and their social, political and policy implications.

3. An understating of emerging as well as enduring issues of concern in Indian agrarian scene.
4. To be ready for a range of academic and professional roles that may require a knowledge of agrarian societies.

B.A. (H) Sociology Discipline Specific Elective 04 Sociology of Work

Course Objectives:

1. The course introduces the idea that though work and production have been integral to societies through time, the origin and spread of industrialisation made a distinct rupture to that link. This rupture can also be seen mirrored in the coming of sociology as a discipline that considered work as central to the study of society.

2. Based on this premise, the paper goes on to provide an outline as to how values and ideals of pluralised industrialism(s) have caused and absorbed multiple transformative shifts to the local and global social networks of the contemporary world.

3. In this context, the course addresses various contemporay problems, issues and concerns in a historical perspective, such as formal and informal work, unpaid work, gender, alienation, forced labour and hazardous work.

Course Learning Outcomes:

1. Understanding work in its social aspects such as gendered work and unpaid work, as different from its better known economic dimension.

2. Understanding work in its global dimensions, including the mutual relation between work in underdeveloped societies and that in developed ones, thus bringing out the importance of the comparative perspective in the study of work.

3. Learning about the complexities, disparities and inequalities in the area of work.

4. Learning about the socio-historical context of work, theoretical concerns and problems, and contemporary issues in the area of work and industry.

BA (H) Sociology Discipline Specific Elective 06

Indian Sociological Traditions

Course Objectives

1. Improve sociological understanding of Indian society.

2. Examine how sociologists in India have primarily been engaged with issues of tradition and modernity, caste, tribe and gender.

3. Acquaint the students to the continuities and contradictions in Indian society.

4. Help understand the history of ideas related to the analysis of Indian society.

Course Learning Outcomes

1. Ensure that students have conceptual clarity and can articulate the main debates and arguments with regard to sociology in India.

2. Acquaint the students to the continuities and contradictions in Indian society

3. To ensure that students have understood the formation of the discipline in India and the challenges that it has faced.

4. To help students understand the history of ideas related to the analysis of Indian society.

Skill Enhancement Course (SE-1)
Semester – 3
Credits – 2 (30 Hours)
DEVELOPMENT OF SOCIAL RESEARCH SKILLS

SEC- B(1)) Statistical Reasoning for Sociology

CO-1 Conceptualizing statistics in social research, Descriptive and inferential statistics.

CO-3 Defining the Statistics population variable.

CO-4 discussing the sampling and its type.

CO-5 analyzing the frequency distribution and graphical techniques.

CO-6 practicing mean median and mode.

Contact Hours: 2hrs/ week.

Skill Enhancement Course (SE-2)
Semester – iv
Credits - 2
GENDER SENSITIZATION

1. SEC-A-(2) Gender sensitization
CO-1 Defining Gender, sex, sexuality, masculinity and
feminist.
CO-2 Discussing the gender construction and gender binary and LGBT.
CO-3 Discussing gender inequality, female infanticide, child marriage, eve-teasing, rape & domestic
violence .
CO-4 Conceptualizing sexual harassment of women at work place.

Understand better and appreciate the sensitive needs of other genders relating to biological, sociological, psychological, political, economic and legal aspects. Understand Instill empathy and communicate better in an intercultural ambience. Question pre-conceived realities and identify a better response to gender discrimination. Modify behavior through raised awareness of gender equality.

Contact Hours: 2hrs/ week.

Course Outcome

New syllabus for CBCS (SOCG)

1. **GE/CC-1 Introduction to Sociology**

Course Objectives 1. The mandate of the course is to introduce the discipline to students from diverse academic and social backgrounds, trainings and capabilities. The course is intended to introduce the students to a sociological ways of thinking. They learn how to apply sociological concepts to the everyday life. 2. Illustrations through popular stories for instance help students understand more cogently how even children's literature and fiction is a reflection of the times. The student by the end of the course realises that the individual choices are impacted by the social structure of which we are a part. A person's individual biography is a reflection of the times in which they live. They develop reflective thinking skills of both self and society. They develop a sense of how common sense is actually limited to those who share the same spatial- geographical, social and cultural location. 3. The students are able to demonstrate the ability to apply the theoretical concepts learned to all kinds of societies whether simple or complex. They understand various aspects of society and how these are interlinked with each other. These include understanding the relationship of individuals with groups. By understanding these relationships the student develops a sense of how closely the lives of individuals are intertwined and impact each other. 4. The course also introduces the students to the emergence of Sociology as a systematic and scientific field of study. The emergence of sociology as a science also helps them understand the changing conceptualisation of what it means to be scientific. They are also for the first time

exposed to the interdisciplinary nature of the social sciences like social anthropology, history and psychology. They learn how these relate to each other while maintain their disciplinary boundaries. 5. The students also learn about the basics of doing field work. This is important since field work based projects are often assigned in various papers across the semesters. By doing projects the students learn to apply sociological concepts to understand various aspects of society. 6. The course is designed in a manner that for each topic there are multiple readings. The students learn how to read complex texts and to express thoughts and ideas effectively in writing. They also learn how to frame arguments cogently. The course also provides a foundation for the other more detailed and specialized courses in sociology. Course Learning Outcomes 1. The students learn to apply the sociological perspective in understanding how society shapes our individual lives. 1 2. It also provides a foundation for the other more detailed and specialized courses in sociology. 3. The students also learn about the basics of doing field work and use it for doing field work based projects. They also learn to write project reports. 4. The students learn how to read and interpret complex ideas and texts and to present them in a cogent manner.

