

# **PROGRAMME OUTCOME AND COURSE OUTCOME (CBCS) OF PUB KAMRUP COLLEGE**

**2020-2021**



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## **Course Outcome**

### **Under Graduate Program**

**Pub Kamrup College, Baihata Chariali**

## **ASSAMESE**

**ASM-HC-1016 &**

**ASM-HG-2016 :** Through this course the students will get to know about Scholars' views on the division of the age of Assamese literature, the concept of common literature and its important pattern, features of the composition of the major literary works of Pre-Sankari era and Sankari era.

**ASM-HC-1026 :** Through this study of this course the students will get the knowledge about uttar Sankari era, Prak Arunudoi and the knowledge of background of the dawn era, also they will be introduced to the most important literary work of the time.

**ASM-HG-1016 :** In this course the idea of evolution of the Assamese literature is been circulated through different text.

**ASM-HC-2016 :** Through this course the students will be introduced to different branches of language analysis, history of language studies with levels and types based on linguistic.

**ASM-HC-2026 :** This course will help the students looking at some of the popular directions of oriental and Western literary theory.

**ASM-HC-3016 :** A number of creative and critical writing of Assamese literature will pave the way for literary enjoyment for the student.

**ASM-HC-3026 :** This course will introduce the students with Prak-Sankari, Sankari, Romantic and modern potery/poem.

**ASM-HC-3036:** Through this course, the students will gain knowledge on folklore, religious traditions, festivals, environmental arts, architecture, sculpture and painting also they will get an idea of the process of greater Assamese's nation building.

**ASM-SE-3014:** A special subject to be taken as a scholarship for the next life of a student with knowledge of Assamese, basic and practical knowledge will be in this text.

**ASM-HG-3016 :** Through this lesson, you can learn about folk drama, Prachaniyan, alternative stage form and stage gain knowledge of the ancillary aspects f acting.

**ASM-HC-4016 :** The background of the comparative literature of the students through this lesson introduce the modern era of Indian literature.

**ASM-HC-4026 :** With the help of this text Sanskrit, Prakrit, Bengali, Oriya and other Aryan languages to determine the relation of Assamese language with Aryan language. Similarly in Assamese language Ahom, Bodo, Rabha etc. Language affects and factors are discussed in Aryan language.

**ASM-HC-4036 :** Students have a clear idea about Assamese prose literature, the text has been inserted here for Buranji prose wearing Sankardeva's Natya Prose.

**ASM-HC-4014 :** Poetry and storytelling are the beginnings of this lesson providing primary and practical knowledge.

**ASM-HC-4016 :** Through this course the students will be introduced with modern Assamese jugamiya songs of different periods of lyric literature and will establish intimacy with it.

**ASM-HC-5016 :** Through this course the students will get to know about the outline of history of Assamese drama and representative drama special presentation style.

- ASM-HC-5026:** In this course grammatical analysis of Assamese language according to high grammatical style will be taught.
- ASM-HE-5016 :** Through this course the students will be introduced with the form of folk literature and various sources of Assamese folklore.
- ASM-HE-5026 :** Through this course the students will learn about the romance that began in Assamese poetry in the late nineteenth century and about its different stages.
- ASM-HE-5046 :** Through this course, the students will learn about the nature of science fiction and they will be able to taste Assamese science fiction short Stories, Assamese science fiction novel and Assamese Science fiction dramas.
- ASM-HC-6016 :** Through this course, the students will be informed about the sections of Assamese short stories and novels also they will be able to taste the important novels and stories of Assamese language and will realise its academic importance.
- ASM-HC-6026:** Through this course, the students will get to know about the history of Assamese script and will get knowledge about Assam's inscriptions, Assam's cooperate.
- ASM-HE-6016 :** Through this course, the students will get to know about the creative and thought feel writing of literary scholar Laxminath Bezbarua.
- ASM-HE-6026:** Through this course, the students will be introduced to the critical and thoughtful articles of Banikanta Kakati.
- ASM-HE-6036 :** Through this course, the students will be introduced to children adolescents suitable verses, poems, saints, essays, dramas and epics.
- ASM-HE-6046 :** In this course, various regional and social dialects of Assamese language are discussed. Also this course will attempt to give the students an idea of the literary application of the dialect.
- ASM RC 1016 :** In this course the idea of evolution of the Asamese language is been circulated through different text.
- ASM RC 2016 :** Through this course the students will get the ideas about pre sankari era, Sankari era and literary background of the past Sankari period and prominent literary works.
- ASM RC 3016 :** Through this course apart from being informed about folk drama prachenium as an alternative platform the student will get the knowledge of stage and ancillary aspects of acting.
- ASM RC 3014:** In this course there will be basic knowledge and practical knowledge of special subject that can be taken as a career in later life through the knowledge of Asamese language.
- ASM RC 3016:** Through this course the students will be informed about the songs poems drama and literature of ancient Asamese literature.
- ASM RC 4016:** This course will introduced the students with modern Asamese geeti sahitya duets of various festivals and will established intimacy with it.
- ASM SE 4014:** Through this course the student will get the primacy and practical knowledge of how to write story and poem.
- ASM CC 4016:** Through this course it will teach to establish intimacy with poems of choice short story essay and drama of modern Asamese literature.
- ASM SE 5014:** Through this course it will try to give knowledge of poetry recitation.
- ASM RE 5016:** The students will get the knowledge of Bargeet kirtanghosa poem and drama of genius of the age Sankardev of the Assamese literature.

- ASM RE 5016:** Through this course the students will be introduced with the nature of folklore and various source of Assamese folklore.
- ASM RE 5026:** Assamese alphabet alignment rules and knowledge of strategy have been included in this course.
- ASM SE 6014:** Through this course the students will learn about theoretical knowledge of rhyme and rhetoric used in Assamese.
- ASM RE 6026:** The students will gain knowledgeon theoretical and practical knowledge of adaption through this course.

## **ENGLISH**

### **1<sup>st</sup> SEMESTER (HONOURS)**

#### **ENG-HC-1016**

##### **Paper 1: INDIAN CLASSICAL LITERATURE**

After completion of this course the students will be able to:

- Learn a selection of literatures of India in English translation.
- Study a rich and diverse canvas that span across genres like drama,poetry ,the epic narrative as well as short fictional fables.
- Think laterally about literatures of the world and possibility of cultural exchange .

#### **ENG-HC-1026**

##### **Paper 2: EUROPEAN CLASSICAL LITERATURE**

After completion of this course the students will be able to:

- Study the emergence of traditions that cut across many genres which included poetry ,theater and general discourses .
- Focus on widely divergent compositions by Sophocles and Plautus respectively which show the consolidation of a rich cultural discourse.
- Familiarize with the enriching literary tradition through the study of representative texts belonging to the classical period .

### **1<sup>ST</sup> SEMESTER (REGULAR)**

#### **ENG-CC-1016**

After the completion of this course the students will be able to-

- Read and respond to representations of issues in contemporary life and culture in the English language.
- Understand themes and topics that are stimulating, insightful and informative.

#### **ENG-RC-1016**

##### **Individual and Society**

The aim of this course is to-

- Acquaint the students with individual-society relationships and their representation change in different historical periods of literature.
- Introduce the students with the social milieu in which individuals function and the conditions for emergence of the literary text.

### **2<sup>nd</sup> SEMESTER (HONOURS)**

#### **ENG-HC-2016**

#### **Paper 3: INDIAN WRITING IN ENGLISH**

After completion of this course the students will be able to:

- Develop familiarity with the issues of politics of language and gender, nationalism and modernity pertaining to pre and post-Independence India that have been responsible for the emergence of Indian English literature.
- Understand the place of English Writing in India in the larger field of English Literature .
- Learn to discuss critically the use of literary forms of the novel, poetry and drama by Indian English writers in distinctive ways against Indian historical and cultural context.

#### **ENG-HC-2026**

#### **Paper 4: BRITISH POETRY AND DRAMA: 14<sup>th</sup> to 17<sup>th</sup> centuries**

After completion of this course the students will be able to:

- Understand the two major forms in British Literature from the 14<sup>th</sup> to the 17<sup>th</sup> centuries – poetry and drama .
- Discuss larger contexts of the Renaissance, the nature of the Elizabethan Age and its predilections for certain kinds of literary activities, and the implications of the emergence of new trends .
- Highlight the seminal issues and pre occupation of the writers and their ages as reflected in this texts.

### **2<sup>ND</sup> SEMESTER (REGULAR)**

#### **ENG-CC-2016**

The aim of this course is to-

- Acquaint the students with individual-society relationships and their representation change in different historical periods of literature.
- Introduce them to read and respond to representations of issues in contemporary life and culture in the English language.

#### **ENG-RC-2016 Modern Indian Literatures**

The aim of this course is to-

- Familiarize the students with different historical and cultural backgrounds of the various Indian languages and literatures
- Give the students a taste of Indian writing from different regions of the country.

### **3<sup>RD</sup> SEMESTER (HONOURS)**

#### **ENG-HC-3016**

#### **Paper 6: HISTORY OF ENGLISH LITERATURE AND FORMS**

After completion of this course the students will be able to:

- Acquire a sense of the historical development of each literary form.
- Gain understanding of the contexts in which literary forms and individual texts emerge.
- Learn to analyze texts as representative of broad generic explorations.

#### **ENG-HC-3026**

#### **Paper 5: AMERICAN LITERATURE**

After completion of this course the students will be able to:

- Learn to discuss the main currents of American literature in its social and cultural contexts.
- Understand the American society in its evolutionary stages from the beginnings of modernism to the present as well as with exciting generic innovations and developments that have tried to keep pace with social changes.
- Acquire a sense of Social Realism, Folklore and The American Dream.

#### **ENG-HC-3036**

#### **Paper 7: BRITISH POETRY AND DRAMA: 17<sup>th</sup> and 18<sup>th</sup> centuries**

After completion of this course the students will be able to:

- Gain knowledge on British literature in the 17<sup>th</sup> and 18<sup>th</sup> centuries, a time-period which sees the emergence and establishment of greatly diverse kinds of writings .
- Encourage themselves to look at the economic ,political and social changes in Britain during this period , such as the shifts from the Puritan Age to the Restoration and Neoclassical periods.
- Learn to discuss the larger contexts that generated such literatures as well as the possible impacts of the literature on society.

### **3<sup>RD</sup> SEMESTER (HONORS)**

#### **SKILL ENHANCEMENT COURSE-I**

**ENG-SE-3014****CREATIVE WRITING**

The aim of this course is to-

- Familiarize students with three creative genres viz, fiction, non-fiction and poetry.
- Build proficiency in readings and writings and to allow students to explore ideas, feelings, experiences.
- Facilitate reading techniques of texts, narratology and rhetorical positions.

**3<sup>RD</sup> SEM (REGULAR)****Alternative English-I****ALT-CC-3016**

The aim of this course is to-

- Acquaint students with the major genres of English literature through texts which are landmarks of each genre.
- Effectively represent the distinctive qualities of a particular genre.
- Encourage students to read prescribed texts in their social and cultural contexts.

**DSC1-C****ENG-RC-3016****British Literature**

The aim of this course is to-

- Offer a representative sampling of the major literary traditions of British life and culture through a study of texts in different genres.

**4<sup>TH</sup> SEMESTER (HONOURS)****Paper 8: ENG-HC-4016****British Literature: The 18<sup>th</sup> Century**

The course outcome of this paper is to-

- Familiarize the students with British literature in the 18<sup>th</sup> century, which was an age of reason and rationality.
- Acquaint the students with some of the best novels and works of non-fictional prose and poetry of the 18<sup>th</sup> century.
- Give the students an overview of the age and the writings that the age produces.

**Paper 9: ENG-HC-4026**

## **British Romantic Literature**

The course outcome of this paper is to-

- Familiarize the students with 19<sup>th</sup> century English literature.
- To enable the students to appreciate the essence of the Romantic vision most memorably expressed in the poetry of William Blake, Robert Burns, William Wordsworth, S.T.Coleridge, P.B.Shelley and John Keats.
- To acquaint the students with very different ideas about the relationship between humans and nature and the role of the poet in shaping the worldview.

## **Paper10: ENG-HC-4036**

### **British Literature: The 19<sup>th</sup> Century**

The course outcome of this paper is to:

- Familiarize the students with the 19<sup>th</sup> century novels written by Jane Austen, Charlotte Bronte, Charles Dickens, Thomas Hardy amongst others.
- Acquaint the students with the literary developments of the 19<sup>th</sup> century, from fiction to poetry.

## **BA**

### **SEC I-D**

#### **ENG-SE-4014**

### **Translation: Principles and Practice**

The aim of this course is to-

- Give students basic skills in translation.
- Introduce students to the field of translation studies and give them training in practical translation.

## **BA 4<sup>TH</sup> SEMESTER (REGULAR)**

### **Alternative English II**

#### **ALT-CC-4016**

The aim of this course is to-

- Familiarise students with different forms of literature, texts and their contexts.
- Understand literary representations and a writer's engagement with the social, cultural and political milieu.

#### **ENG-RC-4016**

### **Literary Cross Currents: Forms:Prose, Poetry, Fiction &Play**

The aim of this course is to-

- Acquaint the students with different literary forms, with one part addressing formal concerns including definitions, while the other part will involve study of actual texts which exemplify a particular literary form or genre.
- Contextualize the study so that the evolutionary or historical dimension of the literary works, their growth and transformation over the years is not lost sight of.

**5<sup>TH</sup> SEMESTER**  
**Paper 11: ENG-HC-5016**  
**British Literature: The 20<sup>th</sup> Century**

The course outcome of this paper is to-

- Familiarize the students with the era of literary Modernism that dawned upon England in the 20<sup>th</sup> century.
- Acquaint the students with the spirit of modernism, its urgent desires to break with the codes and conventions of the past, experiment with new forms and idioms and its cosmopolitan willingness to open itself up to influences coming from other shores.
- Introduce them with the ethos of postmodernism through a reading of recent poetic and fictional works.

**Paper 12: ENG-HC-5026**  
**Women's Writing**

The course outcome of this paper is to-

- Direct the student's attention to nineteenth and twentieth century writings by women living in different geographical and socio cultural settings.
- Acquaint the students with situationally distinct experiences of women articulated in a variety of genres-poetry, novels, short stories, and autobiography.
- Familiarize the students with Mary Wollstonecraft's writings, one of the earliest feminist treatises of the western world.
- Engage the students with the specificities of the contexts from which texts emerged and also analyze the women writer's handling of the different genres to articulate their women-centric experiences.
- Introduce the students with broader themes in women's writings such as- gender, sexual/textual politics, feminism, body, identity, class, location, voice, agency.

**Discipline Specific Elective I-A**

**ENG-RE-5016**

**Soft Skills**

The aim of this course is to-

- Equip students with the resources of soft skills so as to develop their overall personality.
- Make the learners understand and be aware about the importance, roles and contents of soft skills through instructions, knowledge acquisition, demonstration and practice.
- Improve the student's communication interaction, writing and documentation skills and thereby hone their confidence level.

## **GE I (Generic Elective)**

### **ENG-RG-5016**

#### **Contemporary India: Women and Empowerment**

The aim of this course is to-

- Look at Women's Issues in India in the light of the various historical and social contexts.
- Trace the evolution of Women's Empowerment both in terms of policy and discourse in postcolonial contemporary India and at the same time try to locate the women's position in earlier times.

### **ENG-SE-5014**

#### **Technical Writing**

#### **SEC III**

The aim of this course is to-

- Equip students with the skills of writing with a practical purpose.
- Acquaint them with the techniques of good writing and communicating.

### **6<sup>th</sup> Semester**

#### **Paper 13<sup>th</sup>: ENG-HC-6016**

#### **Modern European Drama**

The course outcome of this paper is to-

- Introduce students to the innovative dramatic works of playwrights from different locations in Europe, which taken together represents the wide range of modern drama and its fortunes on the written page and the stage.
- Allow an understanding of the emergence of avant garde movement and trends and dramatic devices and techniques during the period of modernism which eventually influenced theatrical practices in other nations of the world.

#### **Paper 14: ENG-HC-6026**

#### **Postcolonial Literatures**

The course outcome of this paper is to-

- Acquaint the students with the effects of the experience of colonialism which had begun long back in the 15<sup>th</sup> century.
- Introduce them to some of the novels, short stories and poems from postcolonial literatures across the world.
- Familiarize the students with the texts showcasing the many regional, cultural differences and peculiarities, as well as common and shared experiences of the postcolonial condition.

#### **DSE-1B: ENG-RE-6016**

## **ACADEMIC WRITING**

The aim of this course is to-

- Familiarize the students with samples of different kinds of academic writing and concentrate on developing the basic skills required for such writing as building up vocabulary for formal use.
- Introduce the students with organizing ideas so that there is coherence and clarity of thinking, making paragraphs and writing without grammatical and spelling errors.
- Focus on giving students practice in different kinds of academic writing, taking them through the processes of making drafts, revising, editing and writing the final version.

## **ENG-RG-6016**

## **CULTURAL DIVERSITY**

The aim of this course is to-

- Facilitate the student's engagement with and understanding of cultural contexts, situations and the rich variety of practices through a sampling of such texts that represent the widely textured tapestry emanating from different locations of the world.

## **SEC-4**

## **ENG-SE-6014**

## **Business Communication**

The aim of this course is to-

- Facilitate the student's engagement with and understanding of business related skills.
- Introduce them with business communication skills.

## **HISTORY**

### **B.A. 1<sup>st</sup> SEMESTER (HONOURS)**

#### **HIS-HC-1016:**

#### **HISTORY OF INDIA- I**

After the completion of this paper, the students will be able to explore and effectively use historical tools in reconstructing the remote past of ancient Indian pre and proto history. The course will also train the students to analyse the various stages of evolution of human cultures and the belief systems in the proto- history period.

#### **HIS-HC-1026 :**

#### **SOCIAL FORMATIONS AND CULTURAL PATTERNS OF THE ANCIENT WORLD**

After the completion of this paper, the students will be able to explain the processes and stages of the evolution of the variety of cultural pattern throughout antiquarian periods in History. They will be able to relate the connections between the various Bronze Age civilizations in the ancient world as well as development of slave and polis societies in ancient Greece.

#### **General**

**HIS –RC-1016:****HISTORY OF INDIA (FROM THE EARLIEST TIMES UP TO c. 1206)**

Upon completion of this course, students will be able to explain the emergence of state system in North India, development of imperial state structure and state formation in South India in the early period. They will be able to understand the changes and transformations in polity, economy and society in early India and the linkages developed through contacts with the outside world.

**2<sup>nd</sup> SEMESTER (HONOURS)****HIS-HC-2016: HISTORY OF INDIA- II**

On successful completion of this course the students will be able to explain the economic and socio-cultural connections, transitions and stratifications during the ruling houses, empires and the politico-administrative nuances of early Indian History from 300 BCE to 300 CE.

**HIS-HC-2026: SOCIAL FORMATIONS AND CULTURAL PATTERNS OF THE MEDIEVAL WORLD**

After the completion of this course, the students will be able to analyse and explain the historical socio-political, administrative and economic patterns of the medieval world. They will be able to describe the emergence, growth and decline of various politico-administrative and economic patterns and the resultant changes therein.

**General****HIS –RC-2016 : HISTORY OF INDIA (c.1206 to 1757)**

Upon completion of this course, students will be able to analyse the political and social developments in India between 1206-1757. Students will be able to explain the formation of different States during this period along with their administrative apparatuses, and the society, economy and culture of India in the 13th to mid-18th century period.

**3<sup>rd</sup> SEMESTER (Honours)****HIS-HC-3016: HISTORY OF INDIA III (c. 750 -1206)**

The completion of this paper will enable the students to relate and explain the developments in India in its political and economic fields and its relation to the social and cultural patterns therein in the historical time period between c.700 to 1206. They will also be able to analyse India's interaction with another wave of foreign influence and the changes brought in its wake in the period.

**HIS-HC-3026: RISE OF THE MODERN WEST – I**

On completion of this course, the students will be able to explain the major trends and developments in the Western world between the 14th to the 16th century CE. They will be able to explore and analyse the significant historical shifts and events and the resultant effects on the civilizations of Europe in the period.

