# BEJOY NARAYAN MAHAVIDYALAYA
# DEPARTMENT OF BENGALI

## B.A. Honours in Bengali

### PROGRAM OUTCOMES

CBCS: বাংলা ভাষা ও সাহিত্য

* সাহিত্য মানুষের কথা বলে। মানবিক বিদ্যার সঙ্গে গভীরভাবে যুক্ত থাকে। অসহায় উপেক্ষিত মানুষের জীবনছবি তুলে ধরে। সহাবস্থানের এমন পাঠ সভ্য হওয়ার আঁতুড়ঘর।

*স্নাতক স্তরের সাহিত্যে এমন অসহায়,উপেক্ষিত ও নারীদের সঙ্গে মানবিক অনুভূতি সংযোগ স্থাপনে সহায়তা করে।

* সিবিসিএস পাঠক্রমের ছোট প্রশ্নোত্তর পরবর্তী ক্ষেত্রে প্রতিযোগিতামূলক পরীক্ষার প্রস্তুতি নিতে সাহায্য করে।

* সিবিসিএস এর বিষয়বৈচিত্র স্নাতকোত্তরে পড়াশোনায় সহায়তা করে।

* সমকালিনতার সঙ্গে বিষয়ের আন্তর্শৃঙ্খলতা কাজের বাজারে ছাত্রছাত্রীদের উপযোগী করে তোলে।

## PROGRAMME SPECIFIC OUTCOMES

বাংলায় সাম্মানিক স্নাতক ডিগ্রির পাঠ্যক্রম সম্পূর্ণ করার মাধ্যমে:

এক) বাংলাভাষী ছাত্রছাত্রীদের মধ্যে বাংলা ভাষার উৎপত্তি,বিবর্তন,বৈচিত্র এবং সমৃদ্ধির স্পষ্ট ধারণা গড়ে ওঠে।

দুই) বাঙালি সাহিত্যিকদের রচনাকর্মও বাংলা ভাষায় রচিত বিভিন্ন শিল্পরীতির সাহিত্য --- কবিতা,গল্প,উপন্যাস,প্রবন্ধ প্রভৃতির মধ্য দিয়ে নান্দনিক রসসৃষ্টির ক্ষমতা গড়ে ওঠে।

তিন) ঘনিষ্ট সাহিত্য পাঠের মধ্য  দিয়ে ছাত্রছাত্রীরা প্রতিভাবান সাহিত্যিকদের সঙ্গে ঘনিষ্ট সম্পর্কে যুক্ত হয়ে সৃজনশীল নান্দনিকতা লাভ করে।

চার) বাংলা ভাষার বহুমুখী পাঠে ছাত্রছাত্রীরা সাংবাদিক হতে পারে। রেডিও ও টেলিভিশনের সঙ্গে যুক্ত হতে পারে।

পাঁচ) প্রুফ সংশোধন ও বিজ্ঞাপন রচনা করে আর্থিকভাবে স্বাবলম্বী হতে পারে।

ছয়) বাংলা পাঠক্রম থেকে বাঙালি জাতির উৎপত্তি,সংস্কৃতির ইতিহাস,ভূগোল,মানসিকতা সম্পর্কে সুস্পষ্ট ধারণা করতে পারে।ব্যক্তিত্ব নির্মাণের ভিত্তিও গড়ে তোলে।

# COURSE OUTCOMES

## SEMESTER-I

### CC-1

ক) প্রাচীন যুগের সাহিত্য-ইতিহাসের পাঠাংশ চর্যাপদ ভারতীয় ধর্ম ইতিহাসের শিক্ষা দেয়। বৌদ্ধ ধর্মের অবক্ষয় - সহজিয়া বৌদ্ধদের নিজ ধর্মচর্চার পরিসর নির্মাণের প্রয়াসী হয়ে গূঢ় তত্ত্বকথাগুলি লিপিবদ্ধকরণ। শুধু তাই নয়, একইসঙ্গে রচনাগুলির সাহিত্যিক সৌন্দর্য উপভোগের অবকাশ।