CO-1 Explaining nature and scope of Sociology and perspective- functional & structural.

CO-2 Discussing the scientific nature of Sociology & common sense of Sociology.

CO-3 Evaluating the relationship between Sociology and social anthropology, Sociology and Psychology

and Sociology and history.

CO-4 Conceptualizing individual group association culture and society.

CO-5 Defining social change and it's effect.

Contact Hours: 6hrs/ week.

2) GE/CC-2 Sociology of India

Course Objectives: 1. Indian Society: Images and Realities is an interdisciplinary introductory course on Indian society. It constitutes Indian society as an object of study through delineating the historical processes and ideological tensions that tentatively constitute this object. It proceeds to familiarize the students with constituent institutions and processes of Indian society such as village, town, region, caste, class, religion family, gender and political economy. It concludes with a section that marks the ongoing conversations about Indian society. 2. This generic elective course may serve as a foundational course for any graduate of the University as the disciplinary knowledge it transmits brings reflexivity, criticality, multicultural competence and ethical awareness essential for citizenship education of all graduates. 3. It enables the capacity to invoke scientific and analytical attitude towards one's own society and its ongoing workings and evolution. It provides the cultural knowledge and research skills that would be necessary for problem solving in Indian context. 4. The course works with fine and extremely well crafted sociological writing. In doing so it contributes to augmentation of their communication skills. Finally, the course provides the ethos and categories for lifelong learning about Indian society and history and a means to appreciate aspects of its culture in its proper context. . Course Learning Outcomes: 1. A familiarity with ideas of India in their social and historical context. 2. An acquaintance with key institutions and processes of Indian society. 3. An ability to understand social institutions with sociological imagination with a critical and

comparative spirit. 4. A preliminary understanding of sociological discourse on Indian society. 5. A capacity to situate contemporary public issues pertaining to Indian society in the context of these enduring institutions, processes and contentions.

CO-1 Conceptualizing unity & diversity in India and problems of national unity.

CO-2 Defining caste sanskritization and changing aspect.

CO-3 Discussing the features of tribes in India.

CO-4 Contrasting rural class and urban class.

CO-5 Conceptualizing self-sufficient village economy.

CO-6 Evaluating the family and kinship in India.

CO-7 Critically studying dailt movement and women movement.

CO-8 Describing the Communalism & secularism.

Contact Hours: 6hrs/ week.

ourse Objectives 1. The course aims to provide a general introduction to sociological thought. The focus is on studying from the original texts to give the students a flavour of how over a period of time thinkers have conceptualized various aspects of society. This paper also provides a foundation for thinkers in the other papers. The course teaches the students how to read the original works by the various thinkers. 2. The course is designed in a manner that for each topic there are multiple readings. The students learn how to read original works of various thinkers and to understand the central argument. They also learn how to present complex ideas of a particular thinker effectively in writing. They also learn how to frame arguments cogently. 3. The sequence in which the theoretical perspectives are introduced to the students reflects the way in which sociological thought has evolved and emerged. The focus is also on understanding how

the development of theory is not in vacuum but is an outcome of the changing times. For example the theories of Marx, Weber and Durkheim are all in some ways related to the Industrial Revolution and the emergence of capitalism. Their theories also reflect the impact of large scale urbanization and industrialization on the lives of individuals. The impact is not just limited to individuals but is also reflected in the emergence of a new way of life and new institutions. They also learn about industrialization as a social phenomenon and the emergence of modern society as an outcome of industrialization. 4. The students will be able to understand since theories are a reflection of changes taking place in society thus each subsequent set of theoretical approaches will either support, critique identify logical flaws and gaps in the preceding arguments. 5. A student learns that social theories are inherently multicultural in nature. They cannot be limited by the boundaries of any one society or culture. They learn how to use theory for the other courses that they will be doing in the subsequent semesters. The course intends to equip students with tools to understand and appreciate the impact of globalization in an overall perspective instead of specific instances. The study of theory helps the students realize the impact of social, political, economic and technological processes on the world as a whole and their responsibility as global citizens. Course Learning Outcomes: 1. The students are introduced to the relationship between theory and perspectives. 2. The students are introduced to sociological theories which they learn in greater detail during the later semesters. 3. This paper also provides a foundation for sociological theories that are a part of papers in the subsequent semesters.

3) GE/CC-3 Sociological theories

CO-1 Conceptualizing the emergence of Sociology.

CO-2 Conceptualizing Marxist theories.

CO-3 Discussing Durkheimian theory of social fact and solidarity.

CO-4 Conceptualizing ideal type and social action of Max Weber.

4) GE/CC-4 Methods of Sociological enquiry

Course Objective: 1. The course is a general introduction to the methodologies of sociological research. It will provide the student with elementary knowledge of the complexities and philosophical underpinnings of research. COURSE LEARNING OUTCOMES 1. Students are introduced to sociological research both from a theoretical and methodological perspective. They understand the importance of research in social science. 2. Students develop the ability to evaluate the methodological validity of the claims made by theory. 3. The course enables students to evaluate a piece of research and move towards designing a simple research project. 4. Identify the difference between quantitative and qualitative methods. 5. Students will learn to identify ethical and practical issues in research. They also engage with the ideals of objectivity and reflexivity. 6. Students learn that research methods are universal and not bound by cultural location.