### **HIS-HC-3036: HISTORY OF INDIA IV (c.1206 - 1550)**

After completion of this course students will be able to explain the political and administrative history of medieval period of India from 1206 to 1550 AD. They will also be able to analyse the sources of history, regional variations, social, cultural and economic set up of the period.

#### **General**

### **HIS –RC-3016 :HISTORY OF INDIA (c. 1757 to 1947)**

Upon completion of this course, students will be able to understand the major factors that led to the establishment and consolidation of British rule in India. They will also be able to identify the process of growth of resistance against British colonial rule and the eventual growth of Indian nationalist movement, which ultimately led to the end of the British rule in the country.

#### **Skill Enhancement Elective Courses**

### **HIS –SE-3014: Historical Tourism in North East India**

After completing this course, students will be able to explain Tourism in North East India with special reference to the historical monuments, cultural and ecological elements and places of the north east India country as tourist and heritage sites of the nation. They will be able to relate to the growing vocation of tourism as an industry and the applicability of historical knowledge for its growth.

## **4<sup>th</sup> Semester (Honours)**

### **HIS-HC-4016 : RISE OF THE MODERN WEST – II**

After the completion of this course, the student will be able to explain the political and intellectual currents in Europe in the Modern Age. They will also be able to relate the circumstances and causal factors of the intellectual and revolutionary currents of both Europe and America at the beginning of the Modern age

### **HIS-HC-4026 : HISTORY OF INDIA V (c. 1550 - 1605)**

At the completion of this course, the students will be able to analyse the circumstances and historical shifts and foundations of a variety of administrative and political setup in India between c.1550-1605. They will also be able to describe the inter relationships between the economy, culture and religious practices of the period.

### **HIS-HC-4036 : HISTORY OF INDIA VI (c. 1605 - 1750)**

After the completion of this course, the students will be able to explain and reconstruct the linkages of the history of India under the Mughal Rule. As a whole, this course will enable them to relate to the socio-economic and religious orientation of the people of Medieval period in India.

#### **General**

### **HIS –RC-4016: SOCIAL AND ECONOMIC HISTORY OF ASSAM**

Upon completion of this course, students will be able to analyse and explain the socio-economic history of Assam including among others the development of caste system, religious beliefs, agriculture and land system, the social organization, trade and commerce, various agricultural regulations, plantation economy, development

of modern industries, transport system, education, the emergence of middle class, development of literature and press, and growth of public associations.

### **Skill Enhancement Elective Courses**

#### **HIS –SE-4014: Oral Culture and Oral History**

After this course the students will be able to explain complex interrelationships of structures or events in the context of broader social and cultural framework of societies through ‘public memory’ and use oral history to preserve oral culture and local history. The students will be able to espouse the relevance to the northeastern region of India with its diverse culture and ethnic communities whose history is largely oral. The students will be able to use ‘Public memory’ as a tool and a source not only to write public history but also to explore new knowledge in the humanities , social sciences and even in disciplines like architecture, communication studies, gender studies, English, history, philosophy, political science, religion, and sociology.

### **5<sup>th</sup> SEMESTER (HONOURS)**

#### **HIS-HC-5016: History of Modern Europe- I (c. 1780-1939)**

After the completion of this course the students will be able to evaluate the historical evolution and political developments that occurred in Europe in the period between 1780 to 1939. They will also be able to critically analyse the evolution of social classes, nation states, evolution of capitalism and nationalist sentiment in Europe. They will also be able to relate to the variety of causes that dragged the world into devastating wars in the intervening period.

#### **HIS-HC-5026 : HISTORY OF INDIA VII (c. 1780 - 1857)**

After the completion of this course, the students will be able to relate the circumstances leading to the consolidation of colonial rule over India and their consequences. They will also be able to explain the orientation of the indigenous population and the masses towards resistance to the colonial exploitation. The course will also enable the students to analyse popular uprisings among the tribal, peasant and common people against the British policies.

### **Discipline Specific Elective Courses**

#### **HIS –HE-5016: HISTORY OF ASSAM (UPTO c. 1228)**

This paper will give a general outline of the history of Assam from the earliest times to the advent of the Ahoms in the 13th century. Upon completion, students will be acquainted with major stages of developments in the political, social and cultural history of Assam during the early times.

#### **HIS –HE-5026: HISTORY OF ASSAM (c. 1228 –1826)**

On completion of this paper, students will be able to identify major stages of developments in the political, social and cultural history of Assam during the medieval times. This paper will enable the student to explain the history of Assam from the 13th century to the occupation of Assam by the English East India Company in the first quarter of the 19th century.

### **General**

#### **HIS –RE-5016: HISTORY OF ASSAM (From earliest times upto 1826 CE)**

This paper will give a general outline of the history of Assam from the earliest times to the advent of the British. On completion of this paper, students will be able to identify major stages of developments in the political history of Assam from the earliest times to the occupation of Assam by the English East India Company in the first quarter of the 19th century.

### **Generic Elective Courses**

#### **HIS –RG-5016 : HISTORY OF EUROPE (c. 1648-1870)**

After completing the course the students will be able to explain the emergence of state system in Europe and the rise of modernity. They will also be able to analyse the revolutionary upheavals of Europe that finally shaped the world.

#### **6<sup>th</sup> SEMESTER (HONOURS)**

#### **HIS-HC-6016 : HISTORY OF INDIA VIII (c. 1857 - 1950)**

At the completion of this course, the learners will be able to analyse the course of British colonial exploitation, the social mobilizations during the period between c.1857 to 1950 and also the techniques of Indian resistance to British policies. It will also enable the students to explain the circumstances leading to de-colonization and also the initial period of nation building in India.

#### **HIS-HC-6026: HISTORY OF MODERN EUROPE II (c. 1780 -1939)**

After the completion of this course, the students will be able to analyse the historical developments in Europe between c.1780 to 1939. As the course structure of this paper focuses on the democratic and socialist foundations modern Europe, the students will be able to situate the historical development of working class movements, socialist upsurge and the economic forces of the two wars and the other ideological shifts of Europe in the period.

The course outcome of this paper will be to-

- Develop an understanding of the basic concept of educational management.
- Enable the students to know about the various resources in education
- Enable the students to understand the concept and importance of educational planning.
- Enable the students to know about the financial resources and financial management in education.

### **Discipline Specific Elective Courses**

#### **HIS –HE-6016 : HISTORY OF ASSAM (c. 1826 – 1947)**

Upon completion of this course, students will be able to describe the period of British rule in Assam after its annexation by the imperialist forces. They will also be able to situate the development of nationalism in Assam and its role in India's freedom struggle. The course would enable the students to analyse the main currents of the political and socio-economic developments in Assam during the colonial period.

#### **HIS –HE-6026 : ASSAM SINCE INDEPENDENCE**

Students will be able to assess the aftermath of Partition and other socio-economic developments in post-independence Assam upon completion of this course. They will also be able to identify the main currents of political and socio-economic development in Assam after India's independence and the causes and impact of various struggles and movements in contemporary Assam.

### **General**

#### **HIS –RE-6016: HISTORY OF ASSAM (c. 1826 – 1947)**

Upon completion of this course, students will be able to describe the period of British rule in Assam after its annexation by the imperialist forces. They will also be able to situate the development of nationalism in Assam and its role in India's freedom struggle. The course would enable the students to analyse the main currents of the political and socio-economic developments in Assam during the colonial period.

### **Generic Elective Courses**

#### **HIS –RG-6016 :HISTORY OF EUROPE (c. 1870 – 1939)**

After completing the course the students will be able to explain the major political developments in Europe from 1870 to 1939. The students will be able to delineate how the rise of two unified nations of Germany and Italy gave rise of intense imperialist contest the world over. The course would also enable the students to analyse the causes and consequences of World War I and the developments leading to World War II.

## **GEOGRAPHY**

### **(HONOURS PAPERS)**

**CO-01:** The students will learn that the earth is unstable and it is undergoing constant changes due to dynamic earth's processes. The students will come to know about the meaning and scope of geomorphology as a major branch of Physical Geography. After gaining knowledge based on the contents embodied in this paper, the students will be able to realize the importance of geomorphological knowledge as applied in various developmental activities executed in different areas.

**CO-02:** Understanding the importance of various cartographic techniques in geographical study. General understanding of map type, map scale and map content. An acquaintance of different cartographic techniques for representation of various facets of physical and human geographic data of any area.

**CO-03:** The paper will be useful for students in developing ideas on human-environment issues that geographers usually address in the anthropocene. The paper will be useful for students preparing for UGC NET/SLET exams and other competitive exams including the civil services.

**CO-04:** The paper will be useful for students in developing ideas on climate related aspects of geographical analyses. The paper will help provide theoretical insights and perspectives to students if they wish to pursue a research programme in future. Students will develop a basic understanding of the introductory concepts in biogeography. The paper be very useful for students preparing for UGC NET-JRF / SLET exam and other competitive exams including civil services.

**CO-05:** The paper will be useful for students in developing ideas on how geographical aspects organise economic space and will offer perspectives to students if they wish to pursue a research programme. The paper will be useful for students preparing for UGC NET/SLET exams and other competitive exams including the civil services.

**CO-06:** The paper will be useful for students in developing understanding on Indian geography and its various dimensions. It will also be useful for students preparing for various competitive examinations including civil services.

**CO-07:** Thorough understanding of the statistical methods and techniques used in geographical studies. Understanding of tabulation, analysis and interpretation of geographical data.

**CO-08 (SEC):** At the end of the course, the students will be able to learn use of a few instruments like rotameter, planimeter, Dumpy Level, etc. To learn the basics of morphometric analysis techniques. To acquaint with the field methods of river studies in across-section.

**CO-09:** This paper will be useful for students in developing ideas on environmental issues including disasters that geographers usually address. This paper will be useful for students preparing for different competitive exams including the civil services.

**CO-10:** The paper will be useful for students in developing ideas about spatio-temporal changes in the characteristics of population and settlement and the factors associated with them. The paper will be useful for students preparing for various competitive exams including the civil services.

**CO-11:** The paper remains useful for students in developing skills in spatial data analysis if they wish to pursue a research programme. The paper will be useful for students preparing for different competitive exams including the civil services.

**CO-12 (SEC):** Understanding the importance of various surveying techniques in geographical study. General understanding of preparation procedures of different types of plan and map. An acquaintance of different surveying techniques for representation of various spatial objects/ Phenomena.

**OC-13:** This course will help equip the students to comprehend various social and political aspects of phenomena and their interface within the realm of geography. The paper will be very useful for students preparing for various competitive examinations including civil services.

**CO-14:** This course will help students to proceed with a research problem and the steps she/he should adopt and the tools and craft to be employed for doing quality research. Students perceive fieldwork to be beneficial to their learning, because through it they experience ‘geographical reality’, and have deeper understanding of the subject. The students will have a chance to interact with respondents and collect data through questionnaire directly from the field. This course will develop understanding about designing and writing a field report.

**CO-15 (HE):** The paper will be useful for students in developing ideas on disparities within and between countries and their fallout. The paper will help provide theoretical insights and perspectives to students, if they wish to pursue a higher studies or research in future. The paper will be very useful for students preparing for various competitive examinations including civil services.

**CO-16 (HE):** This paper will be useful for students in developing ideas about agricultural practices and their distribution and characteristics. This paper will also be useful to the students in understanding the world agricultural systems. This paper will help develop understanding of location of agricultural activities and associated contemporary problems and challenges.

**Co-17:** This course develops a comprehensive understanding of the discipline. This course helps the students to apply the historic and contemporary perspective to explain and approach the real world geographic problems.

**CO-18:** This course will help the students to proceed with a research problem and the steps she/he should adopt and the tools and craft to be employed while doing quality research.

**CO-19 (HE):** The paper will be useful for students in developing ideas on how geographical factors tangent on tourism activities and how geographers seek to address issues of development and carrying capacities of varied environments. It will also build skills for students seeking to enroll in a research programme and/or provide openings for them to work with tourism/eco-tourism planning agencies.

**CO-20:** This paper will be useful to students in developing ideas on different aspects of resources, and the linkages with development issues that geographers usually address. This paper will also be useful for students preparing for different competitive examinations including the civil services.

#### **(HONOURS GENERIC/ REGULAR COURSE PAPERS)**

**CO-01:** The students will learn that the earth is unstable and it is undergoing constant changes due to dynamic earth's processes. The students will come to know about the meaning and scope of geomorphology, which a major branch of Physical Geography. After gaining knowledge based on the contents embodied in this paper, the students will be able to realize the importance of geomorphological knowledge as applied in various developmental activities executed on the land and over the earth's surface.

**CO-02:** The paper will be useful for students in developing ideas on human-environment issues that geographers usually address in the anthropocene. The paper will be useful for students preparing for UGC NET/SLET exams and other competitive exams including the civil services.

**CO-03:** This paper will be useful for the students in developing understanding on how geographical factors organize economic space, and to acquire knowledge about spatial patterns of various economic activities on the earth.

**CO-04 (SEC):** The paper will be useful for students in developing ideas on disparities within and between countries and their fallout. The paper will help provide theoretical insights and perspectives to students if they wish to pursue a research programme in future.

**CO-05:** The paper will be useful for students in developing understanding on Indian geography and its various dimensions. It will also be useful for students preparing for various competitive examinations including civil services.

**CO-06 (SEC):** Understanding the importance of various surveying techniques in geographical study. General understanding of preparation procedures of different types of plan and map. An acquaintance of different surveying techniques for representation of various spatial objects/ Phenomena.

**CO-07 (RE):** The paper will be useful for students in developing ideas on environmental issues including disasters that geographers usually address. The paper will also be useful for students preparing for different competitive exams including the civil services.

**CO-08 (REG. GENERIC):** The paper will be useful for students in developing ideas about spatio-temporal changes in the characteristics of population and settlement and the factors associated with them. The paper will be useful for students preparing for various competitive exams including the civil services.

**CO-09 (REG. SEC):** The paper will be useful for students in developing ideas on how geographical factors tangent on tourism activities and how geographers seek to address issues of development and carrying capacities of varied environments. It will also build skills for students seeking to enroll in a research programme and/or provide openings for them to work with tourism/eco-tourism planning agencies.

**CO-10 (RE):** This course will help equip the students to comprehend various social and political aspects of phenomena and their interface within the realm of geography. The paper will be very useful for students preparing for various competitive examinations including civil services.

**CO-11 (REG. GENERIC):** Understanding of the concept of human health and health care from the perspective of geography. Acquiring knowledge about factors influencing human health and occurrence of diseases in varying ecological settings. Providing useful information about the impact of global climate change on human health and occurrence of various diseases in different ecological settings in India.

**CO-12 (REG. SEC):** This course will help students to proceed with a research problem and the steps she/he should adopt and the tools and craft to be employed for doing quality research. Students perceive fieldwork to be beneficial to their learning, because through it they experience ‘geographical reality’, and have deeper understanding of the subject. The students will have a chance to interact with respondents and collect data through questionnaire directly from the field. This course will develop understanding about designing and writing a field report.

## **EDUCATION**

**B.A. 1<sup>st</sup> SEMESTER (HONOURS)**

**EDU-HC-1016**

### **PRINCIPLES OF EDUCATION**

After completion of this course the learners will be able to:

- Acquaint themselves with the concept, principles, curriculum, democracy, discipline and freedom.
- Develop knowledge about different aims of education, various types of curriculum, correlation studies and forms of discipline.
- Familiarize themselves with democratic idea of modern education.

**EDU-HC-1026**

### **Psychological Foundations of Education**

After completion of this course the learners will be able to:

- Understand the relationship between education and psychology and need of educational psychology in teaching learning process.
- Understand the concept of memory, forgetting, attention and interest.
- Describe the nature and theories of learning and role of motivation in learning.
- Understand intelligence, its theories, measurement, and concept of emotional intelligence.
- Understand different types of personality and the adjustment mechanism.

## **EDU-RC-1016 (Generic)**

### **Foundations of Education**

After completion of this course the learners will be able to:

- Understand the principles, aims and various forms of education.
- Gain knowledge about the importance of discipline and freedom.
- Gain knowledge about the concept of emotional and national integration and international understanding.

## **2<sup>nd</sup> SEMESTER (HONOURS)**

### **EDU-HC-2016**

#### **PHILOSOPHICAL AND SOCIOLOGICAL FOUNDATION OF EDUCATION**

After completion of this course the learners will be able to:

- Know the concept of philosophy and its relationship with education.
- Understand the educational implications of various Indian schools of philosophy.
- Understand the educational implications of various Western schools of philosophy.
- Know the concept of sociology and its relationship with education.
- Develop understanding about the concept of sociology, social group, and socialization.

### **EDU-HC-2026**

#### **DEVELOPMENT OF EDUCATION IN INDIA – I**

After completion of this course the learners will be able to:

- Recount the concept of Ancient Indian Education system.
- Describe the educational system in ancient India, particularly Vedic education.
- Examine the educational system in Medieval and British period.

## **EDU-RC-2016 (Generic)**

### **PSYCHOLOGY OF ADOLESCENTS**

After completion of this course the learners will be able to:

- Understand the period of adolescence and its significance in human life.
- Know about various problems associated with adolescence.
- Understand the development aspect of adolescence and its importance.

### **3<sup>RD</sup> SEMESTER (HONOURS)**

#### **EDU-HC-3016**

#### **DEVELOPMENT OF EDUCATION IN INDIA – II**

After completion of this course the learners will be able to:

- Understand the educational situation during the time of independence.
- Explain the recommendations and educational importance of different educational commission and committees in Post- Independent India.
- Analyze the National Policy on Education in different times.
- Accustom themselves with the recent educational development in India.

#### **EDU-HC-3026**

#### **EDUCATIONAL TECHNOLOGY AND TEACHING METHODS**

After completion of this course the learners will be able to:

- Understand the objective of educational technology in teaching learning process.
- Know about the innovations in the field of education through technology.
- Understand about various methods and devices of teaching.
- Acquaint themselves with levels, effectives of teaching and classroom management.
- Understand the strategies of effective teaching as a profession.

#### **EDU-HC-3036**

#### **VALUE AND PEACE EDUCATION**

After completion of this course the learners will be able to:

- Understand the meaning and concept of value, peace, and its importance in human life.
- Understand the meaning and importance of peace education and its relevance at national and international level.
- Identify different issues in imparting peace education.
- Identify strategies and skills in promoting peace education at institutional level.

#### **EDU-RC-3016 (Generic)**

#### **Guidance and Counselling**

After completion of this course the learners will be able to:

- Understand the concept, need and importance of guidance and counselling.
- Know the different types and approaches to guidance and counselling.
- Acquaint themselves with organization of guidance service and school guidance clinic.
- Understand the challenges faced by the teacher as guidance worker.

#### **EDU-SE-3014**

#### **PUBLIC SPEAKING SKILL**

After completion of this course the learners will be able to acquire the capacities of public speaking skill.

## **4<sup>TH</sup> SEMESTER (HONOURS)**

### **EDU-HC-4016**

#### **GREAT EDUCATIONAL THINKERS**

The course outcome of this paper is to –

- To enable the students to learn the Philosophy of life of different Educational Thinkers and their works.
- To enable the students to learn about the views of thinkers in educational context.
- To enable the students to learn about relevance of some of their thoughts at present day context.

### **EDU-HC-4026**

#### **EDUCATIONAL STATISTICS AND PRACTICAL**

After the completion of this course the learner will be able to:

- Develop the basic concept of Statistics.
- Be acquainted with different statistical procedures used in Education.
- Develop the ability to represent educational data through graphs.
- Familiarize the students about the Normal Probability Curve and its applications in Education.

### **EDU-HC-4036**

#### **EMERGING ISSUES IN EDUCATION**

The course outcome of this paper will be to-

- Make the students acquaint with major emerging issues of national, state, and local level.
- Acquaint the students with the various issues in education that are emerging in the recent years in the higher education system.
- Address the various problems and challenges of education in India at all levels.