খ) মধ্যযুগের সাহিত্য-ইতিহাসের শ্রীকৃষ্ণকীর্তন,মঙ্গলকাব্যগুলিতে সমকালীন সমাজচিত্রের বাস্তব পর্যবেক্ষণ। অনুসারী সাহিত্যের মধ্যে ধ্রুপদী ভারতীয় সাহিত্যগুলির আস্বাদন ও বাঙালিয়ানার প্রক্ষেপে স্বতন্ত্রতা। ইসলামী বাংলা সাহিত্য ও চৈতন্যজীবনীকাব্যগুলিতে মানুষকথা।

### CC-2

ক) ছন্দশাস্ত্রের নিবিড় পাঠের মধ্য দিয়ে কাব্যকবিতার বহিরঙ্গ সৌন্দর্যের অনুধাবন।
খ) অলঙ্কারের আস্বাদনে সংস্কৃত ও বাংলা সাহিত্যের উপাদানগত বিশেষত্ব আস্বাদন।

## SEMESTER-II

### CC-3

ক) বৈষ্ণব ও শাক্ত পদাবলি সাহিত্যের একাধিক কবির রচনায় কলাকৈবল্যের পাশাপাশি সমাজজীবনের প্রতিফলন। একইসঙ্গে পরমাত্মা-জীবাত্মার অন্যোন্য সম্পর্কের অনুভূতিপ্রবণ চিত্র।

### CC-4

ক) অন্নদামঙ্গল কাব্যের অনুপুঙ্খ পাঠে যুগরুচির পরিচয়। রামায়ণের লঙ্কাকাণ্ডের ইতিকথায় ধর্ম-অধর্মের সংঘাতে ধর্মের বিজয়নীতি ঘোষণার পাশাপাশি বাঙালি সত্তার সহজ উদ্ভাস।

## SEMESTER-III

### CC-5

ক) আধুনিক যুগের সাহিত্য -ইতিহাসের গভীর পর্যবেক্ষণের মধ্য দিয়ে সামাজিক -সাংস্কৃতিক-প্রশাসনিক-অর্থনেতিক-ধর্মীয় অবস্থার প্রেক্ষায় সৃষ্টিশীল রচনার সংযোগ বীক্ষণ।

### CC-6

ক) সাহিত্যের মাধ্যম ভাষা। ভাষাতত্ত্বের রূপতাত্ত্বিক ও ধ্বনিতাত্ত্বিক বৈশিষ্ট্যসমূহ অবগত হওয়ার প্রয়োজনেই এই পাঠক্রমে বিশেষ গুরুত্ব আরোপ।

### CC-7

ক) আধুনিক যুগের সাহিত্য-ইতিহাসের পাঠশেষে সেই সময়ের সৃষ্টিশীল রচনার আস্বাদনের প্রায়োগিক প্রেক্ষায় বীরাঙ্গনার পাঠ। উনিশ শতকের নারী জাগরণের ইতিবাচক প্রতিফলনে কাব্যগ্রন্থটি ছাত্রছাত্রীদের ভবিষ্যৎ দৃষ্টিভঙ্গি তৈরিতেও উৎসাহব্যঞ্জক।

SEMESTER-IV

**CC-8**

ক) রবীন্দ্রকবিতা ও আধুনিক কবিতার রসাস্বাদনের মধ্য দিয়ে কাব্যসৌন্দর্যের উৎসেচন।

**CC-9**

দীনবন্ধুর নীলদর্পণ ও রবীন্দ্রনাথের শারদোৎসব দুই ভিন্নধর্মী নাটকের মধ্য দিয়ে প্রচলিত ধারার নাটক এবং সাংকেতিক তত্ত্বধর্মী নাটকের প্রভেদ সম্পর্কে ধারণা।