CO-1 Defining concept variable and propositions.

CO-2 Formulating and verifying hypothesis.

CO-3 Classifying research design explanatory, exploratory and descriptive.

CO-4 Classifying sampling probability and non-probability.

CO-5 Evaluating perspectives-positivist, interpretative, comparative

and ethnographic.

CO-6 Contrasting theory and research - quantitative and qualitative.

Contact Hours: 6hrs/ week.

DEPARTMENT OF ZOOLOGY
P. R. THAKUR GOVERNMENT COLLEGE
Ganti, Thakurnagar, North 24 Parganas – 734287

PROGRAM SPECIFIC OUTCOMES (PSOs) AND COURSE OUTCOMES (COs)

Programme: B. Sc. Zoology (Hons.) (CBCS) under West Bengal State University

Year of Introduction: 2018

I. Programme Specific Outcomes (PSOs): A new term "BIOSPHERE" was coined clubbing the three different subsystems (spheres) of earth- Hydrosphere, Lithosphere and Atmosphere as the living being started roaming over these regions since the origin of life on earth. To explore the attribution of the living world more precisely, they were classified into six kingdoms and out of which Kingdom Animalia is the most progressive one. The scientific study for better understanding of the Kingdom Animalia is basically known as ZOOLOGY. The Programme Specific Outcomes (PSOs) for a B.Sc. Zoology Honours Programme typically encompass a wide range of skills, knowledge areas, and competencies that students are expected to achieve by the end of their program. Here are some specific outcomes that are commonly associated with a B.Sc. Zoology Honours Programme:

1. **PSO: 1: Understanding of Zoological Concepts:**
   - Students will attain knowledge and can develop fundamental skill of animal sciences which will help to analyze the complex interactions among the organisms belonging to different phyla, their distribution, and their relationship with the environment.
   - Students will acquire in-depth knowledge about animal diversity, taxonomy, classification, and systematics in the light of evolutionary relationships among the organisms through theoretical concept with practical hands-on training.
   - Students will develop a holistic idea about ecology, environment, conservation biology and behavioural biology by learning the basic principles and processes and their functioning both theoretically and practically through excursion and field work to different National Parks and Sanctuaries.
   - Students will be able to understand the basic concept of cell biology, developmental biology, genetics, molecular mechanism of gene function and role of immune system in animal organization.
   - Basic knowledge about the physiological, endocrinological, neurological and biochemical processes of animals will help them to understand proper functioning as well as integration of different organ systems.
2. **PSO: 2: Laboratory and Field Skills:**
   - Students will be able to acquire basic experimental skills in different fields of genetics, biochemistry, cell biology, biostatistics, molecular biology and biotechnology which will provide them extra edge during their higher studies and conduct scientific investigations using appropriate laboratory techniques.

- The students will learn about the different techniques and instrument used for wildlife conservation and ecological studies which will also help them during their higher studies and observing and studying animals in their natural habitats.

3. **PSO: 3: Critical Thinking and Problem-Solving:**
   - This programme helps to develop critical thinking, creativity, analytical and problem-solving skills among the students by strong conceptual foundation in biology which will help them analyze and evaluate scientific data and literature related to zoological studies.
   - Students will able to apply critical thinking skills to solve biological problems and address research questions.
4. **PSO: 4: Communication and Presentation:**
   - The students will learn different communication and presentation skills during this programme which will help them to communicate effectively on complex subject activities with the subject community and with society at large, such as being able to comprehend and write effective reports and design documentation, make presentations, and give and receive clear instructions.
   - Students will able to use scientific terminology accurately in written and verbal communication.
5. **PSO: 5: Research and Project Management:**
   - Student will acquire in depth theoretical and practical knowledge of different field of biological science which will able them to design, plan, execute, and report on independent research projects in their future endeavor.
   - Students will develop project management skills through their educational excursion or filed trip which will help them for organizing and conducting scientific research.
6. **PSO: 6: Interdisciplinary Knowledge:**
   - Students will able to integrate concepts from related disciplines such as genetics, cell and molecular biology, biotechnology, physiology, and endocrinology into zoological studies.
   - Student will able to understand the interdisciplinary nature of biological research and its applications.
7. **PSO: 7: Ethical and Professional Conduct:**
   - Students will imbibe and demonstrate ethical practice in planning experiments, research designs and communicating the complex concepts to the scientific and non-scientific community.
   - Demonstrate ethical conduct in animal research and handling.
   - Apply ethical principles and commit to professional ethics and responsibilities and norms of subject practice.
8. **PSO: 8: Individual and team work:**
   - Participation in field trips and academic excursions while studying zoology honours will help the students to function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

9. **PSO: 9: Sensitive to environment sustainability issues:**
   - Students will able to critically weigh and evaluate the potentials and impact of scientific innovations on environment and find sustainable solution to issues pertaining to environment, public health and agriculture.
   - Students will able to identify the impact of various potential risk factors like pollutants, toxins, toxics, pests, parasites, parasitoids, microbes and many other pathogens on environment and health of biological organisms including humans.
10. **PSO:10: Competencies for Employment and Research:**
   - Apply zoological knowledge to address real-world challenges such as conservation, wildlife management, and public health.
   - Skill enhancement courses including sericulture, apiculture and aquaculture would be of great help for self-employment and thus evolve them as potential entrepreneur.
   - Skills acquired in haematology, histology and basic medical diagnosis will provide them with opportunities of working in the diagnostic and research centres.
   - Students after completion of this programme have the eligibility to join jobs in Indian Civil Services as IAS, IFS, IPS etc., WBCS, UPSC, Banking Sector, Railways, Airlines etc., technical jobs at research institutes or as school teacher.
   - This program covers theoretical studies and practical proficiency training which may help in their placement at several pharmaceutical/ biotechnology/ microbiology/ based laboratory and/ or preparation of M.Sc. entrance examination for universities & institutes.
   - As a science graduates, students will be ready to serve in industries, may even become entrepreneur or may opt for establishing their own business or industrial unit.