## **4<sup>TH</sup> SEMESTER (REGULAR)**

### **EDU-RC-4016**

#### **HISTORY OF EDUCATION IN INDIA**

After completion of this course the learner will be able to:

- Analyse the education system during British Period .
- Understand the Educational situation during the time of Independence.
- Explain the recommendations and educational importance of different Education Commission and Committees in post Independent India .
- Analyse the National Policy on Education in different tomes
- Accustom with the recent Educational Development in India.

### **EDU-SE-4014**

#### **WRITING BIODATA AND FACING AN INTERVIEW**

After completing this course, students will be able to write a biodata scientifically and will develop confidence to face different types of interview.

**5<sup>th</sup> SEMESTER (HONOURS)**

**EDU-HC-5016**

**MEASUREMENT AND EVALUATION IN EDUCATION & PRACTICAL**

The course outcome of this paper is to-

- Enable the students to understand the concept of measurement and evaluation in education.
- Acquaint the students with the general procedure of test construction and characteristics of a good test.
- Develop an understanding of different types of educational tests and their uses.
- Acquaint the students about personality test, and aptitude tests.

**EDU-HC-5026  
GUIDANCE AND COUNSELLING**

The course outcome of this paper will be to-

- Help the students to understand the concept, need and importance of Guidance and Counselling.
- Enable the students to know the different types and approaches to Guidance and Counselling.
- Acquaint the students with the organization of guidance service and school guidance clinic.
- Enable the learners to understand the challenges faced by the teacher as guidance worker.

**EDU-DSE-5026  
DEVELOPMENTAL PSYCHOLOGY**

The course outcome of this paper will be to-

- Enable the students to understand the basic concepts relating to development
- Acquaint the students about heredity and environmental factors affecting pre-natal development
- Enable the students to understand the development aspects during infancy and childhood
- Enable the students to understand the development aspects of adolescence, importance of adolescence period and problems associated with this stage.

**EDU-DSE-5046  
TEACHER EDUCATION IN INDIA**

After completion of this course the learner will be able to:

- Explain the Concept, Scope, Aims & Objectives and Significance of teacher education
- Acquaint with the development of Teacher Education in India
- Acquaint with the different organising bodies of teacher education in India and their functions in preparation of teachers for different levels of education
- Acquaint with the innovative trends and recent issues in teacher education, and be able to critically analyse the status of teacher education in India
- Understand and conceive the qualities, responsibilities and professional ethics of teachers.

**5th SEMESTER (REGULAR)**

**EDU-DSE-5026**

## **DEVELOPMENTAL PSYCHOLOGY**

The course outcome of this paper will be to-

- Enable the students to understand the basic concepts relating to development
- Acquaint the students about heredity and environmental factors affecting pre-natal development
- Enable the students to understand the development aspects during infancy and childhood
- Enable the students to understand the development aspects of adolescence, importance of adolescence period and problems associated with this stage.

### **EDU-RG-5016 DISTANCE EDUCATION**

The course outcome of this paper will be to-

- Enable the students to understand the concept of distance education and its growth in India and Assam
- Acquaint the students with the growing need and importance of distance education.
- Acquaint the students with the different forms and methodologies applied in distance education.
- Enable the students to understand different programmes of distance education.
- Acquaint the students with different instructional strategies of distance education.

### **EDU-SE-5014 EXTENSION ACTIVITIES**

After completing this course, students will be able to do extension activities.

### **6<sup>th</sup> SEMESTER (HONOURS)**

#### **EDU-HC-6016**

#### **EDUCATION AND DEVELOPMENT**

After completion of this course the learner will be able to understand:

- Relation between education and development
- Educational development in the post globalization era
- Role of education in community development
- Education for human resource development
- Economic and political awareness through education

### **EDU-HC-6026 PROJECT**

After completion of this course the learner will be able to:

- Explain the process of conducting a Project.
- Prepare a Project Report.

**EDU-DSC-6016**  
**MENTAL HEALTH AND HYGIENE**

**After completion of this course the learner will be able to:**

- Acquaint with the fundamentals and development of mental health and the characteristics of a mentally healthy person.
- Understand the concept and importance of mental hygiene and its relationship with mental health.
- Acquire knowledge about the principles, factors promoting mental health and the role of home, school, and society in maintaining proper mental health.
- Learn the meaning and problem of adjustment and also the different adjustment mechanisms.
- Familiarize with the concept and issues of positive psychology, mental health of women, role of WHO and stress management.

**EDU-DSC-6036**  
**EDUCATIONAL MANAGEMENT**

The course outcome of this paper will be to-

- Develop an understanding of the basic concept of educational management.
- Enable the students to know about the various resources in education
- Enable the students to understand the concept and importance of educational planning.
- Enable the students to know about the financial resources and financial management in education.

**6<sup>th</sup> SEMESTER (REGULAR)**

**EDU-DSE-6046**  
**WOMEN AND SOCIETY**

After completion of this course the learner will be able to:

- Know the changing role of women in India
- Understand gender discrimination in Indian society
- Make the students understand the constitutional provisions for women and their rights.
- Make the students understand women empowerment
- Develop an awareness and sensitivity towards women

**EDU-RG-6016**  
**MENTAL HEALTH AND HYGIENE**

After completion of this course the learner will be able to

- Acquaint with the fundamentals and development of mental health and the characteristics of a mentally healthy person.
- Understand the concept and importance of mental hygiene and its relationship with mental health.
- Acquire knowledge about the principles, factors promoting mental health and the role of home, school, and society in maintaining proper mental health.
- Learn the meaning and problem of adjustment and also the different adjustment mechanisms.
- Familiarise with the concept and issues of positive psychology, mental health of women, role of WHO and stress management.

**EDU-SE-6014**  
**DEVELOPING TEACHING SKILL**

After completing this course, students will be able to develop understanding about different teaching skills which are used in classroom transaction.

**PHILOSOPHY**

**Course Outcome:**

**CO-1 (PHI-HC-1016)** : This paper let us know the Philosophical knowledge was developed in India in ancient time, specially the upani sodic and vedic Period and also attesstic School of Indian Philosophy.

**CO-2 (PHI-HC-1026)** : This Paper provides Preliminary study of the thinking, inference nature or of Reasoning and its truth and validity. Basically this paper improves the reasoning Power of the student.

**CO-3 (PHI-HG-1016)** : This course introduced students with the nature of Philosophical enquiry and also introduced the students with the different methods and the origin of knowledge.

**CO-4 (PHI-HC-2016)** : This paper is designed to provide an introduction to ancient Greek Philosophy, This Paper let the student know how the philosophical thinking and enquiry was developed in ancient Greel philosophy. How they wanted to find out the ultimate Staff by which the univeres is composed.

**CO-5 (PHI-HC-2026)** : This paper basically develops the knowledge how to determine the logical truth and also the validity of arguments. It enables students to face different competitive examination. In this paper mathematical logic is applied to solve the Prolem of logical and mathematical enquiry.

**CO-6 (PHI-HG-2016)** : This paper introduced students with the development of Indian Philosophical school let the readers to know how to thinkers developed logical,epistemological and metaphysical knowledge of the world.

**C.O-7 (PHI- HC-3016)**: This paper basically Let the student to know how the rationalistic, empiricestic,critical and idealitic enquiry regarding the origine of knowledge was developed in western Philosophical world.

**C.O. 8 (PHI-HC-3026)** : This paper introduced students with the different Theistic and Vedic Schools of Indian Philosophy and also provides the Knowledge of the logical,epistenological and metaphysical enquiry.

**C.O.9 (PHI-HC-3036)** : This paper aims at to promote the student the moral Consciousness,a sense of co-operation and responsibility. How the people should lead a moral life and the relevance of morality in different fields of our activity and Profession can be realized by Proper study of this paper.

**C.O.10 PHI HG/-3016 Same as C.O.-9 (PHI-RC-3036)**

**C.O.11 (PHI-HC-4016)**: In this paper the Indian attempt contemporary a thinkers made an systematic, Critical and comprehensive study regarding the problem of the nature and desting of the universe. They have largely concentrated with the new meaning and re-orientation to classical Indian thought. Through this paper the students may be benifitted to realise huminity in real sense.

**C.O.12 (PHI-HC-4026)**: Religion occupies significant place and plays a very important role in our lives.Religion emerged in response to human needs. Man looked to realiset religion for guidance when confronted with problem in life and religion guided almost every aspect of human life.

**C.O.13 (PHI-HC-4036)**: The paper promote students Knowledge the individual.This also introduces reader with the different Political and Social ideologies which enables and benifited th student to face different competitive exams.

**C.O.14 (PHI-HG-4016)** : This Paper Provides. Preliminary study of the thinking, inference, nature of reasoning and it's truth and validity. Basically. this paper improves. the reasoning power of the student and is benifited the student for different competitive exams.

**C.O.15 (PHI-HC-5016)** : In this paper the western contemporary thickness attempted to made a systematic, scientific, integrated critical and a comprehensive study of the problem of philosophical enquiry which are termed as new trends in Contemporary philosophy.

**C.O.16 (PHI-HC-5026)**: This is the paper in which huminism and man's existence is the main theme of Philosophy. This Paper leads the reader to huministic philosophy which recognizes the value and dignity of man and it makes him measure of all things. This paper also stressed upon subjectivity of individual human being and also the freedom and responsibility.

**C.O.17 (PHI-HE-5016)** : This paper stressed upon the philosophy of Vedas and upanisods.By this paper the reader may also know the individual desting, law of karma and liberation which is essential to lead an ideal life of human being.

**C.O.18 (PHI-HE-5026)** : This paper basically wants to give knowledge of the Gita. It tries to give the knowledge of the Bhakti and karma, and also the meaning and application of yoga.

**C.O.19(PHI-HC-6016)**: This paper basically based upon the philosophy of Mind.Students will get the knowledge about the psychology and the philosophy of mind by Proper study of this paper.

**C.O.20 (PHI-HC-6026)** : This paper. wants to give knowledge of the Students about meta ethics, the ethical concepts and evaluations regarding Good and Right.

**C.O.21 (PHI-HE- 6016)** : This paper introduced the students about the philosophy of plato's theory of knowledge, Hegels phenomenolistic idea wittgensteins use theory of meaning and also sartres,Concept of existance and humanism.

**C.O.22 (PHI-HE-6026)** : This paper basically about the knowledge of linguistic philosophy. The student will introduced with meaning & and use of language and also able to know the different theories of truth by Proper study of this Paper.

**C.O.23 (PHI-HE-6036)**: Tuis paper aims at to Promote the students the moral consciousness, a sense of co-operation and responsibility. How the people should lead a moral life and in relevance of morality in different fields of our activity and Professions.Can be realised by The proper study of this paper. This paper is helpful for various com Petitive examinations.

## **SEC**

**C.O.24 (PHI-SE-3014)** : On completion of the Course students will able to understand the scope of philosophical vis-a-vis Psychological counseling. They will inculcate self-confidence in one's own abilities to reason. They may understand the opinions of other people. They can appraising. develop fair mindedness in reasoning etc.

**C.O.25 (PHI-SE-4013)** : On completion of the course students will able to analyse the original and Primary ideas of varian, thinkers. They may develop ancillary skills of observation, reasoning, decision making etc. They may also dove - lop effective communication skill.

**C.O.24 (PHI-SE-5014)** : On completion of the course the students will able to identify fallacies in day to day conversations and argumentation.By avoiding committing fallacies it will provide well reasoned arguments in any discourse.

**C.O.27 (PHI-SE 6014)** : On completion of the course students will be able to articulate the importance and Environment. They will understand One's duties and responsibilities towards Protection of environment.

## **Political Science**

### **BA 1<sup>ST</sup> SEMESTER (HONOURS)**

#### **POL/ HC-1016: Understanding Political Theory**

The paper introduces idea of political theory, its history and approaches. The paper is designed to reconcile political theory and practice through reflections on the ideas and practices related to democracy.

#### **POL/HC-1026: Constitutional Government and Democracy in India**

This course acquaints students with the constitutional design of states structure and institutions and its actual working overtime.

### **BA 2<sup>ND</sup> SEMESTER (HONOURS)**

#### **POL/HC 2016: Political Theory: Concepts and Debates**

The paper helps students to familiarize with the basic normative concepts of Political theory. Again the Paper includes important political debates of recent times.

#### **POL/HC 2026: Political Process in India**

This course maps the working of “modern” institutions, premised on the existence of an individuated society in a context marked by communitarian solidarities and their mutual transformation thereby.

### **BA 3<sup>RD</sup> SEMESTER (HONOURS)**

#### **POL/HC 3016: Introduction to Comparative Government and Politics**

The paper helps students to familiarize with the basic concepts and approaches to the study of comparative politics.

#### **POL/HC 3026: Perspectives on Public Administration**

The course provides an introduction to the discipline of public administration. The paper encompasses public administration in its historical context with an emphasis on the various classical and contemporary administrative theories.

#### **POL/HC 3036: Perspectives on International Relations and World History**

This paper seeks to equip students with the basic intellectual tools for understanding International Relations. It introduces students to some of the most important theoretical approaches for studying international relations.

### **BA 4<sup>TH</sup> SEMESTER (HONOURS)**

#### **POL/HC 4016: Political Processes and Institutions in Comparative Perspective**

Students will be trained in the application of comparative methods to the study of politics through this paper. This paper aims to introduce range of issues, literature and methods of comparative politics.

#### **POL/HC 4026: Public Policy and Administration in India**

The paper seeks to provide an introduction to the interface between public policy and administration in India.

#### **POL/HC 4036: Global Politics**

This course introduces to the key debates on the meaning and nature of globalization by addressing the political, economic, social cultural and technological dimensions of global politics.

### **BA 5<sup>TH</sup> SEMESTER (HONOURS)**

#### **POL/HC 5016: Classical Political Philosophy**

This course goes back to Greek antiquity and familiarizes students with the manner in which the political questions were first posed. It interprets ideas underlying traditions in classical political philosophy.

#### **POL/HC 5026: Indian Political Thought-I**

This course introduces the specific elements of Indian Political thought spanning over two millennia. The basic focus of study is on individual thinkers whose ideas are however framed by specific themes.

### **BA 6<sup>TH</sup> SEMESTER (HONOURS)**

#### **POL/HC 6016: Modern Political Thought**

We explore ideas underlying traditions in modern political philosophy through this paper. The paper studies the debates and arguments of leading political philosophers of different political traditions.

#### **POL/HC 6026: Indian Political Thought-II**

The course introduces a wide span of thinkers and themes that defines the modernity of Indian Political thought. It helps students to understand the relevance of political thought of modern India in understanding contemporary politics.

### **Skill Enhancement Course**

### **BA 3<sup>RD</sup> SEMESTER**

#### **POL SE 3014 : Parliamentary Procedures and Practices**

The course attempts to make the students familiar with legislative practices in India with an orientation to equip them with the adequate skills of participation in deliberative practices and processes of decision making.

### **BA 4<sup>TH</sup> SEMESTER**

#### **POL SE 4014: Panchayati Raj in Practice**

The course acquaints students with the Panchayati Raj Institutions and their actual working. It further encourages a study of PRI's in their mutual interaction and their interaction with the people.

### **BA 5<sup>TH</sup> SEMESTER**

#### **POL-SE- 5014: Public Opinion and Survey Research**

This course will introduce the students to the debates, principles and practices of public opinion polling in the context of democracies, with special reference to India.

### **BA 6<sup>th</sup> Semester**

**POL-SE-6014 Conflict and Peace Building:** This course is designed to help build an understanding of a variety of conflict situations among students in a way that they can relate to them through their lived experiences.

### **DISCIPLINE SPECIFIC ELECTIVE**

## **BA 5<sup>TH</sup> SEMESTER**

### **POL HE 5016 Human Rights**

The course helps students to understand the concepts and institutions related to Human Rights at international level. It again familiarizes students with different approaches and perspectives on Human rights.

### **POL HE 5046 Select Constitutions**

The paper introduces the constitutional and political systems of four countries namely, UK, USA, China and Switzerland. This course is an integral part of public service examinations and familiarizes students with the various types of governments of those countries.

### **POL HE 6036 Women, power and politics**

This course opens up the question of women's agency, taking it beyond "women's empowerment" and focusing on women as racial social agents. It attempts to question the complicity of social structures and relations in gender equality.

### **POL HE 6046 Social Movements in North-east India**

It helps students to familiarize with social movements of the North-east India and their historical developments of such social movements of the region.

## **GENERIC ELECTIVE**

### **POL HG 1016 Introduction to Political Theory**

This course aims to introduce certain key aspects of conceptual analysis in political theory and the skills required to engage in debates surrounding the application of the concepts.

### **POL HG 2016 Indian Government and Politics**

This course would introduce students to the major approaches to the study of Indian Politics. The course details the functioning of the major institutions of government and political systems in India.

### **POL HG 3016 Comparative Government and Politics**

The paper helps students to understand the comparative governments and politics throughout this world. It incorporates the study of classification of the government and the political behavior of institutions.

### **POL HG 4016 Introduction to International Relations**

This course is designed to give students a sense of some important theoretical approaches to understand international relations, and a history from 1945 till present.

**POL-RE-5016 Public Administration-I:** Students will be able to understand the basics of public administration and this paper is an integral part of public services examinations.

**POL-RG-5026 Democracy in India:** Students will be able to understand the importance of freedom movement in India. The debates on the nature of Indian democracy will provide an important insight to the complex nature of challenges faced by the state and different public institutions.

**POL-RE-6016 Public Administration-II :** After reading this course the students will be in a position acquaint with the different layers and structures of public administration and also to know how public administration contributes towards development.

**POL-RG-6026 Indian Administration:** The basic objective is to introduce the students to the process of evolution of Indian administration through ages.