**CC-10**

বঙ্কিমচন্দ্রের চন্দ্রশেখর ও তারাশঙ্করের গণদেবতা পাঠের মধ্য দিয়ে দুই ভিন্ন সময়ের ঔপন্যাসিকের দৃষ্টিভঙ্গির প্রভেদ মাত্রা।

SEMESTER-V

**CC-11**

ছোটোগল্পের আঙিনায় রবীন্দ্রনাথের গল্পগুলির আস্বাদন। একালের গল্পগুলির পাঠাভ্যাসের মধ্য দিয়ে তাদের পার্থক্য এবং বাংলা গল্পের বিচিত্র ধরন-গড়ন-চলন সম্পর্কে অভিজ্ঞতা লাভ।

SEMESTER-VI

**CC-12**

সাহিত্যের রূপরীতি, বাদানুবাদ,তত্ত্বালোচনা এবং সাহিত্যের বিভিন্ন জাঁর পাঠ্যান্তর্ভুক্ত হওয়ার ফলে এই পত্রটি শিক্ষার্থীদের মন,মনন ও মেধার উৎকর্ষসাধন করতে সহায়তা করে।

SEMESTER-VI

**CC-13**

সংস্কৃত ও ইংরেজি সাহিত্যের ইতিহাসের  সুনির্দিষ্ট বিষয়গুলি অবগত হয়ে শিক্ষার্থীরা বাংলা সাহিত্যের তুল্যমূল্য আলোচনায় অগ্রসর হতে পারে।

BEJOY NARAYAN MAHAVIDYALAYA

DEPARTMENT OF ENGLISH

# B.A. Honours in English

## PROGRAMME OUTCOME

The overall CBCS course scores a decisive progress over the traditional classical, humanist syllabus of English literature and language. It opens up several choices with a lot of flexibility in students' progress. By breaking up the monolithic model of the year-end summative assessments into several smaller semester chunks, a latest, scientific approach to teaching-learning and evaluation system, the current course adopts micro-tests of several types like internal and final ones in every semester, which ensures a continuous assessment of learner progress all through.

The content of the B.A. (Hons./General) programme under CBCS is far more comprehensive than what it was in the previous format, and more relevant at the same time having courses on skill development which are aimed at providing hands-on-training, competency, skill, to the students pursuing the course. Besides there are Discipline Specific Courses that are intended to offer advance knowledge on specialized topics in the core course domain. Apart from Core Courses, a student studies elective courses from other discipline/ subject of study on the basis of his/her choice- a course that offers the student an exposure to other disciplines and scope to have proficiency in areas of knowledge outside the components of the Core Courses.

## PROGRAMME SPECIFIC OUTCOMES

B.A. Programme in English Honours contains a whole range of texts starting from great classical literature of both the Orient and the West down to that of the modern Indian diaspora. Students undertaking this course, are getting an overview of literature of the West and that of their own land. This syllabus presents a holistic approach to literature in English covering Indian Classical Literature, European Classical Literature, Indian Writing in English, British Poetry, Drama (16$^{th}$ – 17$^{th}$ Centuries), and Rhetoric &Prosody, American Literature, Popular Literature, British Poetry and Drama (17$^{th}$ – 18$^{th}$ Centuries), British Literature (18$^{th}$ Century), British Romantic Literature, British Literature (19$^{th}$ Century), Women's Writing, British Literature (Early 20$^{th}$ Century), Modern European Drama, and Postcolonial Literatures. Besides it offers such course components as Modern Indian Writing in English Translation, Partition Literature, Literary Theory, Literary Criticism and History of the English Language that acquaint the students with vast field of English Literature across the world, and provide

necessary theoretical perspectives to approach and understand the different kinds of English literary texts.

## COURSE OUTCOMES

The Course outlines of the discipline of English are divergent and universally humanistic. After careful examination of the courses, the department of English has pointed out the following outcomes of the selected courses as sample.