II. Course Outcomes (COs):

Sl. No.	Semester	Name of Course	Course Code	Course Outcomes (COs)
1	Sem-I	Non-Chordates I (Theory)	ZOOACOR01T	1. Acquire knowledge of general taxonomic rules of non-chordate classification. 2. Learn the general characters and classification of different invertebrate groups (Protozoa to Nematoda) up to subclass level which make the students knowledgeable about animal world. 3. Attain the knowledge morphology, and physiological process of different invertebrate specimens through type study. 4. Learn about the life history, adaptation pathogenicity and diagnostic of different parasitic invertebrate organisms. 5. Development of clear concept about coral reef

				formation and its conservation.
		Non-Chordates I (Practical)	ZOOACOR01P	1. Able to identify and classify invertebrates by studying their external characters, prepare keys and know about their habits and habitats (Protists to Nematodes). 2. Acquire the skills of identification, mounting and staining of some non-chordate specimens. 3. Able to write project report on any topic of invertebrate phyla up to Nematoda. 4. Development of knowledge about microscopy and handling of microscopes
2	Sem-I	Ecology (Theory)	ZOOACOR02T	1. Acquire knowledge and understanding about ecology, environment and their proper functioning. 2. Able to understand the basic concepts of ecology, biogeochemical cycles, population ecology & its properties. 3. Understand the study of life history pattern, fertility rate and age structure. 4. Learn about the types and function of ecosystem, characteristics of community; ecological succession and major biomes of the world. 5. Attain knowledge about interrelationship of animal, plants, microbes and their interactions with abiotic factors. 6. Students will involve in the protection and conservation of nature and natural resources
		Ecology (Practical)	ZOOACOR02P	1. Ability to determine population density and to calculate ecological indices like Shannon-Weiner index; ability to measure the different physico-chemical and biological parameters of an aquatic ecosystem. 2. Able to study of life tables and plotting of survivorship curves. 3. Lear different techniques to study an aquatic ecosystem (phytoplankton and zooplankton, measurement of area, temperature, determination of pH, dissolve O_2 & free CO_2). 4. Able to prepare a report on a visit to National Park/Biodiversity Park/Wild life sanctuary/ Biodiversity Centre/Any Museum/Sea shore. 5. Engage in field-based activities to learn

				techniques for gathering data from the field.
3	Sem-II	Non-Chordates II (Theory)	ZOOACOR03T	1. Able to understand the evolution of coelom and metamerism. 2. Learn the classification, diversity, physiology, and life- cycle pattern of representative animals of non-chordates from Annelida to Hemi-chordates. 3. Attain the knowledge of phylum Hemichordata and their relationship with non-chordates and chordates. 4. Understand some special features like torsion of molluscs, water vascular system of Echinodermata, filter feeding of lower chordates, metamorphosis of insects and its hormonal control.
		Non-Chordates II (Practical)	ZOOACOR03P	1. Able to Identify and classify invertebrates (Annelids to Echinoderms) by studying their external characters, prepare keys and know about their habits and habitats. 2. Get a clear concept about the internal organ systems of non-chordate - nervous system, digestive system and mouth parts. 3. Able to write project report' on any related topic on invertebrate taxa. 4. Get a flavor of research by working on project besides improving their writing skills. It will further enable the students to think and interpret individually.
4	Sem-II	Cell Biology (Theory)	ZOOACOR04T	1. Able to understand the structures and function of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles. 2. Attain knowledge about cell division, cell cycle and its regulation. 3. Acquire knowledge of cancer biology and oncogenesis. 4. Understand clinical aspects, including epidemiology, tumor cell metabolism, cancer stem cells, DNA viruses, metastasis and therapeutic strategies. 5. Understand Cell signaling transduction pathways; Types of signaling molecules and receptors.

				6. Get new avenues of joining research in areas such as cancer research, researches related to signal transduction pathways, cell viability assays, diabetes research etc.
		Cell Biology (Practical)	ZOOACOR04P	1. Learn different technique for staining of different macromolecules including DNA. 2. Develop the skill of preparation of temporary stained squash preparation of onion root tip and grasshopper testis to study various stages of mitosis and meiosis respectively. 3. Able prepare the permanent slide to show the presence of Barr body in human female blood cells/cheek cells. 4. They also study cell viability by Trypan Blue staining from onion root tip or blood cells.
5	Sem-III	Chordates (Theory)	ZOOACOR05T	1. Have a knowledge on the vast diversity of chordates gaining knowledge on their general characteristics and classification of Chordates: from protochordates to mammals. 2. Learn about some Special adaptive feature of some classes like parental care in fish and amphibian, poison apparatus of snakes, echolocation in bats etc. 3. Develop a knowledge about Exoskeleton and migration in Birds and mammals; Principles and aerodynamics of flight; Adaptive radiation in mammals; Echolocation in Micro chiropterans and Cetaceans 4. Learn about different Zoogeographical realms, Plate tectonic and Continental drift theory, distribution of birds and mammals in different realms.
		Chordates (Practical)	ZOOACOR05P	1. Able to identify and classify vertebrates specimens (protochordates to mammals) by studying their external characters. 2. Learn the key for Identification of poisonous and non-poisonous snake. 3. Develop the skill of dissection different vertebrate specimens for studying different organs and systems. 4. Able to prepare power point presentation on any two animals (different Classes) emphasize the importance of biodiversity, habit, habitat