# ECONOMICS

<b>Course Outcome for Honours in Economics</b>			
Year	Semester	Courses	Course Outcomes
1 <sup>st</sup> Year	1 <sup>st</sup> Semester	Core Course 1 ECO-HC-1016: Introductory Microeconomics	This course is to expose the students to the basic principles of microeconomic theory. The emphasis will be on thinking like an economist and the course will illustrate how microeconomic concepts can be applied to analyze real-life situations.
		Core Course 2 ECO-HC-1026: Mathematical Methods for Economics-I	This course is about basic mathematics that enables the study of economic theory at the undergraduate level, specifically the courses on microeconomic theory, macroeconomic theory, statistics and econometrics set out in this syllabus. In this course, particular economic models are not the ends, but the means for illustrating the method of applying mathematical techniques to economic theory in general. The level of sophistication at which the material is to be taught is indicated by the contents of the prescribed textbook.
	2 <sup>nd</sup> Semester	Core Course 3 ECO-HC-2016: Introductory Macroeconomics	It enables students to learn the basic concepts of Macroeconomics. Macroeconomics deals with the aggregate economy. This course discusses the preliminary concepts associated with the determination and measurement of aggregate macroeconomic variable like savings, investment, GDP, money, inflation, and the balance of payments.
		Core Course 4 ECO-HC-2026: Mathematical Methods for Economics-II	This course is the second part of a compulsory two-course sequence. This part is to be taught in Semester II following the first part in Semester I. The objective of this sequence is to transmit the body of basic mathematics that enables the study of economic theory at the undergraduate level, specifically the courses on microeconomic theory, macroeconomic theory, statistics and econometrics set out in this Syllabus. In this course, particular economic models are not the ends, but the means for illustrating the method of applying mathematical techniques to economic theory in general. The level of sophistication at which the material is to be taught is indicated by the contents of the prescribed textbook.
2 <sup>nd</sup> Year	3 <sup>rd</sup> Semester	Core Course 5 ECO-HC-3016: Intermediate Microeconomics-I	The course is designed to provide a sound training in microeconomic theory to formally analyze the behaviour of individual agents. Since students are already familiar with the quantitative techniques in the previous semesters, mathematical tools are used to facilitate understanding of the basic concepts. This course looks at the behaviour of the consumer and the producer and also covers the behaviour of a competitive firm.
		Core Course 6 ECO-HC-3026: Intermediate Macroeconomics-I	This course introduces the students to formal modeling of a macro-economy in terms of analytical tools. It discusses various alternative theories of output and employment determination in a closed economy in the short run as well as medium run, and the role of policy in this context. It also introduces the students to various theoretical issues related to an open economy.
		Core Course 7 ECO-HC-3036: Statistical Methods for Economics	This is a course on statistical methods for economics. It begins with some basic concepts and terminology that are fundamental to statistical analysis and inference. It then develops the notion of probability, followed by probability distributions of discrete and continuous random variables and of joint distributions. This is followed by a discussion on sampling techniques used to collect survey data. The course introduces the notion of sampling distributions that act as a bridge between probability theory and statistical inference. The semester concludes with some topics in statistical inference that include point and interval estimation.
	Skill Enhancement Course (SEC)-I		This course discusses how data can be summarized and analysed for drawing statistical inferences. The students will be introduced to

		ECO-SE-3014: Data Collection and Presentation	important data sources that are available and will also be trained in the use of statistical softwares like SPSS/PSPP to analyse data.
3 <sup>rd</sup> Year	4 <sup>th</sup> Semester	Core Course 8 ECO-HC-4016: Intermediate Microeconomics-II	This course is a sequel to Intermediate Microeconomics I. The emphasis will be on giving conceptual clarity to the student coupled with the use of mathematical tools and reasoning. It covers general equilibrium and welfare, imperfect markets and topics under information economics.
		Core Course 9 ECO-HC- 4026:Intermediate Macroeconomics-II	This course is a sequel to Intermediate Macroeconomics I. In this course, the students are introduced to the long run dynamic issues like growth and technical progress. It also provides the micro-foundations to the various aggregative concepts used in the previous course.
		Core Course 10 ECO-HC-4036: Introductory Econometrics	This course provides a comprehensive introduction to basic econometric concepts and techniques. It covers statistical concepts of hypothesis testing, estimation and diagnostic testing of simple and multiple regression models. The course also covers the consequences of and tests for misspecification of regression models.
		Skill Enhancement Course (SEC)-II ECO-SE-4014: Data Analysis	This course discusses how data can be summarized and analysed for drawing statistical inferences. The students will be introduced to important data sources that are available and will also be trained in the use of statistical softwares like SPSS/PSPP to analyse data.
	5 <sup>th</sup> Semester	Core Course 11 ECO-HC-5016: Indian Economy-I	Using appropriate analytical frameworks, this course reviews major trends in economic indicators and policy debates in India in the post-Independence period, with particular emphasis on paradigm shifts and turning points. Given the rapid changes taking place in India, the reading list will have to be updated annually.
		Core Course 12 ECO-HC-5026: Development Economics-I	This is the first part of a two-part course on economic development. The course begins with a discussion of alternative conceptions of development and their justification. It then proceeds to aggregate models of growth and cross-national comparisons of the growth experience that can help evaluate these models. The axiomatic basis for inequality measurement is used to develop measures of inequality and connections between growth and inequality are explored. The course ends by linking political institutions to growth and inequality by discussing the role of the state in economic development and the informational and incentive problems that affect state governance.
		DSE: ECO-HE- 5026: Money and Financial Markets	This course exposes students to the theory and functioning of the monetary and financial sectors of the economy. It highlights the organization, structure and role of financial markets and institutions. It also discusses interest rates, monetary management and instruments of monetary control. Financial and banking sector reforms and monetary policy with special reference to India are also covered.
		DSE: ECO-HE- 5036: Public Finance	This course is a non-technical overview of government finances with special reference to India. The course does not require any prior knowledge of economics. It will look into the efficiency and equity aspects of taxation of the centre, states and the local governments and the issues of fiscal federalism and decentralisation in India. The course will be useful for students aiming towards careers in the government sector, policy analysis, business and journalism.
	6 <sup>th</sup> Semester	Core Course 13 ECO-HC-6016: Indian Economy-II	This course examines sector-specific policies and their impact in shaping trends in key economic indicators in India. It highlights major policy debates and evaluates the Indian empirical evidence. Given the rapid changes taking place in the country, the reading list will have to be updated annually.
		Core Course 14 ECO-HC-6026: Development Economics-II	This is the second module of the economic development sequence. It begins with basic demographic concepts and their evolution during the process of development. The structure of markets and contracts is linked to the particular problems of enforcement experienced in poor countries. The governance of communities and organizations is

			studied and this is then linked to questions of sustainable growth. The course ends with reflections on the role of globalization and increased international dependence on the process of development.
	DSE: ECO-HE-6016: Environmental Economics		This course focuses on economic causes of environmental problems. In particular, economic principles are applied to environmental questions and their management through various economic institutions, economic incentives and other instruments and policies. Economic implications of environmental policy are also addressed as well as valuation of environmental quality, quantification of environmental damages, tools for evaluation of environmental projects such as cost-benefit analysis and environmental impact assessments. Selected topics on international environmental problems are also discussed.
	DSE: ECO-HE-6026: International Economics		This course develops a systematic exposition of models that try to explain the composition, direction and consequences of international trade, and the determinants and effects of trade policy. It then builds on the models of open economy macroeconomics developed in courses 08 and 12, focusing on national policies as well as international monetary systems. It concludes with an analytical account of the causes and consequences of the rapid expansion of international financial flows in recent years. Although the course is based on abstract theoretical models, students will also be exposed to real-world examples and case studies.

Course Structure for Economics (Regular)			
1 <sup>st</sup> Year	1 <sup>st</sup> Semester	ECO-RC-1016: Principles of Microeconomics—I	This course intends to expose the student to the basic principles in Microeconomic Theory and illustrate with applications.
	2 <sup>nd</sup> Semester	ECO-RC-2016: Principles of Microeconomics—II	This is a sequel to Fundamentals of Microeconomics covered in the first semester.
2 <sup>nd</sup> Year	3 <sup>rd</sup> Semester	ECO-RC-3016: Principles of Macroeconomics—I	This course introduces students to the basic concepts in Macroeconomics. Macroeconomics deals with the aggregate economy. In this course the students are introduced to the definition, measurement of the macroeconomic variables like GDP, consumption, savings, investment and balance of payments. The course also discusses various theories of determining GDP in the short run.
	4 <sup>th</sup> Semester	ECO-RC-4016: Principles of Macroeconomics—II	This is a sequel to Principles of Macroeconomics—I. It analyses various theories of determination of National Income in greater detail. It also introduces students to concept of inflation, its relationship with unemployment and some basic concepts in an open economy.
3 <sup>rd</sup> Year	5 <sup>th</sup> Semester	SEC -3 ECO-SE-5014: to be framed	
		<b>FIFTH SEMESTER</b> <b>DSE</b> ECO-RE-5016: Economic Development and Policy in India—I	This course reviews major trends in aggregate economic indicators in India and places these against the backdrop of major policy debates in India in the post- Independence period.
		<b>FIFTH SEMESTER</b> <b>GE</b> ECO-RG-5016: Economic Development	This course reviews major trends in aggregate economic indicators in India and places these against the backdrop of major policy debates in India in the

		and Policy in India-I	post- Independence period.
6 <sup>th</sup> Semester	SEC -4 ECO-SE-6014: to be framed		
	<b>SIXTH SEMESTER DSE</b> ECO-RE-6016: Economic Development and Policy in India-II	Building on the more aggregative analysis of trends in the Indian Economy offered in Economic Development and Policy-I, this course examines sector-specific trends in key indicators and their implications in the post-Independence period.	
	<b>SIXTH SEMESTER GE</b> ECO-RG-6016: Economic Development and Policy in India-II	Building on the more aggregative analysis of trends in the Indian Economy offered in Economic Development and Policy-I, this course examines sector-specific trends in key indicators and their implications in the post-Independence period.	

## **CHEMISTRY**

### **Semester I**

- **CHE-HC-1016: INORGANIC CHEMISTRY-I**

This course aims at theoretical understanding about the basic constituents of matter – atoms, ions and molecules in terms of their electronic structure and reactivity with basic quantum chemistry treatment. Periodic classification of elements and trends in properties are also studied in detail. Students would have clear understanding of the concepts related to atomic and molecular structure, chemical bonding, periodic properties and redox behaviour of chemical species. Accompanying laboratory course is designed for students to have hands-on experience of basic quantitative analytical techniques related to volumetric titrations which will help standard solution preparation in different concentration units and learn volumetric estimation through acid-base and redox reactions.

- **CHE-HC-1026: PHYSICAL CHEMISTRY I**

This course contains states of matter- gaseous, liquid and solid states along with ionic equilibria which will help students learn the kinetic theory of gases, ideal gas and real gases. In liquid state unit, the students are expected to learn the qualitative treatment of the structure of liquid along with the physical properties of liquid, viz, vapour pressure, surface tension and viscosity. In the molecular and crystal symmetry unit they are introduced to the elementary idea of symmetry which will be useful to understand solid state chemistry and group theory in some higher courses. In solid state unit the students will learn the basic solid state chemistry application of x-ray crystallography for the determination of some very simple crystal structures.

- **CHE-RC/HG-1016: CHEMISTRY I**

This course may be divided into two broad parts-inorganic and organic chemistry. In inorganic chemistry part the students learn atomic structure, chemical bonding and molecular structure. The organic chemistry part contains fundamentals of organic chemistry, stereochemistry and aliphatic hydrocarbons.

### **Semester II**

- **CHE-HC- 2016: ORGANIC CHEMISTRY I**

This course is inducted to apprise students with introduction to organic compounds, electron displacement, type of reagents and reaction intermediates. The chemistry of aliphatic and aromatic hydrocarbon, conformational analysis of

cycloalkanes and basic stereochemical phenomena are included. Students are expected to learn, explain, describe and analyze different classes of organic compounds, their reactivities and mechanisms along with stereo chemical considerations. Students will be able to identify different classes of organic compounds, describe their reactivity and explain/analyze their chemical and stereo chemical aspects.

- **CHE-HC-2026: PHYSICAL CHEMISTRY II**

In this course the chemical thermodynamics, chemical equilibrium, solutions and colligative properties are taught to the students. In this course the students are expected to learn laws of thermodynamics, thermochemistry, thermodynamic functions, relations between thermodynamic properties, Gibbs Helmholtz equation, Maxwell relations etc. Moreover the students are expected to learn partial molar quantities, chemical equilibrium, solutions and colligative properties. After completion of this course, the students will be able to understand the chemical systems from thermodynamic point of view.

- **CHE-RC/HG-2016: CHEMISTRY2**

This course may be divided into two broad parts-inorganic and physical chemistry. Three units-main group elements, transition elements and co-ordination chemistry is taught in the inorganic chemistry part. After completion of this course the students will learn periodic properties in main group elements, transition metals (3d series). They will also learn the crystal field theory in coordination chemistry unit. The physical chemistry part contains states of matter and chemical kinetics from which the students are expected to learn kinetic theory of gases, ideal gas and real gases, surface tension, viscosity, basic solid state chemistry and chemical kinetics.

### **Semester III**

- **CHE-HC-3016: INORGANIC CHEMISTRY-II**

This course aims to acquaint the students with the application of the redox chemistry. Concepts of protonic and non-protonic acids and bases are introduced for students to appreciate different types of chemical reactions. Periodic behaviour of s and p block elements related to their electronic structure and their reactivity is included to acquaint students with the principles governing their reactivity. This course further intend to apprise students about the variety of compounds of the main group elements including oxides, hydrides, nitrides, interhalogens, noble gases and inorganic polymers. As part of the accompanying lab course, experiments involving iodo- and iodi-metric titrations are included for the students to explore other varieties of redox titration. Preparation of simple inorganic compounds is introduced to give hands-on experience of inorganic synthesis. On successful completion of this course students would be able to apply theoretical principles of redox chemistry in the understanding of metallurgical processes.

- **CHE-HC-3026: ORGANIC CHEMISTRY-II**

This course is intended to apprise students about different classes of organic compounds, including halogenated hydrocarbons, alcohols, phenols, epoxides, carbonyl compounds and carboxylic and sulfonic acids. Students are expected to learn and differentiate between various organic functional groups; explain, analyze and design transformations between different functional groups. Students will be able to describe and classify organic compounds in terms of their functional groups and reactivity.

- **CHE-HC-3036: PHYSICAL CHEMISTRY-III**

The aim of this course is to teach students important topics like phase equilibria and chemical kinetics in detail and topics like surface chemistry and catalysis are introduced. The students are expected to learn phase rule and its application in some specific systems. They will also learn rate laws of chemical transformation, experimental methods of rate law determination, steady state approximation etc. in chemical kinetics unit. After attending this course the students will be able to understand different types of surface adsorption processes and basics of catalysis including enzyme catalysis, acid base catalysis and particle size effect on catalysis.

- **CHE-SE-3074: INTELLECTUAL PROPERTY RIGHTS (IPR) (SEC)**

This course helps students learn the importance of protecting the scientific discoveries, with commercial potential or the intellectual property rights at all levels – statutory, administrative, and judicial. The purpose of this course is to apprise the students about the multifaceted dimensions of this issue. After completing this course, students will have in-depth understanding about the importance and types of IPR. This course will also provide the clarity on the legal and economic aspects of the IP system.

- **CHE-RC/HG-3016: CHEMISTRY 3**

This course contains two broad parts- physical and organic chemistry. In physical chemistry part the students will be taught chemical energetics, chemical equilibrium and ionic equilibrium. After completion of this course the students will able to understand the chemical system from thermodynamic points of view. They will also learn two very important topics in chemistry- chemical equilibrium and ionic equilibrium. In organic chemistry part, the students will be introduced to different classes of organic compounds and the students are expected to learn various classes of organic molecules-alkyl halides, aryl halides, alcohols, phenols, ethers, aldehydes and ketones.

## **Semester IV**

- **CHE-HC-4016: INORGANIC CHEMISTRY-III**

This course introduces students to coordination chemistry. Various aspects like nomenclature, structure, bonding, variety and reactivity of the coordination compounds are included. Bioinorganic chemistry is included in this course to acquaint students on the useful and harmful aspects of metals in biological systems. Through the accompanying lab course, experiments related to gravimetric analysis, synthesis of coordination compounds and separation of metal ions using chromatography is included. This will broaden the experimental skills of the students where students will learn about various aspects of experiment design depending upon the requirements like synthesis, estimation or separation. On successful completion, students will be able name coordination compounds according to IUPAC, explain bonding in this class of compounds, understand their various properties in terms of CFSE and predict reactivity. Students will be able to appreciate the general trends in the properties of transition elements in the periodic table and identify differences among the rows.

- **CHE-HC-4026: ORGANIC CHEMISTRY-III**

The course intrudes students to different classes of N-based compounds, including alkaloids and terpenoids and their potential application. Students are expected to learn about different classes of N-based compounds; their structures, synthesis and reactivity. Students shall demonstrate the ability to identify and classify different types of N-based derivatives, alkaloids and heterocyclic compounds/explain their structure mechanism and reactivity/critically examine their synthesis and reactions mechanism.

- **CHE-HC-4036: PHYSICAL CHEMISTRY-IV**

The aim of this course is to introduce students with primarily two areas of physical chemistry- electrochemistry and electrical and magnetic properties of atoms and molecules. In this course the students will learn theories of conductance and electrochemistry. Students will also understand some very important topics such as solubility and solubility products, ionic products of water, conductometric titrations etc. The students are also expected to understand the various parts of electrochemical cells along with Faraday's Laws of electrolysis. The students will also gain basic theoretical idea of electrical & magnetic properties of atoms and molecules.

- **CHE-SE-4064: FUEL CHEMISTRY (SEC)**

This course discusses about the chemistry of various sources of energy. Students are expected to learn about the composition of coal and petroleum products, their extraction, purification methods and usage. A section also covers classification and applications of natural and synthetic lubricants. Students will also learn about the determination and significance of various industrially relevant physical parameters for different fuels and lubricants.

## **Semester V**

- **CHE-HC-5016: ORGANIC CHEMISTRY-IV**

This course introduces students to nucleic acids, amino acids and pharmaceutical compounds. Students will be familiarized with the importance of nucleic acids, amino acids and develop basic understanding of enzymes, bioenergetics and pharmaceutical compounds. Students will be able to explain/describe the important features of nucleic acids, amino acids and enzymes and develop their ability to examine their properties and applications

- **CHE-HC-5026: PHYSICAL CHEMISTRY-V**

The aim of this course is to introduce the students with three important areas- quantum chemistry, molecular spectroscopy and photochemistry. In quantum chemistry unit the students will be taught the postulates of quantum mechanics and the application of quantum mechanical ideas in some simple systems such as particle in a box, rigid rotor, simple harmonic oscillator etc. In spectroscopy unit, rotational, vibrational, Raman, electronic, spin resonance, and electronic spectroscopy will be introduced. After completion of this course the students are expected to understand the application of quantum mechanics in some simple chemical systems such as hydrogen atom or hydrogen like ions. The students will also learn chemical bonding in some simple molecular systems. They will be able to understand the basics of various kinds of spectroscopic techniques and photochemistry.

- **CHE-HE-5026: ANALYTICAL METHODS IN CHEMISTRY (DSE)**

This is an elective course designed to help students who learn about the qualitative/quantitative characterization and separation techniques. The content of this course aims to cover some of the widely used instrumental techniques for characterization of samples. Experiments included aim at giving students hands on experience using different instrumental techniques and chemical analysis. On successful completion students will have theoretical understanding about choice of various analytical techniques used for qualitative and quantitative characterization of samples. At the same time through the experiments students will gain hands on experience of the discussed techniques and take judicious decisions while analyzing different samples.

- **CHE-HE-5046: NOVEL INORGANIC SOLIDS (DSE)**

This course intends to make learners familiar with a wide variety of technologically important and emerging materials. It will prepare the learners for studying materials further at the master's level. After the completion of this course it will also be possible for the students to opt for studying an interdisciplinary master's programme with an emphasis on the synthesis and applications of various materials or take up a job in the materials production and/or processing industry.

## **Semester VI**

- **CHE-HC-6016: INORGANIC CHEMISTRY-IV**

The unit on reaction mechanism is included for the students to get acquainted with the kinetic and thermodynamic factors governing the reaction path and stability of inorganic compounds. Organometallic compounds are introduced so as to apprise students about the importance of metal carbon bond to form complexes and their application as catalysts. Students are expected to learn factors leading to stability of organometallic compounds, their synthesis, reactivity and uses. Qualitative inorganic analysis is included to give students an idea and hands on experience of application of inorganic chemistry. Students should learn how differential reactivity under different conditions of pH can be used to identify variety of ions in a complex mixture. Experiments related to synthesis and characterization of coordination compounds are included to supplement their theoretical knowledge. By studying this course the students are expected to learn about how ligand substitution and redox reactions take place in coordination complexes. Students will also learn about organometallic compounds, comprehend their bonding, stability, reactivity and uses. They will be familiar with the variety of catalysts based on transition metals and their application in industry. On successful completion, students in general will be able to appreciate the use of concepts like solubility product, common ion effect, pH etc. in analysis of ions and how a clever design of reactions, it is possible to identify the components in a mixture. With the experiments related to coordination compound synthesis, calculation of 10Dq, controlling factors etc. will make the students appreciate the concepts of theory in experiments.

- **CHE-HC-6026: ORGANIC CHEMISTRY-V**

This is a basic course in organic spectroscopy and provides introduction to carbohydrate chemistry, dyes and polymers. Students are expected to learn about the different spectroscopic techniques and their applications in organic chemistry. Students shall be apprised with carbohydrate chemistry, dyes and polymers and their structure, reactivity and chemical properties. Students will be able to explain/describe basic principles of different spectroscopic techniques and their importance in chemical/organic analysis. Students shall be able to classify/identify/critically examine carbohydrates, polymers and dye materials.

- **CHE-HE-6036: INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE (DSE)**

This course helps to learn the synthetic process, properties and the utility of the industrially important inorganic materials (such as silicates, ceramics, cements, fertilizers, paints, batteries, alloys and explosives) and learn some of the industrial process such as surface coating and catalysis in relevant to industry where heterogeneous catalysis dominates. Experiments help learners acquire hands on experience in qualitative and quantitative analysis of the inorganic materials which are basically manufactured in chemical industries.

- **CHE-HE-6056: DISSERTATION**

Student will complete a project work and then prepare a report on that.

## **COMPUTER SCIENCE**

**CO1: Introduction to Programming Language:** This paper will develop the ability to learn new languages more quickly to understand the concept of functional programming language Develop ability to learn and write small programs in different programming Languages.