### CC-01: INDIAN CLASSICAL LITERATURE

The course content of CC-1 in the first semester of English Literature introduces the students to the Indian Classical Literature. This course is intended to expose the English students to the rich tradition of Indian classical literature which includes classical drama of Kalidasa, Banbhatta and Sudrak along with the most celebrated epic by Vyasa.

**CO-1**: By pursuing this course the students get acquainted with the major concerns and conventions of classical Indian literature. They get insight into the aesthetic principles, the dramaturgy, and the epic tradition that developed in ancient India. They also gather a fair idea about the society that produced them.

**CO-2:** Through the texts of ancient Indian literature students get acquainted with the traditional Indian culture and its moral values. Besides, the study of Indian classical literature alongside European classical and modern India English literature lends a wider perspective to the students' for understanding literature as such.

### CC-02: EUROPEAN CLASSICAL LITERATURE

**CO-1**: The content introduces first semester students of English Literature to Western Classical Literature which has remained the source of many a text in English. The students get an idea about important genre like drama and the epic and gets to read cult texts which have served as the basis of so much of literature in future.

**CO-2**: The course gears up the students to face the larger gamut of English Literature in the years to come.

### CC-03: INDIAN WRITINGS IN ENGLISH

**CO-1**: In pursuing this course the students get acquainted with Indian literature written in English. A foreknowledge of the socio cultural reality of the native country enables the students to appreciate literature in English in a very personal and intimate way.

**CO-2**: They get exposed to a whole range of issues and topics that acquaint them with colonial past, regional culture and social condition prevailing in different parts of India, the condition of women in India and its reflection in literature.

**CO-3**: Students also get introduced to the changing course of Indian English Literature from colonial times down to the present age of modernity.

## CC- 04: BRITISH POETRY, DRAMA (16TH-17TH CENTURIES), RHETORIC & PROSODY

**CO-1**: Students are enriched with sonnets of William Shakespeare and metaphysical poetry of John Donne.

**CO-2**: Students learn the art of public speaking and creative writing simultaneously.

**CO-3**: Students are informed with plays of Christopher Marlowe and William Shakespeare.

**CO-4**: Students understand ideas like Renaissance Humanism, Royal Stage and City Life, Religion and Politics, Love and Marriage.

**CO-5**: Students get knowledge about the role of contemporary writers during 16th-17th Centuries.

## CC-05: AMERICAN LITERATURE

**CO-1**: The present course, comprising a well number of detailed and non-detailed texts, is supportive to inculcate a sound knowledge in American literature, starting from earliest to recent time. Texts with a balanced coverage of main literary aspects---poetry, prose, drama & novel, claim easily a reader's response on Transcendentalism, psycho analysis, quest for mystery and adventure.

**CO-2**: In congruity with traditional British literature, an undergraduate student may feel an additional flavour of Commonwealth literature in it, too.

## CC-06: POPULAR LITERATURE

**CO-1:** Popular Literature is one of the most important genre taught in the universities globally in different disciplines of literature. Alice in Wonderland and The Wonderful Wizard of Oz and the incomparable contrast the texts creates between realism and the magical, the adventures of the inimitable Tintin and the spine chilling narrative of Agatha Christie instil in young minds an aura which will remain with them for long.

**CO-2**: It also creates a lot of space for future research.

## CC- 07: BRITISH POETRY & DRAMA (17TH-18TH CENTURIES)

**CO-1**: Students are enriched with poetry of John Milton and Alexander Pope.

**CO-2**: Students are informed with works of Thomas Dekker and Aphra Behn.

**CO-**3: Students understand ideas like Religion, Secularism, colonialism, and feminism.

**CO-4**: Students are made well aware with the role of contemporary writers during 17th-18th Centuries.

## CC- 08: BRITISH LITERATURE (18TH CENTURIES)

**CO-1**: This course acquaints the students with the literary tradition that prevailed in the 18th century England, and the social and intellectual climate that produced it.