				or behaviour.
6	Sem-III	Physiology: Controlling and Coordinating Systems (Theory)	ZOOACOR06T	1. Develop a concept of different types of tissues, bones and cartilage in our body and an elaborate knowledge on each type. 2. Have a clear understanding of different animal physiological systems like excretion, skeletal muscle contraction, nerve impulse and mammalian reproduction. 3. Gain knowledge of the different endocrine and neuro-endocrine glands and their functions; endocrine regulation of different reproductive cycle. 4. Learn about the molecular mechanism of hormone action and the signal transduction pathways for steroidal and non-steroidal hormones.
		Physiology: Controlling and Coordinating Systems (Practical)	ZOOACOR06P	1. Students learn to record simple muscle twitch with electrical stimulation (or virtual) 2. Understand the unconditioned reflex action (deep tendon reflex such as knee jerk reflex) by demonstration. 3. Preparation of temporary mounts of squamous epithelium and striated muscle fibres. 4. Able to Identify of histological section of different mammalian tissue such as cartilage, bone, pituitary, liver, kidney, intestine, lung, pancreas, testis, ovary, adrenal, thyroid 5. Develop skill for preparation of histological tissue, section cutting and their staining. 6. In depth practical skill will help to undertake research in any aspect of animal physiology in future.
7	Sem-III	Biochemistry (Theory)	ZOOACOR07T	1. Develop in depth knowledge about fundamentals of biochemical reactions and metabolism. 2. Acquire the knowledge about the structure and biological importance of carbohydrates, lipids, proteins and nucleic acids and their catabolic and anabolic pathways. 3. Able to understand the nature, mechanism, and kinetics of enzyme action. 4. Learn about Oxidative Phosphorylation:

				Redox systems and Mitochondrial Electron Transport Chain.
		Biochemistry (Practical)	ZOOACOR07P	1. They also learn qualitative biochemical tests for amino acids, carbohydrates, proteins and nucleic acids and do measurement of enzyme activity and its kinetics. 2. Develop the skill for quantitative estimation of proteins; paper chromatographic technique and protein separation by SDS-PAGE. 3. Able to study the enzymatic activity of salivary Trypsin, Lipase and Acid and Alkaline phosphatase assay from serum/ tissue. 4. Acquired practical skills will help to undertake research in any aspect of animal physiology in future.
8	Sem-IV	Comparative Anatomy (Theory)	ZOOACOR08T	1. Know about the structure, function of integument derivatives in amphibian, birds and mammals. 2. Comparative anatomical account of different organs and organ systems in different Vertebrate Classes. 3. Learn the aspects of evolutionary changes that occurred to the animal's body structures.
		Comparative Anatomy (Practical)	ZOOACOR08P	1. Able to identify different fish scales (such as Cycloid & Ctenoid) and prepare whole mounts. 2. Develop the knowledge to identify the disarticulated skeleton of Toad, Pigeon and Guineapig. 3. Know the anatomy of Carapace and plastron of turtle from model and chart (Demonstration). 4. Able to identify mammalian skulls – both herbivorous (Guineapig) and carnivorous animal (Dog). 5. Develop the dissection skills for studying circulatory system, brain, pituitary and urinogenital system in Tilapia.
9	Sem-IV	Physiology: Life Sustaining system (Theory)	ZOOACOR09T	1. Learn the physiology of Digestion - structural and function of digestive tract, mechanism of digestion and absorption of carbohydrates, lipids, proteins and nucleic acids in humans. 2. Acquire in depth knowledge about physiology

				of respiration including transport of Oxygen and Carbon dioxide in blood. 3. Learn the physiology of circulation and function of heart, coronary circulation, structure and working of myocardial fibres, origin and conduction of cardiac impulses, cardiac cycle and cardiac output. 4. Develop knowledge of structure and functions of haemoglobin, blood clotting system, haematopoiesis, ABO blood grouping and Rh factor etc. 5. Learn about different physiological thermoregulation, osmoregulation in aquatic vertebrates and invertebrates.
		Physiology: Life Sustaining system (Practical)	ZOOACOR09P	1. Acquire theoretical knowledge about different haematological parameter and its clinical significance. 2. Develop the soft skill for determination of different haematological parameters such as determination of ABO blood group, total count of RBC and WBC, estimation of haemoglobin, preparation of haemin crystals etc. 3. Able to determine of blood pressure using a Sphygmomanometer (analog and digital). 4. The practical knowledge will help to pursue higher studies such as laboratory medical technology and get job in pathological laboratory.
10	Sem-IV	Immunology (Theory)	ZOOACOR10T	1. Learn about immune system with respect to health and diseases, historical perspective, cells and organs associated with the immune system, concept of innate and adaptive immunity. 2. Develop the wide concept of about antigen, antibody, cytokines, adjuvants, haptens, complement proteins and its activation, MAC formation, MHC. 3. Know about Immuno-techniques and Immuno-assays and their applications. 4. Know about Hypersensitivity reactions; Gell and Coombs' classification. 5. Develop knowledge about immunology of various diseases - malaria, filariasis, dengue