**CO2: Basic Electronics:** This paper will develop the ability to check the hardware issues in any electrical devices.

**CO3: Practical Programming in C:** This paper will develop the ability to learn basic programming skills and enhances the problem solving capacity using computer programming.

**O4: ICT Hardware:-** This paper specially focuses to understand the structure, function and characteristics of computer systems, to understand the design of the various functional units and components of computers. This paper also includes MS Word, MS power point, MS excel contents.

**CO5: Discrete Mathematics:** Students will be bale to learn functionalities of basic logic gates and Boolean Algebra and other discrete mathematics applications in computer science.

**CO6: Practical ICT Hardware:-** This paper specially focuses on the hardware part of the Computer system specially the motherboard parts, diagnosis also Practical of MS office (MS power point, MS Excel, MS Word etc.).

**CO7: Data Structures:** This paper will develop the ability to learn the structures of data and how data can actually be organized and stored in computer memory.

**CO8: Computer Organization and Architecture:** This paper specially focuses to understand the structure, function and characteristics of computer systems, to understand the design of the various functional units and components of computers, identify the elements of instructions sets and their impacts on processor design, to explain the function of each element of a memory hierarchy and to identify and compare different methods for computer I/O modules.

**CO9: Practical Data Structure :**This paper provides practical approaches to design the available user defined data structures using programming language

**CO10: Operating System:** This paper focuses to understand the basic components of a computer operating system, and the interactions among the various components. The course covers an introduction on the policies for disk scheduling, CPU scheduling, deadlocks, memory management, synchronization, system calls, and file systems.

**CO11: Database Management System:** This paper will develop the ability to learn the structural knowledge of data storage. It covers the introduction of Database and DBMS.

**CO12: Practical Operating System DBMS:** This paper will develop the practical based knowledge of database management system.

**CO13: Object Oriented Programming using C++:** This paper specially focuses to students understand the principles of object-oriented problem solving and programming. This paper also analyse problems and implement simple C++ application using an object-oriented software engineering approach. After completing this subject student will be able to learn the concept of object, class, Inheritance and polymorphism.

**CO14: Computer Oriented Numerical Methods and Statistical Techniques:** This paper specially focuses on solving various numerical methods theoretically like Bisection, Newton-Raphson, Simpson's rules, Runge-Kutta, Polynomials etc. with the help of computer programming.

**CO15: Computer Networks:** - This paper focuses to understand and describe the layered protocol model and describe,analyse and evaluate a number of data link, network, and transport layer protocols ,and evaluate networks and services homes,data centres,LANs,WANs.This paper also teach program network communication services for client/server and other applications layouts.This paper describes,anaylse and evaluate various related technical,administrative and social aspects of specific computer network protocols from standards documents and other primary materials found through research.

**CO16: Microprocessor and Assembly Language Programming:** This paper specially focuses to understand the structure, function and characteristics of computer systems, to understand the design of the various functional units and components of computers and different architectures which supports processor,provides interface for i/o devices,maintains timing and control of the computer.This paper will also help to learn assembly language program which helps students understanding the processor and memory functions,using assembly language program we can generate traffic control signal etc.This subjects also helps to identify the elements of instructions sets and their impacts on processor design, to explain the function of each element of a memory hierarchy and to identify and compare different methods for computer I/O modules.

**CO17: Practical Object Oriented Programming and Computer Networks:** This Lab paper specially focuses on practical implementation of Object Oriented Programming through C++ language and Computer Networks protocols and other terminologies relating to it.

**CO18: Practical Computer Oriented NMST Microprocessor and Assembly Language Programming:** This paper specially focuses on the practical of Computer oriented numerical methods like Bisection, Newton-Raphson, Simpson's rules etc. and assembly language programming.

**CO19: Automata Theory and Languages:** This paper focuses to understand the basic properties of Formal Languages and Grammars of Regular, Context-Free and Recursively Enumerable languages, study on grammars to produce strings from a specific language. It also acquires concepts relating to the theory of computation and computational models.

**CO20: Web Technologies:** On completion of this paper, a student will be familiar with client-server architecture and able to gain basics of developing and hosting a web application using HTML, JAVASCRIPT, CSS, XML, ASP, PHP etc.

**CO21: System Administration using Linux:** This paper focuses to understand and describe the basics of file structures and processing with files using commands and System maintenance, Disk usage, User management, Networking and IP addressing basics and other system administration related tasks.

**CO22: Practical Web Technologies System Administration using Linux:** One part of this paper focuses on practical approaches to design, develop and host a web application using various languages and other part of the paper helps students to become familiar with Linux environment with various commands and tools and techniques learnt in the theory paper of System Administration using Linux.

**CO23: Project:** Each student is assigned with a project work based the knowledge and concepts of previous subjects taught to them and it strongly emphasizes on how a software is designed and developed from the stage of feasibility analysis to maintenance of the software.

## **PHYSICS**

### **Honors Course**

<b>Paper Code</b>	<b>Paper Name</b>	<b>Outcome</b>
PHY-HC-1016	<b>Mathematical Physics I</b>	Successful students should be able to understand vector and its applications in various fields, differential equations and its applications, different coordinate systems, concept of probability and error.
PHY-HC-1026	<b>Mechanics</b>	On successful completion of the course students should be able understand Inertial and non inertial reference frames, Newtonian motion, Galilean transformations, projectile motion, work and energy, Elastic and inelastic collisions, motion under central force, simple harmonic oscillations, special theory of relativity.

PHY-HC-2016	<b>Electricity &amp; Magnetism</b>	After successful completion of this course, students will be able to Understand electric and magnetic fields in matter, Dielectric properties of matter magnetic properties of matter, electromagnetic induction, applications of Kirchhoff's law in different circuits, applications of network theorem in circuits
PHY-HC-2026	<b>Waves &amp; Optics</b>	After successful completion of this course, students will be able to Understand superposition of harmonic oscillations, different types of wave motions, superposition of harmonic waves, interference and interferometer, diffraction, holography
PHY-HC-3016	<b>Mathematical Physics II</b>	After successful completion of the course, students will be able to solve differential equation using power series solution method, solve differential equation using separation of variables method, special integrals, different properties of matrix, Fourier series.
PHY-HC-3026	<b>Thermal Physics</b>	Upon successful completion, students will have the knowledge and skills to identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, Thermodynamics potentials, Free energies, Maxwell's relations in thermodynamics.
PHY-HC-3036	<b>Digital Systems &amp; Applications</b>	After successful completion of the course student will be able to understand the working principle of CRO, develop a digital logic and apply it to solve real life problems, Analyze, design and implement combinational logic circuits, Classify different semiconductor memories, Analyze, design and implement sequential logic circuits, Analyze digital system design using PLD, Simulate and implement combinational and sequential circuits.
PHY-SE-3014	<b>Physics Workshop Skills</b>	The aim of this course is to enable the students to familiar and experience with various mechanical and electrical tools through hands-on mode
PHY-HC-4016	<b>Mathematical Physics III</b>	On successful completion of the course students will be able to solve complex integrals using residue theorem, apply Fourier and Laplace transforms in solving differential equations, understand properties of Tensor like Transformation of coordinates, contravariant and co-varient tensors, indices rules for combining tensors.
PHY-HC-4026	<b>Elements of Modern Physics</b>	On completion of the course students will be able to understand modern development in Physics, Starting from Planck's law, it development of the idea of probability interpretation and the formulation of Schrodinger equation. Students will also get preliminary idea of structure of nucleus, radioactivity Fission and Fusion and Laser

PHY-HC-4036	<b>Analog Systems &amp; Applications</b>	On successful completion of the course students will be able to understand about the physics of semiconductor p-n junction and devices such as rectifier diodes, zener diode, photodiode etc. and bipolar junction transistors, transistor biasing and stabilization circuits, the concept of feedback in amplifiers and the oscillator circuits, students will also have an understanding of operational amplifiers and their applications.
PHY-HC-5016	<b>Quantum Mechanics &amp; Applications</b>	On successful completion of the course students will be able to understand the principles in quantum mechanics, such as the Schrödinger equation, the wave function, the uncertainty principle, stationary and non-stationary states, time evolution of solutions, as well as the relation between quantum mechanics and linear algebra. Students will be able to solve the Schrödinger
PHY-HC-5026	<b>Solid State Physics</b>	On successful completion of the course students should be able to explain the main features of crystal lattices and phonons, understand the elementary lattice dynamics and its influence on the properties of materials, describe the main features of the physics of electrons in solids; explain the dielectric ferroelectric and magnetic properties of solids and understand the basic concept in superconductivity.
PHY-HE-5036(DSE)	<b>Advanced Mathematical Physics-I</b>	After the completion of this course, students will be able to solve problems in Physics related to Linear Vector space, Matrix algebra, Tensor.
PHY-HE-5056(DSE)	<b>Nuclear and Particle Physics</b>	Upon completion of this course, students will have the understanding of the sub atomic particles and their properties. They will gain knowledge about the different nuclear techniques and their applications in different branches of Physics and societal application. The course will develop problem based skills and the acquire knowledge can be applied in the areas of nuclear, medical, archeology, geology and other interdisciplinary fields of Physics and Chemistry.
PHY-HC-6016	<b>Electromagnetic Theory</b>	On successful completion of the course students will acquire the concepts of Maxwell's equations, propagation of electromagnetic (EM) waves in different homogeneous-isotropic as well as anisotropic unbounded and bounded media, production and detection of different types of polarized EM waves, general information as waveguides and fibre optics.
PHY-HC-6026	<b>Statistical Mechanics</b>	On successful completion of the course students will learn the techniques of Statistical Mechanics to apply in various fields including Astrophysics, Semiconductors, Plasma Physics, Bio-Physics, Chemistry and in many other directions.

PHY-HE-6036	<b>Advanced Mathematical Physics II</b>	After completion of the course students will be able to apply the concepts of Calculus of Variations, Group Theory and Probability Theory to solve numerical problems in Physics.
PHY-HE-6056 PHYSICS-DSE:	<b>CLASSICAL DYNAMICS</b>	Upon completion of this course, students will have the overview of Newton's Laws of Motion, Special Theory of Relativity by 4-vector approach and fluids. Students will also have the understanding of the Lagrangian and Hamiltonian of a system.. By the end of this course, students will be able to solve the seen or unseen problems/numericals in classical mechanics.

### Regular Courses

<u>Paper Code</u>	<u>Paper name</u>	<u>Outcome</u>
PHY-RC/HG-1016	<b>Mechanics</b>	Upon completion of this course, students are expected to understand the role of vectors and coordinate systems in Physics, solve Ordinary Differential Equations, laws of motion and their application to various dynamical situations, Inertial reference frames their transformations, concept of conservation of energy, momentum, angular momentum and apply them to basic problems, phenomenon of simple harmonic motion, motion under central force, concept of time dilation, Length contraction using special theory of relativity. In the laboratory course, after
		acquiring knowledge of how to handle measuring instruments (like screw gauge, Vernier calipers, travelling microscope) student shall embark on verifying various principles and associated measurable parameters.
PHY-RC/HG-2016	<b>Electricity &amp; Magnetism</b>	Upon completion of this course, students are expected to apply Gauss's law of electrostatics to solve a variety of problems, calculate the magnetic forces that act on moving charges and the magnetic fields due to currents, have brief idea of magnetic materials, understand the concepts of induction, and apply them to solve variety of problems. In the Lab course, students will be able to measure resistance (high and low), Voltage, Current, self and mutual inductance, capacitor, strength of magnetic field and its variation, study different circuits RC, LCR etc.

HY-RC/HG-3016	<b>Thermal Physics &amp; Statistical Mechanics</b>	Upon completion of this course, students are expected learn the basic concepts of thermodynamics, the first and the second law of thermodynamics, the concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations, Maxwell's thermodynamic relations, fundamentals of the kinetic theory of gases, Maxwell-Boltzman distribution law, equipartition of energies, mean free path of molecular collisions, viscosity, thermal conductivity, diffusion and Brownian motion, black body radiations, Stefan- Boltzmann's law, Rayleigh-Jean's law and Planck's law and their significances, quantum statistical distributions, viz., the Bose- Einstein statistics and the Fermi- Dirac statistics. In the laboratory course, the students will be able to Measure of Planck's constant using black body radiation, determine Stefan's Constant, coefficient of thermal conductivity of a bad conductor and a good conductor, determine the temperature coefficient of resistance, study variation of thermo emf across two junctions of a thermocouple with temperature etc
PHY-RC/HG-4016	<b>Waves &amp; Optics</b>	Upon completion of this course, students are expected to understand Simple harmonic oscillation and superposition principle, importance of classical wave equation in transverse and longitudinal waves and solving a range of physical systems on its basis, concept of normal modes in transverse and longitudinal waves: their frequencies and configurations, interference as superposition of waves from coherent sources derived from same parent source, Demonstrate understanding of Interference and diffraction experiments, Polarization. In the laboratory course, student will gain hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc. Resolving power of optical equipment, the motion of coupled oscillators, study of Lissajous figures and behaviour of transverse, longitudinal waves.
PHY-HE-5036(Generic& Regular)	<b>Advanced Mathematical Physics-I</b>	After the completion of this course, students will be able to solve problems in Physics related to Linear Vector space, Matrix algebra, Tensor.

PHY-HE-6036	<b>Advanced Mathematical Physics II</b>	After completion of the course students will be able to apply the concepts of Calculus of Variations, Group Theory and Probability Theory to solve numerical problems in Physics.
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## **Mathematics**

### **SEMESTER -I**

#### **PAPER : MAT-HC-1016: CALCULUS (Including practical)**

**Course Objectives :** The primary objective of this course is to introduce the basic tools of calculus and geometric properties of different conic sections which are helpful in understanding their applications in planetary motion , design of telescope and to the real world problems .Also , computer lab will help to have a deep conceptual and understanding of the above tools in true sense .

**Course Learning Outcomes :** This course will enable the students to :

- i) Learn first and second derivative tests for relative extremum and apply the knowledge in problems in business , economics and life sciences .
- ii) Sketch curves in a plane using its mathematical properties in different coordinate systems .
- iii) Compute area of surfaces of revolution and the volume of solids by integrating over cross-sectional areas.
- iv) Understanding the calculus of vector functions and its use to develop the basic principles of planetary motion .

#### **PAPER: MAT-HC-1026: ALGEBRA**

**Course Objectives :** The primary objective of this course is to introduce the basic tools of set theory , functions , induction principle , theory of equations , complex numbers , number theory , matrices and determinant to understand their connection with the real-world problems .

**Course Learning Outcomes :** This course will enable the students to:

- i) Employ De Moivre's theorem in a number of applications to solve numerical problems.
- ii) Learn about equivalent classes and cardinality of a set .
- iii) Use modular arithmetic and basic properties of congruences.
- iv) Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix.
- v) Learn about the solution sets of linear systems using matrix method and Cramer's rule.

### **SEMESTER-II**

#### **PAPER : MAT-HC-2016 : REAL ANALYSIS**

**Course Objectives:** This course will develop a deep rigorous understanding of real line and of defining terms to prove the results about convergence and divergence of sequences and series of real numbers. These concepts have wide range of applications in real life scenario .

**Course Learning Outcomes :** This course will enable the students to :

- i) Understand many properties of the real line  $\mathbb{R}$  , including completeness and Archimedean properties .
- ii) Learn to define sequences in terms of functions from  $\mathbb{N}$  to a subset of  $\mathbb{R}$  .
- iii) Recognize bounded , convergent ,divergent ,Cauchy and monotonic sequences and to calculate their limit superior ,limit inferior and the limit of a bounded sequence.
- iv) Apply the ratio , root ,alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers .

#### **PAPER : MAT-HC-2026: DIFFERENTIAL EQUATIONS (including practical)**

**Course Objectives :** The main objective of this course is to introduce the students to the exciting world of differential equations , mathematical modeling and their applications .

Course Learning Outcomes : the course will enable the students to :

- i) Learn basics of differential equations and mathematical modeling .
- ii) Formulate differential equations for various mathematical models.
- iii) Solve first order non-linear differential equations and linear differential equations of higher order using various techniques .
- iv) Apply these techniques to solve and analyze various mathematical models.

#### **SEMESTER-III**

#### **PAPER : MAT-HC-3016 : THEORY OF REAL FUNCTIONS**

**Course Objectives :** It is a basic course on the study of real valued functions that would develop an analytical ability to have a more matured perspective of the key concepts of calculus , namely ; limits , continuity , differentiability and their applications .

Course Learning Outcomes : This course will enable the students to :

- i) Have a rigorous understanding of the concept of limit of a function .
- ii) Learn about continuity and uniform continuity of functions defined on intervals .
- iii) Understand geometrical properties of continuous functions on closed and bounded intervals .
- iv) Learn extensively about the concept of differentiability using limits , leading to a better understanding for applications.
- v) Know about applications of mean value theorems and Taylor's theorem.

#### **PAPER : MAT-HC-3026 : GROUP THEORY-I**

**Course Objectives :** The objective of the course is to introduce the fundamental theory of groups and their homomorphisms . Symmetric groups and group of symmetries are also studied in detail . Fermat's Little theorem is studied as a consequence of the Lagrange's theorem on finite groups .

**Course Learning Outcomes :** The course will enable the students to :

- i) Recognize the mathematical objects that are groups and classify them as abelian , cyclic and permutation groups, etc ..

- ii) Link the fundamental concepts of groups and symmetrical figures .
- iii) Analyze the subgroups of cyclic groups and classify subgroups of cyclic groups .
- iv) Explain the significance of the motion of cosets , normal subgroups and factors groups.
- v) Learn about Lagrange's theorem and Fermat's Little theorem .
- vi) Know about group homomorphisms and group isomorphisms.

#### **PAPER : MAT-HC-3036 : ANALYTICAL GEOMETRY**

**Course Objectives :** The primary objective of this to introduce the basic tools of two dimensional coordinates systems , general conics , and three dimensional coordinate systems .

**Course Learning Outcomes :** This course will enable the students to :

- i) Learn conic sections and transform co-ordinate systems.
- ii) Learn polar equation of a conic , tangent , normal and properties.
- iii) Have a rigorous understanding of the concept of three dimensional coordinates systems.

#### **PAPER : MAT-SE-3014:COMPUTER ALGEBRA SYSTEMS AND RELATED SOFTWARE**

**Course Objectives :** This course aims at familiarizing students with the usage of mathematical softwares ( Mathematica / MATLAB /Maxima / Maple) and the statistical software R . The basic emphasis is on plotting and working with matrices using CAS . Data entry and summary commands will be studied in R. Graphical representation of data shall also be explored.

**Course Learning Outcomes :** This course will enable the students to :

- i) Use of softwares ; Mathematica/MATLAB/Maxima/maple etc. as a calculator ,for plotting functions and animation.
- ii) Use of CAS for various applications of matrices such as solving system of equations and finding eigenvalues and eigenvectors .
- iii) Understand the use of the statistical software R as calculator and learn to read and get data into R.
- iv) Learn the use of R in summary calculation ,pictorial representation of data and exploring relationship between data.
- v) Analyze ,test and interpret technical arguments on the basis of geometry.

#### **PAPER : MAT-SE-3024: COMBINATORICS AND GRAPH THEORY**

**Course Objectives :** This course aims to provide the basic tools of counting principles ,pigeonhole principle .Also introduce the basic concepts of graphs , Eulerian and Hamiltonian graphs and applications to dominoes , diagram tracing puzzles ,Knight's tour problem and Gray codes .

**Course Learning Outcomes:** This course will enable the students to :

- i) Learn about the counting principles , permutations and combinations ,Pigeonhole principles.
- ii)Understand the basic of graph theory and learn about social networks, Eulerian and Hamiltonian graphs , diagram tracing puzzles and Knight's tour problem.

#### **SEMESTER-IV**

#### **PAPER: MAT-HC-4016: MULTIVARIATE CALCULUS**

**Course Objectives :** to understand the extension of the studies of single variable differential and integral calculus to functions of two or more independent variables. Also ,the emphasis will be on the use of Computer Algebra Systems by which this concepts may be analyzed and visualized to have a better understanding .This course will facilitate to become aware of applications of multivariate calculus tools in physics ,economics ,optimization and understanding the architecture of curves and surfaces in plane and space etc.

**Course Learning Outcomes:** this course will enable the students to :

- i) Learn the conceptual variation when advancing in calculus from one variable to multivariable discussion .
- ii) Understand the maximization and minimization of multivariate functions subject to the given constraints .
- iii) Learn about inter-relationship amongst the lie integral ,double and triple integral formulations.
- iv) Familiarize with Green's ,Stokes' and Gauss divergence theorems.

#### **PAPER : MAT-HC-4026: NUMERICAL METHODS (including practical)**

**Course Objectives :** to comprehend various computational techniques to find approximate value for possible root(s) of non-algebraic equations and to find the approximate solutions of system of linear equations and ordinary differential equations .Also ,use of Computer Algebra System(CAS) by which the numerical problems can be solved both numerically and to enhance the problem solving skills.

**Course Learning Outcomes:** The course will enable the students to:

- i) Learn some numerical methods to find the zeroes of nonlinear functions of a single variable and solution of a system of linear equations ,up to a certain given level of precision.
- ii) Know about methods to solve system of linear equations ,such as False position method ,Fixed point iteration method Newton's method ,Scant method and LU decomposition .
- iii) Interpolation techniques to compute the values for a tabulated function at points not in the table .
- iv) Applications of numerical differentiation and integration to convert differential equations into difference equation of numerical solutions

#### **PAPER: MAT-HC-4036: RING THEORY**

**Course Objectives:** The objective of this course is to introduce the fundamental theory of rings and their corresponding homomorphisms. Also introduces the basic concepts of ring of polynomials and irreducibility tests for polynomials over ring of integers .

**Course Learning Outcomes:** On completion of this course students will be able to :

- i) Appreciate the significance of unique factorization in rings and integral domains.
- ii) Learn about the fundamental concept of rings,integral domains and fields .
- iii) Know about ring homomorphism and isomorphism theorems of rings.
- iv) Learn about the polynomial rings over commutative rings, integral domains, Euclidian domains and UFD.

**Programme Learning Outcomes:** the completion of the BMATH(H) Programme shall enable a student to:

- i) Communicate mathematics effectively by oral, written , computational and graphic means.
- ii) Create mathematical ideas from basic axioms .
- iii) Gauge the hypothesis , theories ,techniques and proofs provisionally .
- iv) Utilize mathematics to solve theoretical and applied problems by critical understanding, analysis and synthesis.

- v) Identify applications of mathematics in other disciplines and in real world ,leading to enhancement of career prospects in a plethora of fields .
- vi) Appreciate the requirement of lifelong learning through continued education and research.

**SEMESTER- V**  
**MAT-HC-5016: Riemann Integration and Metric spaces**  
**Total Marks: (Theory 80, Internal assessment 20)**

**Course Objectives:** To understand the integration of bounded functions on a closed and bound interval and its extension to the cases where either the interval of integration is infinite, or the integrand has infinite limits at a finite number of points on the interval of integration. Up to this stage , students do study the concepts of analysis which evidently rely on the notion of distance .

In this course, the objective is to develop the usual idea of distance into an abstract form on any objects, maintaining its inherent characteristics, and the resulting consequences.

**Course Learning Outcomes:** The course will enable the students to:

- i) Learn about some of the classes and properties of Riemann integrable functions, and the applications of the Fundamental theorems of integration.
- ii) Know about improper integrals including, beta and gamma functions.
- iii) Learn various natural and abstract formulations of distance on the sets of usual or unusual entities. Become aware one such formulations leading to metric spaces.
- iv) Analyse how a theory advances from a particular frame to a general frame.
- v) Appreciate the mathematical understanding of various geometrical concepts, viz. Balls or connected sets etc. in an abstract setting.
- vi) Know about Banach fixed point theorem, whose far-reaching consequences have resulted into an independent branch of study in analysis, known as fixed point theory.
- vii) Learn about the two important topological properties, namely connectedness and compactness of metric spaces .

**MAT-HC-5026: Linear Algebra**  
**Total Marks: 100: (Theory 80 Internal Assessment: 20)**

**Course Objectives:** The objective of this course is to introduce the fundamental theory of vector spaces, also emphasizes the application of techniques using the adjoint of a linear operator and their properties to least squares approximation and minimal solutions to systems of linear equations.

**Course Learning Outcomes:** The course will enable the students to:

- i) Learn about the concept of linear independence of vectors over a field, and the dimension of a vector space.
- ii) Basic concepts of linear transformations, dimension theorem, matrix representation of a linear transformation, and the change of coordinate matrix.
- iii) Compute the characteristic polynomial, eigenvalues, eigenvectors, and eigenspaces, as well as the geometric and the algebraic multiplication of an eigenvalue and apply the basic diagonalization result .
- iv) Compute inner products and determine orthogonality on vector spaces, including gram- Schmidt orthogonalization to obtain orthonormal basis.
- v) Find the adjoint, normal, unitary and orthogonal operators.

**DSE-1**  
**MAT-HE-5016: Number Theory**

**Course Objectives:** In number theory there are challenging open problems which are comprehensible at undergraduate level, this course is intended to build a micro aptitude of understandind aesthetic aspect of mathematical instructions and gear young minds to ponder upon such problems.

**Course Learning Outcomes:** This course will enable the students to:

- i) Learn about some fascinating discoveries related to the properties of prime numbers, and some of the open problems in number theory, viz., Goldbach conjecture etc. .
- ii) Know about number theoretic and modular arithmetic.
- iii) Solve linear, quadratic and system of linear congruence equations.

### **MAT-HE-5026: Mechanics**

**Course Objectives:** The course aims at understanding the various concepts of physical quantities and the related effects on different bodies using mathematical techniques. It emphasizes knowledge building for applying mathematics in physical world.

**Course Learning Outcomes:** The course will enable the students to:

- i) Know about the concepts in statics such as moments, couples, equilibrium in both two and three dimensions.
- ii) Understand and theory behind friction and center of gravity.
- iii) Know about conservation of mechanical energy and work-energy equation.
- iv) Learn about translation and rotational motion of rigid bodies.

### **MAT-HE-5036: Probability and Statistics**

**Course Objectives:** To make the students familiar with the basic statistical concepts and tools which are needed to study situations involving uncertainty or randomness. The course intends to render the students to several examples and exercises that blend their everyday experiences with their scientific interests.

**Course Learning Outcomes:** This course will enable the students to:

- i) Learn about probability density and moment generating functions.
- ii) Know about various univariate distributions such as Bernoulli, Binomial, Poisson, gamma and exponential distribution.
- iii) Learn about distributions to study the joint behavior of two random variables.
- iv) Measure the scale of association between two variables, and to establish a formulation helping to predict one variable in terms of the other, i.e., correlation and linear regression.
- v) Understand central limit theorem, which helps to understand the remarkable fact that: the empirical frequencies of so many natural populations, exhibit a bell-shaped curve, i.e., a normal distribution.

### **DSE-2 MAT-HE-5046: Linear Programming**

**Course Objectives:** This course develops the ideas underlying the Simplex Method for Linear programming problem, as an important branch of Operations Research. The course covers Linear programming with applications to transportation, assignment and game problem. Such problems arise in manufacturing resource planning and financial sectors.

**Course Learning Outcomes:** This course will enable the students to:

- i) Learn about the graphical solution of linear programming problem with two variables.
- ii) Learn about the relation between basic feasible solutions and extreme points.
- iii) Understand the theory of the simplex method used to solve linear programming problems.
- iv) Learn about two-phase and big-M methods to deal with problems involving artificial variables.
- v) Learn about the relationships between the primal and dual problems.
- vi) Solve transportation and assignment problems.
- vii) Apply linear programming method to solve two-person zero-sum game problems.

### **MAT-HE-5056: Spherical Trigonometry and Astronomy**

**Course Objectives:** The main objectives of this course is to provide the spherical triangles, Napier's rule of circular parts and Planetary motion

**Course Learning Outcomes:** This course will enable the students to:

- i) Learn about the properties of spherical and polar triangles.
- ii) Know about fundamental formulae of spherical triangles.
- iii) Learn about the celestial sphere, circumpolar star, rate of change of zenith distance and azimuth.
- iv) Learn about Kepler's law of planetary motion, Cassini's hypothesis, differential equation for fraction.

### **MAT-HE-5066: Programming in C (including practical)**

**Course Objectives:** This course introduces C programming in the idiom and context of mathematics and imparts a starting orientation using available mathematical libraries, and their applications.

**Course Learning Outcomes:** After completion of this paper, student will be able to:

- i) Understand and apply the programming concepts of C which is important to mathematical investigation and problem solving.
- ii) Learn about structured data-types in C and learn about applications in factorization of an integer and understanding Cartesian geometry and Pythagorean triples.
- iii) Use of containers and templates in various applications in algebra.
- iv) Use mathematical libraries for computational objectives.
- v) Represent the output of programs visually in terms of well formatted text and plots.

### **SEMESTER-VI**

#### **MAT-HC-6016: Complex Analysis (including practical)**

**Course Objectives:** This course aims to introduce the basic ideas of analysis for complex functions with visualization through relevant practicals. Emphasis has been given on Cauchy's theorems, series expansions and calculation of residues.

**Course Learning outcomes:** Completion of the course will enable the students to:

- i) Learn the significance of differentiability of complex functions leading to the understanding of Cauchy-Riemann equations.
- ii) Learn some elementary functions and can evaluate the contour integrals.
- iii) Understand the role of Cauchy-Goursat theorem and the Cauchy integral formula.
- iv) Expand some simple functions as their Taylor and Laurent series, classify the nature of singularities, find residues and apply Cauchy Residue theorem to evaluate integrals.

#### **MAT-HC-6026: Partial Differentile Equation (including Practical)**

**Course Objectives:** The main objectives of this course are to teach students to form and solve partial differential equations and use them in solving some physical problems.

**Course Learning Outcomes:** The course will enable the students to:

- i) Formulate, classify and transform first order PDEs into canonical form.
- ii) Learn about method of characteristics and separation of variables to solve first order PDE's.
- iii) Classify and solve second order linear PDEs.
- iv) Learn about Cauchy problems for second order PDE and homogeneous as well as nonhomogeneous wave equations.
- v) Apply the method of separation of variables for solving second order PDEs.

### **DISCIPLINE SPECIFIC PAPERS DSE-3**

**Course Objectives:** This course aims to introduce the basic ideas and properties of ordered sets, Lattices Boolean algebra and automata theory.

**Course Learning Outcomes:** The courses will enable the students to:

- i) Learn about the order isomorphism, Hasse diagrams, building new ordered set.

- ii) Learn about the algebraic structure lattices, properties of modular and distributive lattices.
- iii) Get ideas about the Boolean algebra, Switching circuits and application of switching circuits.
- iv) Appreciate the theory of automata and its applications.

### **MAT-HE-6026: Bio-Mathematics**

**Courses Objectives:** The focus of the courses is on scientific study of normal functions related to living systems. The emphasis is on exposure to nonlinear differential equations with examples such as heartbeat, chemical reactions and nerve impulse transmission. The basic concepts of the probability to understand molecular evolution and genetics have also been applied.

**Course Learning Outcomes:** Apropos conclusion of the course will empower the student to:

- i) Learn the development, analysis and interpretation of bio mathematical models such as population growth, cell division, and predator-prey models.
- ii) Learn about the mathematics behind heartbeat model and nerve impulse transmission model.
- iii) Appreciate the theory of bifurcation and chaos.
- iv) Learn to apply the basic concepts of probability to molecular evolution and genetics.

### **MAT-HE-6036: Mathematical Modelling (including Practical)**

**Course Objectives:** The main objective of this course is to teach students how to model physical problems using differential equations and solve them. Also, the use of Computer Algebra Systems (CAS) by which the listed problems can be solved both numerically and analytically.

**Course Learning outcomes:** The course enable the students to:

- i) Know about power series solution of a differential equation and learn about Legendre's and Bessel's equations.
- ii) Use of Laplace transform and inverse transform for solving initial value problems.
- iii) Learn about various models such as Monte Carlo simulation models, queuing models, and linear programming models.

### **MAT-HE-6046: Hydromechanics**

**Course Objectives:** The main objectives of this course are to teach students about fluid pressure on plane surfaces, curved surfaces and Gas law. Also, introduces velocity of a fluid at a point, Eulerian and Lagrangian method, velocity and acceleration of a fluid at a point.

**Course Learning outcomes:** The course will enable the students to:

- i) Know about Pressure equation, rotating fluids.
- ii) Learn about Fluid pressure on plane surfaces, resultant pressure on curved surfaces, Gas law, mixture of gases.
- iii) Learn about the Eulerian and Lagrangian method.
- iv) Learn about equation of continuity, examples, acceleration of a fluid at a point.

### **DSE-4**

### **MAT-HE-6056: Rigid Dynamics**

**Course Objectives:** The main objectives of this course is to introduce moments and products of inertia, theorem of six constants, D'Alembert's principle, Motion of a body in two dimension and Lagrange's equation.

**Course Learning Outcomes:** The course will enable the students to:

- i) Know how to find the moments and products of inertia.
- ii) Learn about the motion of the centre of inertia.
- iii) Learn about the D'Alembert's principle and Lagrange's equation.
- iv) Learn about motion of a body in two dimension.

### **MAT-HE-6066: Group Theory II**

**Course objectives:** The course will develop an indepth understanding of one of the most important branch of the abstract algebra with applications to practical real-world problems. Classification of all finite abelian groups can be done.

**Course Learning Outcomes:** The course shall enable students to:

- i) Learn about automorphisms for constructing new groups from the given group.
- ii) Learn about the fact that external direct product applies to data security and electric circuits.
- iii) Understand fundamental theorem of finite abelian groups.
- iv) Be familiar with group actions and conjugacy in  $S_n$ .
- v) Understand Sylow theorems and their applications in checking non-simplicity.

### **MAT-HE-6076: Mathematical Finance**

**Course Objectives:** This course is an introduction to the application of mathematics in finacial world, that enables the students to understand some computational and quantitative techniques required for working in the financial markets and actuarial mathematics.

**Course Learning Outcomes:** On completion of this course, the students will be able to:

- i) Know the basics of financial markets and derivatives including options and futures.
- ii) Learn about pricing and hedging of options , as well as interest rate swaps.
- iii) Learn about no-arbitrage pricing concept and types of options.
- iv) Learn stochastic annlysis (Ito formula, Ito integration) and the Black-Scholes model.
- v) Understand the concepts of trading strategies and valuation of currency swaps

## **STATISTICS**

### **STA-HC-1016**

**Objective:-**To present a brief picture of data, measures of central of the main feature of the entire data .If helps in reducing the data to a single value which is used for doing comparative studies.

**Outcomes:-** This course will enable the students to

- (1) Differentiate between the mean , the meadian and the mode of data.
- (2)Determine the value of the mean , the median and the mode of ungrouped data .
- (3) Determine the value of the mean , the median and the mode of grouped data.
- (4) Index number are used in economics to measure trends in a wide variety of areas including stock market price ,cost of living ,industrial and agricultural productions, imports etc.

### **STA-HC-1026**

The primary objective of this course is to introduce the basic twls of calculus and geometric properties of different conics seetions which are helpful in understanding their application in plantaryu motion,design of telescope and to the real world problems.

This course will enables the students to learn first and second derivative test for relative extremum and apply the knowledge in problems in business,economics and life sciences.

## **STA-HC-2016**

**Objectives:-** To make the students familiar with the basic statistical concepts and tools which are needed to study situations involving uncertainty and randomness. The course intends to render the students to several examples and exercises that blend these everyday experiences with their scientific interests.

**Outcomes:-** This course will enable the students to

- (1) Learn about probability density and moment generating function
- (2) To know about various univariate distributions such as Bernoulli, Binomial, Poisson, gamma, exponential distribution etc.
- (3) Learn about distribution to study the joint behavior of two random variables.
- (4) Understand central limit theorem which helps to understand the remarkable fact that: the empirical frequencies of so many natural populations, exhibit a bell-shaped curve i.e. a normal distribution.

## **STA-HC-2026**

**Objective:-** The primary objective of this course is to introduce the basic tools of theory of equations, complex numbers, number theory, matrices, determinants, vector space to understand their connection with the real-world problems.

**Outcomes:-** This course will enable the students to:

- (1) Learn how to solve the cubic and biquadratic equations, also learn about symmetric functions of the roots for cubic and biquadratic.
- (2) Employ De-Moivre's theorem in a number of applications to solve numerical problems.
- (3) Recognize them mathematical objects that are groups and classify them as abelian, cyclic and permutation group, ring etc.
- (4) Learn about the concept of linear independence of vectors over a field and the dimension of a vector space.

## **STA-HC-3016**

**Objectives:** Sampling distributions are important for inferential statistics. In practice one will collect sample data and theory there data estimate parameters of the sampling distribution can be very useful in making inferences about the overall population.

**Outcomes:**

- (1) A critical part of inferential statistics involves determining how far sample statistics are likely to vary from each other and from the population parameter.
- (2) The distribution of a statistic is the distribution of that statistic considered as a random variable, when derived from a random sample of size.
- (3) Sampling distributions allow analytical considerations to be based on the sampling distribution of a statistic rather than on the joint probability distribution of all the individual sample values.

## **STA-HC-3026**

**Objectives:-** A sample survey is conducted to determine the attitudes of individuals in a population toward a particular subject. It helps the students for collecting data about the members of a population so that inferences about the entire population can be obtained from a subset, or sample of the population members.

**Outcomes:-** (1) it ensures convenience, collection of intensive and exhaustive data, suitability in limited resources and better rapport.

(2) most research studies in education require some form of sampling. Because we can not always study everyone or everything, sampling means that we only study part of a large group and are still able to draw meaningful conclusion.

### **STA-HC-3036**

It is a Basic course on the study of real valued function that would develop an analytical ability to have a more matured perspective of the key concepts of limit, continuity, differentiability and their applications

This course will enable the students to have a clear understanding of the concepts of limit of a function. Also helps to learn about continuity and uniform continuity of functions defined on intervals. Interpolation techniques help to compute the value for tabulated functions at point not in the table.

### **STA-SE-3014**

The course will enable the students-

- (1) To learn about various software access to a large database and easy customization. These two attributes combined together allow business to ensure that the correct data is assessed and the ensuing figures are unbiased and conclusive. These software analyses make the best usage of the vast data available, such as assisting out the company's growth rate, improve the efficiency of the company etc.
- (2) At present IT age, it is very essential for the students to continue their learning process about using the various software packages such as excel, SPSS,R etc and from this course they can meet up their needs perfectly.

### **STA-HC-4016**

**Objectives:-** statistical inference helps to make decision about the parameters of a population based on random sampling. It helps to assess the relationship between the dependent and independent variables the objective of statistics inference is to estimate the uncertainty or sample to sample variation.

### **Outcomes:-**

- (1) inferential statistics helps to suggest explanation for a situation or phenomenon.
- (2) It allows us to draw conclusion based on extrapolation and is in that way fundamentally different from descriptive statistics that hereby summarized the data that has actually been measured.
- (3) It helps the students to explain the concepts of estimation of parameter.

### **STA-HC-4026**

This course will enable the students to understand and predict the behavior of complex systems or analyze experimental, financial and biological data. Through this chapter students may learn about the regression analysis, analysis of variance, model checking etc. These methods have a considerably lower time complexity when compared to some of the other machine learning algorithms.

### **STA-HC-4036**

**Objective:** The objective of statistical quality control is to monitor production through many stages of manufacturing .The general category of statistical tools used to evaluate organizational quality.SQC is to achieve quality in production and service organizations, through the use of adequate statistical techniques.

**Outcome:** 1) It provides a means of detecting error at inspection.

- 2) It leads to more uniform quality at production
  - 3) It improves the relationship with the customer.
  - 4) It reduces inspection costs
- 5) It reduces the number of rejects and saves the cost of material.

### **STA-SE-4014 R: Software**

**Objective:** - The purpose of this course is to help using R, a powerful free software program for doing statistical computations & graphics. It can be used for exploring and plotting data, as well as performing stat tests.