				and tuberculosis. 6. Learn about various types of vaccines; active & passive immunization (Artificial and natural).
		Immunology (Practical)	ZOOACOR10P	1. Able to identify lymphoid organs in human through model/photograph. 2. Histological study of spleen, thymus and lymph nodes through slides/photographs 3. Prepare stained blood film to identify various types of blood cells. 4. Able to determine the Total count (TC) and Differential count (DC) of WBC 5. Learn about ELISA by the Demonstration of a teaching kit.
11	Sem-V	Molecular Biology (Theory)	ZOOACOR11T	1. Get detailed idea about the structure DNA & RNA and its properties. 2. Develop concept about Central Dogma – Detailed mechanism of replication, transcription and translation – in both prokaryotes and eukaryotes. 3. Learn about post transcriptional modifications and Processing of Eukaryotic RNA. 4. Know about the regulation of gene expression in prokaryotes and eukaryotes; gene silencing, genetic imprinting. 5. Learn about the molecular aspects of various DNA damage and repair mechanisms. 6. Know about the Molecular Techniques - PCR, Western blot, Southern blot, Northern Blot and DNA sequencing.
		Molecular Biology (Practical)	ZOOACOR11P	1. Develop the skill for preparation of polytene and lamp brush chromosome from Dipteran larva of Chironomus/ *Drosophila* and identify them. 2. Acquire the skill for isolation and quantification of genomic DNA using spectrophotometer. 3. Learn the agarose gel electrophoresis technique for separation of DNA.
12	Sem-V	Genetics (Theory)	ZOOACOR12T	1. Able to understand the principles of Mendelian Genetics and its extension. 2. Develop concept on linkage, crossing over and

				chromosomal mapping. 3. Know about chromosomal aberrations and its effects; Genetic and molecular basis of Mutations, effects of physical and chemical mutagens. 4. Learn genetic and molecular mechanism of sex-determination in *Drosophila* and Humans. 5. Learn extra-chromosomal and maternal Inheritance. 6. Study bacterial and Phage genetics - Conjugation, Transformation, Transduction; Complementation test in Bacteriophage. 7. Learn about Transposable Genetic Elements in bacteria, maize, *Drosophila* and Humans.
		Genetics (Practical)	ZOOACOR12P	1. Able to solve statistical problem related Chi-square analyses and T test. 2. Solving genetic problems of linkage maps on *Drosophila*. 3. Able to identify various chromosomal aberrations in *Drosophila* and Humans from photograph. 4. Acquire in depth knowledge about pedigree analysis of some human inherited traits and its application.
13	Sem-VI	Developmental Biology (Theory)	ZOOACOR13T	1. Learn about gametogenesis, fertilization and early embryonic developments, embryonic induction and Organizer concept. 2. Know about extra-embryonic membranes in birds, implantation of embryo in humans and Placentation. 3. Attain wide concept of molecular Induction in Vertebrate Brain and Eye development; Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration. 4. Develop knowledge of In vitro fertilization (IVF), Stem cell, Applications of stem cell therapy in bone marrow transplantation, Amniocentesis and Teratogenesis.
		Developmental Biology (Practical)	ZOOACOR13P	1. Students learn to identify the different developmental stages of chick embryo. 2. Students learn to identify the developmental stages and life cycle of *Drosophila*. 3. Students are able to identify the different

				sections of placenta. 4. Able to prepare a project report on *Drosophila* which will improve the writing skill.
14	Sem-VI	Evolutionary Biology (Theory)	ZOOACOR14T	1. Learn about the origin of life, Lamarckism, Darwinism and Neo-Darwinism 2. Learn about Geological time scale, Molecular Clock, evolution of horse and humans. 3. Develop a clear concept of Natural selection, Synthetic theory, Hardy-Weinberg equilibrium, Genetic drift, founder effect and population bottleneck. 4. Develop knowledge of Speciation, Adaptive radiation; have a concept of back ground and mass extinctions, K-T extinction. 5. Attain knowledge of construction and interpretation of Phylogenetic tree using parsimony, convergent and divergent evolution; learn the basics of bioinformatics.
		Evolutionary Biology (Practical)	ZOOACOR14P	1. Able to study of fossils from models/pictures 2. Study homology and analogy from suitable specimens 3. Able solve problems on Hardy-Weinberg Law by Chi-square analysis. 4. Able to prepare graphical representation and interpretation of data of height /weight of a sample of 100 humans in relation to the age and sex.
15	Sem-V	Animal Behaviour and Chronobiology (Theory)	ZOOADSE01T	1. Students learn about the Origin and history of Ethology; Methods and recording of a behaviour 2. Students learn in details about Patterns of Behaviour found in animals 3. They learn about Social Behaviour of animals like termites and honey bees, Altruism, and Wide aspects of Sexual behaviour in animals. 4. Students learn about Chronobiology, Circadian Rhythm, Role of Melatonin, Photoperiods and their role in animal reproduction.
		Animal Behaviour and Chronobiology (Practical)	ZOOADSE01P	1. Able to study of nests and nesting habits of the birds and social insects. 2. Learn to study of the behavioural responses of wood lice to dry and humid conditions.