**Outcomes:** - This course will enable the students to-

- 1) Become familiar with R syntax & to use R as a calculator.
- 2) Know about summary commands & summary table in R.
- 3) Plots various graphs & charts using R .

### **STA-HC-5016**

**Objectives:** - The objectives of a queuing model is to find out the optimum service rate and the number of servers so that the average cost of being in queuing system and the cost of service are minimized. Stochastic processes underlie many ideas in statistics such as time series, markov chains, markov processes, bayesian estimating algorithms etc. Thus a study of stochastic processes will be helpful in any ways.

**Outcomes:** Stochastic process enables us to develop model for situations of our interest. It enables us to better understand the nuances of the statistical methodology that uses stochastic processes. By applying queuing theory, a business can develop more efficient system, processes, pricing mechanisms, staffing solutions and arrival management strategies to reduce customer wait time and increase the number of customers that can be served.

### **STA-HE-5016**

This course develops the underline the simplex method. This course will enable the students to

- 1) Learn about the graphical solutions of LPP with two variables.
- 2) Learn about the relation between basic feasible solution and extreme points.
- 3) Learn about two phase and big-M method to deal with problems involving artificial variables.

### **STA-HC-5026**

**Objective:-** This course introduces C programming in the idioms and context of mathematics and imparts of a starting orientation using available mathematical libraries, and their application.

**Outcomes:** After completion of their paper, students will be able to-

- 1) Understanding and apply the programming concepts of C which is important to mathematical investigation and problem solving.
- 2) Learn about structured data types in C and learn about application in factorization of an integer and understanding Cartesian geometry and Pythagorean triples.
- 3) Use of containers and templates in various applications in algebra.

- 4) Use mathematical libraries for computational objectives.

### **STA-HE-5026**

This course will enable the students to have the knowledge about identifying the nature of the phenomenon represented by the sequence of observations and forecasting future values of the time series .It helps to understand the underlying courses of trends or systematic patterns over time .It explains the influences of various factors in a time series and based on these concepts one may predict for future period more precisely.

### **STA-HC-6016**

This course will enable the students to learn how to meet lower development costs, lower operating costs, faster time to market and lower cost of poor quality in designing of an experiment .It helps to learn the relationship between factors affecting a process and the output of that process. This course develops the knowledge of some very important statistical tools which are mostly used in any research work, such as Analysis of variance, F-test etc and experimentation concepts.

### **STA-HE-6016**

#### **Objective:-**

The objective of econometrics is to convert qualitative statements (such as the relationship between two or more variable is positive) into quantitative statements (such as consumption expenditure increase in disposable income). Econometrics also provides the students with some useful tools for his/her future research. To help the student to develop thinking in quantitative terms.

#### **Outcomes:**

- 1) By using the tools or applied econometrics one can be able to convert data into a specific model for the purpose of making the decision that supports empirical data.
- 2) Help to getting the specified pattern or result from the scattered data.
- 3) Benefitted to enable us to retrieve the relevant information from the basket of information.

### **STA-HE-6026**

This course will enable the students –

- 1) To learn to collect demographic data, conduct surveys, build a profile of a certain segment of a population, create statistics and draw strategic conclusions from the data gathered.
- 2) It teaches to understand population dynamics by investigating three main demographic processes: Births, migration and aging including death. All three of these processes contributed to change in populations, including how people inhabit the earth, form nations and societies and develop culture.
- 3) It helps to learn achieve a stable population at a level consistent with the requirement of sustainable economic growth, social development and environmental protection.

### **STA-HC-6026**

This course enables the students-

1. How to study the relationship between more than two variables if there are some independent and some dependent variables. It uses multiple advanced techniques for examining relationship among multiple variable at the same time.
2. In real life situation sometimes ordinal or ranked data have to analyze which is very difficult by parametric methods.
3. Students learn through this course how to modeling appropriate statistical methods as a model building tool in financial time series and econometrics.

## ZOOLOGY

### **BSc 1<sup>st</sup> Sem**

CO1: This paper provides a preliminary knowledge about the Taxonomic status of different animals, concept about the species and also the biological nomenclature of different animal species.

CO2: Through this paper students can get knowledges about salient features of different phyla of invertebrate fauna viz : Protista, Parazoa, Metazoa, Porifera, Cnidaria, Ctenophora, Platyhelminthes and Nemathelminthes upto echinodermata..

CO3: The course of the practical paper throws light on the knowledge of identification of animal species based on visible characters etc.

### **BSc 2<sup>nd</sup> Sem**

Co4: In this course classification, general characters and specialized characters of chordates are included. Chordate groups from proto-chordates to mammals are included in this course.

Co5: This paper includes the basic concepts of ecology and wild life biology. Different types of pollutants and pollutions and the wild life conservation and management practices also included in this paper.

CO6: In this practical course , students can learn about the anatomy of different vertebrate animals through practical demonstration, qualitative detection and quantitative estimation of environmental factors etc. Study of articulated and nonarticulated skeleton skeletal system also included. Besides, preparation of temporary slides of preserved and fresh animal and their parts are also included.

### **BSc 3<sup>rd</sup> Sem**

CO6: The course contents through the basic ideas about different organs system in the vertebrate bodies. Endocrine gland and their physiology and the controlling mechanism of different hormone secretion in the endocrine system are also included in the course. Use of different dyes for colouring of cell and sub-cellular organelles also present in the syllabus.

CO7: The contents of the course include overview of different cell types. Learners have the opportunity to gain Knowledge about plasma membrane, Endomembrane system, mitochondria and peroxisomes, cytoskeleton, Nucleus, cell division and cell signaling. More over this course covers the practical knowledge about various stages of mitosis, meiosis, barrbody, iDNA, PAS reaction and protein structure.

CO 9: Through this practical paper students can learn about the cell types , staining and preparation procedures of cells and histological structures etc.

### **BSc IV Sem**

CO10: The course covers the brief knowledge about the embryology of vertebrate animals. Students can learn the process of egg and sperm formation, fertilization and post fertilizational development of the vertebrate animals. Cellular movement during development of the vertebrate animals is also included in this course.

CO11: This paper included genetics part where students get the opportunity to learn basic concept on gene and gene expression , mutation etc.

CO12: This practical paper covers course of the developmental process of vertebrate embryo, study of embryo at different stages and also identification of different types of chromosomes.

#### **B.Sc. 5<sup>th</sup> Sem:**

CO 13: The syllabus of the course covers the different physiological process of the animal body including digestion, respiration, excretion etc. Mechanism of nerve impulse generation and conduction and the synaptic transmission also included. Different cardiovascular mechanism, including regulation of heart function also included in the course.

CO14: Course contents includes transfer of energy through mitochondrial electron transport system, biochemical mechanism of enzyme action, Characters of different biomolecules.

CO15: Students can learn the different endocrine glands and their secretion and physiological activities in the vertebrate animal. Basic concept of immunity and immunization are also included in the paper.

CO16: Different Biological Techniques like microscopy, separation techniques like chromatography, electrophoresis etc included in this paper. Bio-statistical methods and procedures are included in this course.

CO17: Practical paper covers haematological study including Total count of RBC and WBC, differential count of WBC, detection of normal and abnormal constituents of urine. Behaviour of RBC in different conditions also included in the course.

CO18: In the practical paper course contents covers estimation of different component glucose, protein and cholesterol in the blood. Biochemical detection of vitamins in blood and other biological components are also included in the course. Separation of bio-molecules by different chromatographic procedures included in the course.

#### **BSc. 6<sup>th</sup> Sem**

CO19 : This paper includes the animal behavior study where students can learn neural and hormonal control of behavior, social behavior, genetic basis of behavior etc. Different communication mechanism of the animals also included in this paper.

CO20: Main focus of the paper is on evolution and adaptation of different animals. Origin of birds development, human and horse development etc. are included in the paper.

CO21: In the economic Zoology paper students get opportunity to learn the methods of sericulture, apiculture and aquaculture. Different pest management techniques are included in this paper.

CO 22: In the biotechnology paper, course offers basic concepts of tissue culture process, gene transfer gene libraries etc. Different computer added techniques used in biological sciences and computer languages suitable for biological application are included.

CO23: In practical paper students will get practical knowledge on different pest and pest management techniques , life history of silk worm and honey bee etc.

**CO24:** This practical paper is project work and submission based paper where students will get practical idea about the field activities of different animals and process of collection and preservation of animals from natural sources.

## **Bachelor of Business Administration (BBA)**

### **Course Outcomes**

**CO1: Business Communication** - This course enhances the skills of the students in written and oral communication which would be useful when they face the corporate sector. The students get knowledge of writing various business letters and idea about the various written documents which are required in an organisation.

**CO2: Principles of Management** - Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, directing, staffing, controlling. To understand the concept of organization and to Demonstrate the ability to have knowledge about directing, leadership qualities and to communicate effectively. They can analysis various issues and formulate best control methods.

**CO3: Managerial Economics** - Managerial Economics is the application of economic theory and methodology to managerial decision-making problems within various organizational settings such as a firm or a government agency. The emphasis in this course will be on demand analysis and estimation, production and cost analysis under different market conditions, forecasting and decision making under uncertainty.

**CO4: Mathematical Techniques in Business** – This course helps the students to know about the use of mathematical techniques in business decision making. The course covers the areas of arithmetic progression, matrix, calculus, set theory, logarithms etc.

**CO5: Environmental Science** – To sensitize students to environmental issues Creating environmental consciousness among students and also enabling them to identify potential environmental hazards and to solutions to such problems.

**CO6: Financial Accounting** – This course gives the knowledge about the needs and objectives of financial accounting and also about the system of book – keeping. It covers the areas of managing accounts of sole proprietorship and accounts of non-profit organisation. The latest format of balance sheet along with profit and loss account has been covered.

**CO7: Statistics for Business Decisions** - This course helps the students to know about the use of statistical techniques in business decision making. The measurement of central value along with correlation analysis and analysis of time series has been covered besides the topic of probability.

**CO8: Indian Economic Scenario** – This course deals with business environment in India and the government budget along with the financial institutions of banking and non - banking sector. The topics of planning in India and the small and medium scale industries problems and prospects and the role of foreign trade bodies has been covered.

**CO9: Computer Fundamentals** – This course deals with the application of computers and its type along with the basic commands in MS office has been covered. It gives introduction to internet, browsers along with operating system and office automation.

**C10: Cost and Management Accounting** – This course enables the learner to understand the various concepts of cost accounting. To develop various skills among the students related with budget and budgetary control. To make students understand the concept of operating costing in different areas. To make students understand the various concepts of standard costing

**C11: Human Resource Management** - This course equips the students with the idea the way employees are recruited, trained, selected in the organization. Further the processes under which performance is measured and the ways of motivating can be learnt from this course.

**C12: Personality and Personal Skill Development** – This course provides an idea about the various types of teams that exists in an organization and teaches the students about the various business and personal etiquettes. The students learn about the various personality types and also the ways the personality is developed.

**C13: Operations Management and Control** - This course objective is to develop the understanding of concepts, theories and techniques of production process. It gives an idea about the factors affecting a plant location and also about the store management systems. It also gives a glimpse of scheduling of production and about quality control.

**C14: Computer Applications** – This course enables the students to learn practically about Tally, preparing profit and loss statement, balance sheet. The students get knowledge about the word processing and data management system.

**C15: Organisational Behaviour and Industrial Psychology** - This course enables the students to learn about the various behaviours that is manifested by the individual, interpersonal and group in an organisation. The students are also introduced about the history of Industrial Psychology and its importance and scope.

**C16: Financial Management** – This course helps the students to understand the basic concepts of Financial Management in decision making related to business. It also provides insight on time value of money and various managerial decisions such as financial, investment and dividend decisions and importance of working capital management.

**C17: Principles of Marketing** - The course gives the students about the scope and importance of marketing and about the various marketing concept. It focuses on the way every organisation does promotion, the way they take product and pricing decisions and the way that a market is segmented along with targeting and positioning a product.

**C18: Business Research** – This paper focuses on the nature and scope of marketing research along with the various types of research design. The various types of Primary and Secondary data collection methods are discussed along with the sampling techniques and also the way in which a sample size is determined.

**CO19: Legal Aspects of Business** – The course gives the students a detailed description about the various laws which are relevant in the contemporary business environment like The Indian Contract Act 1872, Sale of Goods Act 1930, The Companies Act 2013, Consumer Protection Act 1986 and The Right to Information Act 2005.

**CO20: Summer Project** - This internship gives the students a practical insight of the working of an organisation. The students are sent for internship to various business organisations according to their choice and they prepare a project report based on their topics of interest.

**CO21: International Finance** – This paper introduces the students to the world of international trade and finance. It deals with the foreign exchange management and the various transactions related to it.

**CO22: Investment Banking and Financial Services** - The objective of this paper is to know the different aspects of Investment banking and financial services such as Issue Management, Leasing, Hire Purchase, Factoring and Forfaiting, Insurance, Credit Rating, Securitization and Venture Capital Financing, Mergers and acquisition and the detailed SEBI guidelines on issue management.

**CO23: Consumer Behaviour** - This course helps the students of how to apply the knowledge of consumer behaviour can be applied in marketing and the factors that influence consumer decisions. Besides the key

theories that explain consumers' behaviours and how the group influences a consumer before purchasing any product and also the different stages of the consumer decision making process.

**CO24: Marketing of Services** – This paper deals with the emergence of service economy and also deals with marketing mix done by the service marketer. It gives knowledge about how the service marketing strategy can be deployed besides giving the concept of service quality and relationship building with the customers by the service marketer.

**CO25: Human Resource Development: Systems and Strategies** – This paper deals with the origin and concept of Human Resource Development and the various processes associated with it along with its application in the organisation. The course imbibes the knowledge of HRD Climate and HRD audit and about the evaluation of HRD effort.

**CO26: Management of Industrial Relations** – This paper familiarizes the role of management and unions in the promotions of good industrial relations. This paper deals with the various laws which helps in promoting good industrial relations and also protecting the rights of the workers.

**CO27: Business Policy and Strategy** – This paper lays down the importance of business policy and strategy and the ways of doing business environmental analysis and diagnosis. It also deals with the formulation of competitive strategies to be relevant in the present business scenario.

**CO28: Taxation Laws** – This paper contains laws related to Goods and Services Tax and laws related to income tax and also under which various heads of income falls. The computation of gross total income and total income along with tax planning is being given in detail.

**CO29: Invest Analysis and Portfolio Management** - The aim of this course is to provide a conceptual framework for analysis from an investor's perspective of maximizing return on investment along with a sound theoretical base with examples and references related to the Indian financial system.

**CO30: Business Analysis and Valuation** -This paper describes and apply the basic techniques of financial statement analysis and also explains the linkage between strategic business analysis, accounting analysis and financial analysis Identify and utilize value-relevant information contained within financial statements. It also helps the students to recognize and explain the fundamental role of accounting numbers in the valuation of entities.

**CO31: Advertising and Brand Management** – This paper deals about the need and importance of brand management and the ways in which advertisement works. The paper gives the knowledge about the way in which sales promotion is managed along with media planning. The paper also equips the students with knowledge about establishing a brand and also designing and implementing brand strategies.

**CO32: Personal selling and Sales Force Management** – This course introduces the students to personal selling and the theories and the selling process. The introduction to sales force management is done and the areas of managing the sales force and the concept of sales territory is covered

**CO33: Performance and Compensation Management** – The paper is about the way performance is managed and the reward systems. The paper deals about the methods in which job is evaluated along with the incentive plans for the employees. The wages system and regulations associated with it has been covered in the concerned paper.

**CO34: Training and Management Development** – The course helps the students by giving knowledge about the training methods and functions along with the management development programme methods. The Organisational Development process and the various interventions associated with it has been covered.

## **FOOD PROCESSING AND QUALITY MANAGEMENT**

### **PROGRAMME - B.VOC**

### **TRADE- FOOD PROCESSING AND QUALITY MANAGEMENT**

#### **SKILL PART**

**CO1:** The basic emphasis of this paper is to introduce the students of the trade about the basics of food, processing of food and different unit operations, food quality, different sanitation measures, food safety, food preservation and packaging such that students can get some ideas about the field in food sectors. Also, students are given exposed to basic knowledge on measurements, calculation, formulations and use of basic computer knowledge in the areas of food analysis and processing.

**CO2:** This paper is arranged as such that, students can have the proper knowledge on basic machineries used in food processing together with different Govt food agencies who regulates and formulates different laws and rules related to food. Also, to attract the generation to make employability basic ideas are given regarding entrepreneurship and different programs.

**CO3:** This paper is basically formulated keeping in the mind of NSQF 4 level QP- Jam, Jelly and Ketchup processing Technician to fulfil the program criteria. The paper is structured as such that students can get the different science, chemistry, processing, preservation, packaging and quality maintenance of fruits and vegetable processing.

**CO4:** This paper transfers about different food quality regulation and maintenance in food industry or that kind of organisations to the students. This paper introduces about the principles of quality management system along with different systems utilized in industry to maintain proper work environment.

**CO5:** This paper focus on giving the students about the complete ideas of food chemistry and conjugation of different food from nutritional and formulation point of view along with the scientific benefits of different kinds of foods in our health.

**CO6:** The paper is structured based on the QP- Plant Baker of NSQF Level 5 such that students have the knowledge and skill on bakery field, their processing, chemistry of different ingredients utilized for processing, quality management, documentation and certification.

**CO7:** This paper provides knowledge to the students of the trade about different quality analysis procedure of food to know about different effects of intrinsic and extrinsic parameters on food.

**CO8:** Quality system is an integral part of any food industry, without quality other all things are worthless. So the paper provides proper knowledge on different Quality Management System, different national and international bodies who give certification to the companies, different disciplinary activities maintain in the industries to meet and upgrade the quality system.

**CO9:** Based on the NSQF level 6 of QP- Food Microbiologist, the paper provides the students about the basic knowledge of food microbiology, instrumentation, different microorganisms, their characters, monitoring of environment and analysis of food for microbiological aspects.

**CO10:** This paper introduces students about the different modern technologies used in food analysis. As food is basic needs of human existence, safety of it is prime most important. So to minimize different errors, food engineering and technology sectors is always working in the areas where they can provide better technology, and to provide knowledge on these modern techniques and tools the course is formulated.

**CO11:** To provide knowledge about handling of complain and customer and to sustain in the quality, the course is maintained as such that students have the proper knowledge on quality tools, HACCP system, audits and documentation procedure.

**CO12:** Based on the NSQF level 6 of QP- Food Microbiologist, the paper provides the students about the food spoilage induces by different microorganisms, their safety, different useful and pathogenic microorganism and their utilizations and effects in food respectively. Along with that focus is given on utilization of good microorganisms to process different indigenous fermented food products.

**CO13:** This paper provides an understanding about different cereal grains, pulses, oilseeds, their processing and chemistry. As we are living in the areas where the place is rich with different cultivation, so to provide the basics science regarding what we consume is mainly focused in those areas with subject specific.

**CO14:** As a protein rich item generally we consume the non vegan items like meat, fish and poultry and it is seen that many youth are self employable within this areas. So this paper endow with different scientific knowledge, their storage, processing and quality maintenance of those particular product.

**CO15:** Milk based industries are now-a-days gaining importance and rising in the areas as production of milk is good in India. Collection of milk from different areas or from society is now-a-days quite easy and this benefits both the root level and high level as it gives economic growth. Based on that different industries are establishes which gives employability. So, to be a good manager in those areas, paper is designed as such that it fulfil the NSQF Level 7 with QP-Production manager.

**CO16:** Assam is rich in plantation product like tea. This paper provides the general ideas about different tea, their quality aspects together with the science behind the processing and flavour of tea. The paper is oriented as such that students get a total exposure of industrial tea processing.

**CO17:** Packaging is a silent salesman. To keep food at its best quality from every aspect, it should properly protect and different packaging materials together with various innovative technologies are utilized by food processor in this regard. To give an exposure in this regard, the paper is designed in a way that it contains all the basics of food packaging, their characters and importance, instrumentation and new technologies of food packaging system.

**CO18:** This paper is given to shape the student in research and innovation and utilized their knowledge those they gather throughout the curriculum.

## **GENERAL PART**

**CO1:** This paper provides the student with adequate knowledge to develop vocabulary, to have accuracy in grammar and communication, to improve proper skill on speaking, writing, reading etc.

**CO2:** Computer is fundamental needs in now-a-days. To give the basics of computer the paper is designed with fundamentals of computer.

**CO3:** The objective of this paper is to prepare the students for the competitive world, employment marketplace with a reasonable fluency in spoken English through appropriate English pronunciation and tackle themselves to fascinate them in various vocational sectors like different industries, corporate sector, public administration other government and pertinent fields.

**CO4:** To grow in the field of business and entrepreneurship, the paper is made as such that it provides the fundaments of finance and accountancy.

**CO5:** This paper is formulated to make the students as responsible citizens towards its mother earth. To give proper knowledge on sustainability, ethical, historical and cross cultural relationship between different aspects and issues of environment and the linkage between human and nature the paper is designed.

**CO6:** To make aware about the culture of the society where they live and make them responsible towards the society the paper is provided in the program.

**CO7:** To develop a personality that is attractive and impressive in a way that it will make one to stand independently from rest, and to compete the world, the curriculum is developed.

**CO8:** This curriculum helps the students in development of managerial skill in them. They get an knowledge about the various functions of management like planning, organizing, staffing, directing, controlling.

**CO9:** This paper provides the basic ideas of entrepreneur and entrepreneurship. This helps students to know the fundamentals of entrepreneurship along with the steps of entrepreneurial process. It gives the students knowledge about the skills , characteristics required to be an entrepreneur along with the various types of entrepreneur and the ways entrepreneur contributes to the growth of the society.

**CO10:** The designed paper equips the students the skills of business presentation and to imbibe the knowledge of organising a meeting, preparing agenda along with the ways to prepare for an interview.

**CO11:** This paper enhances the students' creative thinking capability as an entrepreneur. They get an knowledge of the licenses required to set up any business along with the sources of funding available to them.

**CO12:** This paper is planned in a way so that students may get benefits in a way that they control their various emotions like handling of anger, reduction of stress. It makes the students aware of ways to maintain trust with others along with various techniques to increase self – esteem.

## **Post Graduate Program**

### **MSc in Physics**

Semester	Paper Code	Paper Name	Course Outcome
<b>First Semester</b>	MPH182101	Classical Mechanics	This course aims at introducing the foundation of physics – the theory of classical mechanics. The students will be able to describe a wide variety of physical phenomena by the Lagrangian and the Hamiltonian formalisms. They will be able to generalise the laws of physics in higher dimensions and will be able to apply the formalism of classical mechanics to more advanced frameworks.
	MPH182102	Mathematical Physics	The students will be able to learn the relevance of different tools of pure mathematics in the context of the laws of physics and hence will be able to apply the same to deal with the different concrete problems of natural phenomena.

MPH182103	Quantum Mechanics-I	The objective of this course is to introduce students to the laws of Physics in the context of the micro world. The students will be able to understand the underlying mechanics of atomic and sub-atomic phenomena. This course delivers the essence of wave mechanics and matrix formulations of quantum mechanics, concept of identical particles, symmetry, and approximation methods.
MPH182104	Electrodynamics and Fluid Dynamics	The students will acquire advanced knowledge of electromagnetic fields, propagation and scattering of electromagnetic waves. They will be able to investigate the collective behaviour of charged particles and their dynamics, which provides the basic working model of plasma.
MPH182115	Laboratory-I	This course aims at performing basic physics experiments by the students. The students will be able to bring out responses in the concerned equipments for general physics experiments. They will be able to justify some of the theoretical understanding of Physics.

<b>Second Semester</b>	MPH182201	Quantum Mechanics-II	This course introduces the method of applying rules of quantum mechanics to understand the quantum properties of particles, radiations, atoms and their interaction. Students will be able to apply the mathematical theories of quantum mechanics to real problems in particle physics and atomic & nuclear physics.
	MPH182202	Nuclear and Particle Physics	The students will be able to give an in-depth description of the nucleus and its various properties. They will be able to describe the structure of the nucleus and the nature of the interaction that keeps the nucleus bound.
	MPH182203	Condensed Matter Physics	This course aims at acquiring the knowledge of matter in the condensed phase, their structural, electrical, and magnetic properties. The students will be able to compute parameters related to extent and nature of crystallinity, conductivity, defects etc and the way these affect some basic properties.
	MPH182204	Electronics	The students will become acquainted with important electronic devices, circuits and microprocessors.
	MPH182215	Laboratory-II	This course aims at performing basic physics experiments by the students. The students will be able to determine some physical parameters and design circuits to understand important principles of Physics.
	MPH182301	Atomic and Molecular Physics	The students will be able to determine certain parameters associated with length, mass, time and energy from atomic and molecular spectra. They will be able to explain the working of a few laser systems.
	MPH182302	Computational Physics	This course aims to acquaint students with computer programming and numerical analysis. Through this course, students will be able to learn the useful computational techniques to find out solutions to those complicated physical problems where analytic solutions are not obtainable.
	MPH182303	Nano-Structured Materials	The objective of this course is to facilitate learning of nanoscale phenomena. Upon completion of the course, the students will be able to gain insight of the nucleation and growth processes, synthesis and

<b>Third Semester</b>			characterization of nanostructured materials. Through this course, the students will be able to understand fascinating properties of low dimensional materials leading to novel applications of nanomaterials.
	MPH182304	Vacuum Techniques	On successful completion of this course the student be able to perform basic operation of a vacuum system components such as pumps, valves and gauges while troubleshooting.
	MPH18230E1	Astrophysics and Cosmology-I	This course contains introduction to observational techniques in astronomy, stellar astrophysics and galaxies. This is a foundational course, which will help students in understanding basic physical principles of stars and galaxies and their evolution.
	MPH18230E2	Astrophysics and Cosmology-II	This course surveys gravitation and cosmology from both theoretical and observational perspectives. Applications of general relativity to astrophysical phenomena and large-scale structure of the universe are introduced. The basic ideas of radio, x-ray and gamma ray observational techniques used in extragalactic astronomy and cosmology will also be introduced.
	MPH18230E3	High Energy Physics-I	The aim of the course is to make the students understand the quantum reality of the physical universe in a more rigorous way. The course focuses on how the
	MPH18230E4	High Energy Physics-II	The present course focuses on the application of the quantum field theory to understand the fundamental particles and their interactions. The course gives a detailed visualization of how the Standard model of particle physics is developed.
	MPH182401	Statistical Mechanics	This course is intended to understand the microscopic details of thermodynamic systems through the constructions and applications of ensemble theory. In this course, the students will experience the rigorous approach of Statistical Mechanics to explore curious phenomenon like Bose-Einstein Condensation. Upon completion of the course, students will be able to apply statistical mechanics in

			classical and quantum
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<b>Fourth Semester</b>			systems for the detailed understanding of various physical, chemical, and biological phenomena.
	MPH182402	Plasma Physics	The course provides a comprehensive description on the physics of plasmas with an introduction to more advanced topics such as dusty plasmas and fusion plasmas. This enables the students to have a mature understanding of the applied electrodynamics and upon completion of the course, the students are fully ready to take up Plasma Physics as a research career. Given the growth of Plasma Physics research in the country (especially in the North East India), this course provides a major fillip to the overall physics knowledge of the student.
	MPH182403	Meteorology	The objective of this course is to facilitate students to learn the different physical processes and the fundamental laws controlling the Earth-atmosphere system through a balance of theory and applications. This course will act as a starting point for the students to study climate change and associated physics.
	MPH182404	Observational Astronomy	The learning objective of this course is that the student demonstrates the ability to navigate in a modern observatory, perform rudimentary reduction of data from a modern telescope.
	MPH18240E1	Astrophysics and Cosmology-III	At the end of the course, students will be aware of several observational techniques used in astronomy. They will be able to apply the physical principles in pursuing the studies of stellar structure and evolution.
	MPH18240E2	Astrophysics and Cosmology-IV	At the end of the course, students are expected to be aware of applications of the methods of general relativity and cosmology being used in current trends of research in these fields. They will be well acquainted with observational techniques used to address fundamental questions in astronomy. Particularly they will be aware of the problems of multi-messenger astronomy.
	MPH18240E3	High Energy Physics-III	Through this course, the students would learn that the particle and the wave nature are nothing but the different manifestations of a single entity called quantum field. After completion of this course, the

			students will be equipped with the skills and techniques to go for the advanced research well as to opt for research career in this field.
	MPH18240E4	High Energy Physics-IV	After completion of this course one can know what the other possible ways are to go beyond the standard model to address certain unsolved problems of nature. This course will provide a concrete platform to the students to undertake their research career in the field of both theoretical and experimental High Energy Physics.

**M.SC. BIOPHYSICS**  
**SEMESTER -I**  
**BPT-1014 : Molecular Biophysics**

**Course Outcome :**

**CO1-** At the end of the course, the student should

- refresh knowledge of basic physics and chemistry
- appreciate how various laws of physics are applicable in our everyday life.
- apply physical principles in chemical reactions and physiological systems.
- Should understand physical basis of microscopic structure of matter and chemical interaction and affect of various forces in shaping the molecular conformation.
- Should be able to apply principles of ion conduction.

**BPT-1024 : Cellular Biophysics**

**Course Outcome :**

**CO2-** At the end of the course, the student should be able to

- Should be able to enumerate the various cell organelles and their function
- Should be able to understand the constituents and working of a cell as a whole
- Should be able to describe various types of cell multiplications and divisions and differences between them
- Should be able to enumerate the differences in cellular organization of various life forms
- Should understand how evolution can be studied on genetic basis.

**BPT-1034 : Biostatistics and Computer fundamentals**

**Course Outcome :**

**CO3-** At the end of the course, the student should be able to

- choose and apply most relevant mathematics and statistical models to a given set of experimental data.
- Students will be able to apply knowledge of probability & statistical methods .
- Statistical analysis of biological data
- Errors, analysis and data measurements
- Basic computer knowledge

### **BPT-1044 : Biophysical Techniques & Instrumentation**

#### **Course Outcome :**

**CO4-** At the end of the course, the student should be able to

- understand the physical principles behind the various spectroscopic techniques available for interrogating biological macromolecules.
- choose and apply most relevant biophysical technique for characterizing the dynamic behavior of a macromolecule, especially proteins.
- Should be able to understand the important aspects of the macromolecular structures
- Should be able to understand how hydrodynamic methods can be used for differentiating biological macromolecules .
- Should be able to identification of crystal structure through diffraction techniques.

### **BPT-1054 : Classical and Statistical Thermodynamics**

#### **Course Outcome :**

**CO5-** At the end of the course, the student should be able to

- Should understand storage & flow of energy and their applications
- Should be able to solve the statics & dynamics of rigid bodies.
- Should be able to understand the fundamental assumption that all possible configuration of a given system, which satisfy the given boundary conditions such as temperature, volume, and number of particles, are equally likely to occur.
- Should understand basic quantum phenomena in biological system.

### **Master of Science (Biophysics) Practical**

#### **Course Outcome:**

At the end of the course, the student should be able to

**CO1:** verify the knowledge acquired in the theory classes through experiments and apply the theory learnt to the practical problems.

**CO2:** Should be able to independently handle scientific equipment used in experiments.

**CO3:** Should be able to design adequate positive and negative controls relevant to the experiment.

**CO4:** Should be able to analyze data and explain the findings.

**Master of Science (Biophysics)**  
**Semester –II**  
**BPT-2014 : Biophysical Chemistry**

**Course Outcome :**

**CO6-** At the end of the course, the student should be able to

- Should be able to understand Concept of bonding and interaction with biomolecules.
- Should be able to appreciate the effect of cooperatively in protein function
- Should be able to correlate the biomolecular structure to it's specific functions
- Should be able to comprehend the role of biomolecular conformation to function.
- Should know the role and importance of rarer biomolecules
- understand the chemical structure of various macromolecules involved in propagation of life.
- comprehend the influence of macromolecular three dimensional structure on their function.

**BPT-2024 : Membrane Biophysics**

**Course Outcome :**

**CO7-** At the end of the course, the student should be able to

- Organization of various membrane structure and their models and properties.
- Find membrane potential though various equation.
- Transportation of molecules across the membrane through diffusion and their types.
- Energy transduction through mitochondrial membrane.

**BPT-2034 : Molecular Enzymology**

**Course Outcome :**

**CO8-** At the end of the course, the student should be able to

- should be able to rate of the reaction of molecules
- understand the working of enzymes as biocatalysts.
- Able to understand rate and mechanism of enzymes and their function of regulation
- Various Enzymes techniques for diagnosis

**BPT-2044 : Molecular Genetics & Molecular Biology**

**Course Outcome :**

**CO9-** At the end of the course, the student should be able to

- is able to describe structure of DNA organization of prokaryotic and eukaryotic genome and their various levels of gene regulation.
- is able to compare and contrast the mechanisms of bacterial and eukaryotic DNA replication, DNA repair, transcription
- is able to explain concepts in DNA repair mechanisms, and recombination as a molecular biology tool

- is able to describe translation mechanism in prokaryotes and eukaryotes, regulation of translation, and post-translational processing is able to describe post-translational processes
- Application of genetic engineering in DNA profiling.

**BPT-2054: Quantum mechanics for biochemistry and biophysics**

**Course Outcome:**

**CO10-** At the end of the course, the student should be able to understand

- Quantum mathematical concepts in biological system.
- Different physical and chemical principle and their structural determination of compounds.
- Different operator and wave function used.

**Master of Science (Biophysics) Practical  
Semester II**

**Course Outcome:**

At the end of the course, the student should be able to

**CO1:** Verify the knowledge acquired in the theory classes through experiments.

Apply the theory learnt to the practical problems

**CO2:** Should be able to independently handle scientific equipment used in experiments

**CO3:** Should be able to design adequate positive and negative controls relevant to the experiment.

**CO4:** Should be able to analyze data and explain the findings

**Master of Science (Biophysics)  
Semester –III  
BPT-3014: Physiological Biophysics**

**Course Outcome:**

**CO11-** At the end of the course, the student should be able to

- Enumerate the various processes & mechanisms controlling the physiological viability and functions.
- Understand the integration of principles of physiological functioning & sustenance at the whole body level.
- Physiological behaviour of special senses.
- Physiology in different environmental situation.

**Master of Science (Biophysics)  
Semester –III  
BPT-3024: Immunology and Immunotechniques**

**Course Outcome:**

**CO12-** At the end of the course, the student should be able to

- Understand the components involved in generating immunity in living systems.
- Should be understand the basic principles of the immune system
- Different immunotechnique are able to known.

**Master of Science (Biophysics)**

**Semester –III**

**BPT-3034: Radiation Biophysics**

**Course Outcome:**

**CO13-** At the end of the course, the student should be able to

- Understand the various kinds of radiations and their effect on living systems.
- Know the hazards posed by such radiations and the required precautions.
- Principles of radiation detection and measurement.
- Application of radioisotopes in biology.
- Should be clear about the necessity to use radioactive methods and calculations involved.

**Master of Science (Biophysics)**

**Semester –III**

**BPT-3044: Photo Biophysics**

**Course Outcome:**

**CO14-** At the end of the course, the student should be able to

- appreciate the role of light in the physiology of living organisms
- Basic principles and law used in photochemistry
- Should understand the principles of interaction of light with organic molecules and their significance in environment.
- Should understand the biophysical principles of interaction of light with living systems and their significance in biosphere sustenance
- Optical properties known through photo medicine.

**Master of Science (Biophysics)**

**Semester –III**

**BPT-3054: Mathematics in Biological Process**

**Course Outcome:**

**CO15 -**At the end of the course, the student should be able to

- Understand the application of mathematical forces in systems.
- Students will be able to apply knowledge mathematics equations.
- choose and apply most relevant mathematics models to a given set of experimental data correlate mathematical methods and apply to natural (biological) problems.

**Master of Science (Biophysics) Practical**

**Semester III**

**COURSE OUTCOMES:**

At the end of the course, the student should be able to

**CO1:** verify the knowledge acquired in the theory classes through experiments and apply the theory learnt to the practical problems

**CO2:** Should be able to independently handle scientific equipment/software used in experiments

**CO3:** Should be able to design adequate positive and negative controls relevant to the experiment.

**CO4:** Should be able to analyze data and explain the findings

**Master of Science (Biophysics)****Semester –IV****BPT-4014: Bioinformatics and computational Biology****Course Outcome:**

**CO16-** At the end of the course, the student should be able to

- understand information theory and bioinformatics network
- Should be able to know different molecular biology databases and formats in which data is stored.
- Should be able to understand the concept of different forms of sequence alignment methods and selection of appropriate alignment method
- Describe features that can be annotated on a DNA sequence of interest. Interpret sequence analysis results and what functional regions mean biologically
- Extract information relevant to a protein structure of interest from difference structure databases e.g. PDB. (bio informatics)

**Master of Science (Biophysics)****Semester –IV****BPT-4024: Medical Biophysics****Course Outcome:**

**CO17-** At the end of the course, the student should be able to

- Understand the Principles of medical instruments and their applications
- Physical aspects of medical imaging techniques
- Use of basic principles of nuclear medicine and diagnostic
- Application and scope of radiotherapy.

**Master of Science (Biophysics)**

**Semester –IV**  
**BPT-4034: Environmental Biophysics**

**Course Outcome:**

**CO18-** At the end of the course, the student should be able to

- understand the correlation of different environmental /ecological parameters with living systems and their protection & sustenance.
- Characteristics and environmental radiations are used.
- Physical aspects of transmission of sound in several environments.
- Analytical methods by different instrument for environmental studies.

**Syllabus for special papers**  
**Master of Science (Biophysics)**  
**Semester –IV**  
**SPBPT-1: Group Theory and Spectroscopy**

**Course Outcome:**

**CO19-** At the end of the course, the student should be able to

- Understand the symmetry structure and application of group theory.
  - Known physical concept on molecules principle.
  - Concepts of microwave.

**Syllabus for special papers**  
**Master of Science (Biophysics)**  
**Semester –IV**  
**SPBPT-II: Advance quantum theory**

**Course Outcome:**

**CO20-** At the end of the course, the student should be able to

- Concepts of Schrodinger equation.
- Knowledge about variation method and perturbation theory
- About electron wave function and spin
- Physical significance of orbital energies
- Molecular configuration and molecular structure

**Syllabus for special papers**  
**Master of Science (Biophysics)**  
**Semester –IV**  
**SPBPT-III: Applications of spectroscopy**

**Course Outcome:**

**CO21**-At the end of the course, the student should be able to

- Understand of different vibrational mode by the Application of electromagnetic radiation
- To determination of structure of molecules
- Determination of bonding and structure of compounds
- understand the electronic transition and vibrational frequencies of different functional groups.
- fragmentation of organic compounds with respect to their structure determination

**Syllabus for special papers  
Master of Science (Biophysics)  
Semester –IV  
SPBPT-IV: Mathematical Neuroscience**

**Course Outcome:**

**CO22**- At the end of the course, the student should be able to

- Understand the biophysical basis of functioning of neurons & other brain cells, their electrical behaviour & communication mechanism.
- Understand neurological equations.
- Understand the biophysics of perception, cognition & memory formation and the related neuronal disorders.

**Syllabus for special papers  
Master of Science (Biophysics)  
Semester –IV  
SPBPT-V: Bioelectronics and Medical instrumentation**

**Course Outcome:**

**CO23**- At the end of the course, the student should be able to

- Understand some basic concepts of electronics.
- Able to understand different bioelectric signal.
- Understand some diagnostic and therapeutic equipment.
- Some biological and physiological transducers.

**Master of Science (Biophysics)  
Semester IV  
SPBPDW: Dissertation**

**Course Outcome:** To provide conceptual and hands on practical knowledge to the student in the current research areas in the field of biophysics.

**CO24** - At the end of the dissertation, the student should be able to

- Should be able to understand the lacunae and complexity in the present level of understanding of biophysical principles governing biology.
- Should be able to frame relevant research problems and hypothesis to address these lacunae and complexity
- Independently design logical set of experiments to investigate the hypothesis
- Analyze the data to make meaningful results.
- Explain the findings in a scientific manner.



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