				3. Develop skills for studying geotaxis and phototaxis behaviour in animals. 4. Develop team spirit, writing skills and get flavour of field-based research work through education excursion and prepare a short report. 5. Learn how to study of circadian functions in humans (daily eating, sleep and temperature patterns).
16	Sem-V	Entomology (Insects and their Biology) (Theory)	ZOOADSE02T	1. Concept building on diversity, taxonomy, morphology and physiology of insects. 2. Learn about to insect society and their role as vectors. 3. Attain knowledge about plant insect interaction and major pest. 4. Develop the knowledge about the insect vectors and vector borne diseases.
		Entomology (Insects and their Biology) (Practical)	ZOOADSE02P	1. Develop skills for identification of the life cycle of mosquito and different body parts of insects. 2. Knowledge on how to collect, preserve and identify insects of economic interest.
17	Sem-V	Endocrinology (Theory)	ZOOADSE03T	1. Acquire the knowledge about Endocrine systems, classification, characteristics and transport of hormones, neurosecretions and neurohormones. 2. Learn about the morphological and histological structure of different endocrine gland along with their function 3. Students learn about the molecular function of different classes of hormones and their regulation 4. Learn about Bioassays of hormones using RIA and ELISA; hormonal control of ovulation in rats and humans; Multifaceted role of Vasopressin and Oxytocin; Hormonal regulation of parturition.
		Endocrinology (Practical)	ZOOADSE03P	1. Students learn to dissect and display Endocrine glands in laboratory bred rat. 2. They learn to identify with characters T.S. of all the endocrine glands. 3. Students learn the techniques of tissue fixation, embedding in paraffin, microtomy

				and slide preparation of any endocrine gland. 4. Demonstration of hormone assay through ELISA from available teaching kit.
18	Sem-VI	Fish and Fishery (Theory)	ZOOADSE04T	1. Develop clear concept of different types of fisheries and aquaculture and apply relevant scientific principles in of aquatic biology. 2. Able critically analyze, interpret, and evaluate information relevant to aquaculture and fisheries 3. Learn the multidisciplinary nature of the study of Fish and Fisheries and engage positively with people and ideas beyond their own discipline. 4. Develop the knowledge about aquaculture research and its model organism.
		Fish and Fishery (Practical)	ZOOADSE04P	1. Develop soft skills for studying morphometric and meristic characters to identify the species of fishes. 2. Able to identify different types of fishes, scale of fishes. 3. Develop *employable skills* in freshwater biological water quality analysis. 4. Improve report writing skills through the preparation of project report.
19	Sem-VI	Parasitology (Theory)	ZOOADSE05T	1. Students acquire knowledge on Parasitism, Parasite, Parasitoid, Vectors and Host-Parasite relationships. 2. Study of morphology, life cycle, prevalence, epidemiology, pathogenicity, diagnosis, prophylaxis and treatment of various parasitic protists, helminths, nematodes arthropod, vertebrate parasite. 3. The knowledge of parasitology will help to take proper prevention and control measure in their daily life.
		Parasitology (Practical)	ZOOADSE05P	1. Able to identify different life stages of various parasitic protists, helminths, Nematodes. 2. Acquire in depth knowledge for identification of plant parasitic root knot nematode, Meloidogyne from the soil sample and various parasitic arthropods. 3. Develop skills for isolation and fixation of nematode or cestode parasites from the

				intestine of hen.
20	Sem-VI	Wildlife and Conservation (Theory)	ZOOADSE06T	1. Develop an understanding of general principles of wild life conservation and how animals interact with each other and their natural environment. 2. Attain knowledge to solve problems related to wildlife conservation and management. 3. Able to identify common local flora and fauna and how they related to terrestrial and/or aquatic plant and animal conservation and management. 4. Critically evaluate current events and public information related to man animal conflict and other wildlife conservation issues. 5. Understand conservation ethics and acts practiced in India.
		Wildlife and Conservation (Practical)	ZOOADSE06P	1. Develop skills for field study and biodiversity analysis. 2. Able to identify common local flora and fauna like mammalian, avian and herpetofauna and their normal habitat. 3. Acquainted with the basic equipment and their uses for wildlife study. 4. Develop the skill for estimation of flora and fauna diversity and relative abundance through various ecological tools and field techniques.
21	Sem-III	Aquarium Fish Keeping (Theory)	ZOOSSEC001	1. Students will apply information and practical experience in aquarium decoration 2. Students learn the potential scope of Aquarium Fish Industry as a Cottage Industry, Exotic and Endemic species of Aquarium Fishes. 3. Develop knowledge about the biology of aquarium fishes and about various means of Live fish transport. 4. Learn about the use of live fish feed organisms, preparation and composition of formulated fish feeds, aquarium fish as larval predator. 5. Develop the skill for culture breeding and marketing techniques of common indigenous ornamental fishes

				6. Learn about general Aquarium maintenance, budget for setting up an Aquarium Fish Farm as a Cottage Industry.
22	Sem-IV	Vermicompost Production (Theory)	ZOOSSEC002	1. Understanding the role of worm farming in modern farming 2. Understanding the potential of vermicompost as an alternative to chemical fertilizers 3. Learn about role of vermicultre in maintaining the health of soil and its economic importance. 4. Role of Vermiculture in protecting the environment and managing the waste

PROGRAM SPECIFIC OUTCOMES (PSOs) AND COURSE OUTCOMES (COs)

Programme: B. Sc. Zoology (Generic) (CBCS) under West Bengal State University

Year of Introduction: 2018

I. Programme Specific Outcomes (PSOs):

The scientific study for better understanding of the Kingdom Animalia is basically known as ZOOLOGY. The Programme Specific Outcomes (PSOs) for a B.Sc. Zoology Generic Elective Programme typically encompass a wide range of skills, knowledge areas, and competencies that students are expected to achieve by the end of their program. Here are some specific outcomes that are commonly associated with a B.Sc. Zoology Generic Elective Programme:

1. **PSO: 1: Understanding of Zoological Concepts:**
   - Students will acquire in-depth knowledge about animal diversity, taxonomy, classification, and systematics in the light of evolutionary relationships among the organisms through theoretical concept with practical hands-on training.
   - Students will develop a holistic idea about structure and function of different special organ and system of organisms belonging to the Non-chordate and Chordate phyla.
   - Students will be able to understand the basic concept of physiology, biochemistry, insect, vector and disease, and environment and public health related topics.
1. **PSO: 2: Laboratory and Field Skills:**
   - Students will be able to identify and classify different Non-chordate, Chordate and vector specimens with accurate reasons.
   - Students will acquire basic experimental skills in the fields of biochemistry, physiology and environmental biology which will provide them extra edge during their higher studies.
2. **PSO: 3: Critical Thinking and Problem-Solving:**
   - Students will able to apply critical thinking skills to solve biological problems and address research questions.
3. **PSO: 4: Communication and Presentation:**
   - Students will able to use scientific terminology accurately in written and verbal communication.
4. **PSO: 5: Interdisciplinary Knowledge:**
   - Students will able to integrate concepts from related disciplines such as physiology, microbiology and botany and understand the interdisciplinary nature of biological research and its applications.

5. **PSO: 6: Ethical and Professional Conduct:**
   - Students will imbibe and demonstrate ethical practice in animal research and handling.
   - Students will able to apply ethical principles and commit to professional ethics and responsibilities.

6. **PSO: 7: Sensitive to environment sustainability issues:**
   - Students will able to identify the impact of various potential risk factors like pollutants, toxins, toxics, pests, parasites, parasitoids, microbes and many other pathogens on environment and health of biological organisms including humans.
7. **PSO:8: Competencies for Employment and Research:**
   - Apply zoological knowledge to address real-world challenges such as conservation, wildlife management, and public health.
   - Students after completion of this programme have the eligibility to join jobs in Indian Civil Services as IAS, IFS, IPS etc., WBCS, UPSC, Banking Sector, Railways, Airlines etc., technical jobs at research institutes or as school teacher.
   - As a science graduates, students will be ready to serve in industries, may even become entrepreneur or may opt for establishing their own business or industrial unit.

II. Course Outcomes (COs):

Sl. No.	Semester	Name of Course	Course Code	Course Outcomes (COs)
1	Sem-I	Animal Diversity (Theory)	ZOOHGEC01T	1. Develop understanding on the diversity of life with regard to protists, non-chordates and chordates. 2. Knowledge on the general characteristics, classification, life- cycle pattern of representative animals of non-chordates and Chordates.
		Animal Diversity (Practical)	ZOOHGEC01P	1. Able to classify animals based on their morphological characteristics / structures. 2. Able to identify poisonous and non-poisonous snake. 3. The project assignment will also give them a flavour of research to find the process involved in studying biodiversity and taxonomy besides improving their writing skills.
2	Sem-II	Physiology and Biochemistry (Theory)	ZOOHGEC02T	1. Acquire knowledge about the process of digestion, muscle contraction, respiration and transport of gases, urine formation, function of endocrine glands and formation of gametes.

				2. Develop the basic concept of different biomolecules and different anabolic and catabolic process.
		Physiology and Biochemistry (Practical)	ZOOHGEC02P	1. Develop the skill for different haematological test, identification of histological sections. 2. Able to perform different quantitative and qualitative test for different biomolecules.
3	Sem-III	Insect, Vectors and Diseases (Theory)	ZOOHGEC03T	1. Able to understand the general features of insect vector and their taxonomy, general morphology and physiology. 2. Develop knowledge about vector, vector borne diseases and their mode of transmission, virulence, pathogenicity and diagnose. 3. Able to understand the prevention and control mechanism of infectious diseases as per WHO guidelines.
		Insect, Vectors and Diseases (Practical)	ZOOHGEC03P	1. Able to identify and classify different vector insects with reasons and the diseases transmitted by it. 2. Develop the skill for identification of different types of mouth parts through theoretical and hands on training. 3. Through the project assignment they will develop the skill of report writing.
4	Sem-IV	Environment and Public Health (Theory)	ZOOHGEC04T	1. Understand different causes of environmental pollution and their remedies 2. Learn about the depletion and contamination of natural resources. 3. To learn waste management technologies and its applications. 4. Develop awareness about the causative agents and control measures of many commonly occurring diseases.
		Environment and Public Health (Practical)	ZOOHGEC04P	1. Develop the skill for measuring water parameter analysis from different ecological setting.