**CO-2**: They get exposed to the texts that carry the ideals of the Restoration society and that of Enlightenment and the principles of Neoclassicism that marked the Middle class centric urban literature of England in the early 18th century.

**CO-3**: The course, as it stands, provides access to traditional British literary classics like Congreve, Defoe, Swift and pre-romantic poets like Collins, Grey. While dealing with materials like love intrigues in the play of Congreve, students enjoy love for Nature in the poetry of the transitional poets, and in the novels of Defoe and Swift they find the manifestation post-Enlightenment pursuit of adventures among other things.

## CC-09: BRITISH ROMANTIC LITERATURE

**CO-1**: This core course, chiefly based on noted pieces of Romantic poetry, is supposed to be the most popular one, as it exposes and explores some of school-level texts. Intense philosophical introspection, soul gratifying spirituality, conceptions of Nature & Imagination, Gothic sensation, the so- called social revelations are many of such gifts in this paper.

**CO-2**: In a long pathway of English Honours semesters, this is a paper of Reason & Revolution.

## CC- 10: BRITISH LITERATURE (19TH CENTURIES)

**CO-1**: Charles Dickens, had summed up in a succinct manner the thrust of nineteenth century British society, “It was the best of times, it was the worst of times.” The present syllabus introduces the students to this most intriguing period of British Literature encompassing Alfred Tennyson, Robert Browning, Christina Rossetti, Charlotte Bronte, Thomas Hardy and of course Dickens himself.

**CO-2**: The entire Victorian ethos with its Victorian compromise and the other parameters are laid bare to the undergraduates who get a varied and fair taste of the then society. The selection is really handpicked to serve more purposes than one. The

idea of dramatic monologue and the incomparable grace of Jane Eyre among others conjure a magical web.

## CC-11: WOMEN'S WRITING

**CO-1**: It is increasingly becoming more and more important to devote a paper to women's writing at the undergraduate level. There is an amazing variety in the offering. From Emily Dickinson to Sylvia Plath and Eunice De Souza to the amazing adaptation of Jane Eyre by Jean Rhys.

**CO-2**: The students get a taste of women's writing. Even the list of short stories penned by Charlotte Perkins Gilman, Katherine Mansfield, and Mahashweta Devi offer an insight into women's thought and psyche.

**CO-3**: The entire paper introduces the students to the first dozes of feminism, motivates students who could try to engage in researching feminist discourse and women's writing.

## CC-12: BRITISH LITERATURE (EARLY 20TH CENTURIES)

**CO-1**: The course encompasses a prized selection of early twentieth century which we broadly term as the modernist period with its all new clarion call of 'make it new' and its problems with the insurmountable chaos surrounding and the underlying urge to overcome the chaos is so well represented in the syllabus comprising the likes of Virginia Woolf, W.B.Yeats, T.S.Eliot, Joyce and John Osborne. The modern psychological novels of Woolf and Joyce and some works by two great modern poets like Yeats and Eliot acquaint students with the ideals of modernity. Osborne's play gives the students a unique dramatic taste of the simple, uneventful life of the British people about half a century before.

**CO-2**: The students get introduced to the modernist fervour, its methodologies like stream of consciousness, free verse and much more. With Osborne the students get to look at the postmodernist culmination in accepting the chaos that would fast become a way of life.

## CC-13: MODERN EUROPEAN DRAMA

**CO-1**: Students are enriched with plays of Henrik Ibsen, Eugene Ionesco, Bertolt Brecht, and Samuel Beckett.

**CO-2**: Students are enlightened with ideas like Realism, Tragedy, Heroism, and Absurdity from dramatic perspective.

**CO-3**: Students understand the role of contemporary writers in depicting politics and social change in the Stage.

## CC-14: POSTCOLONIAL LITERATURE

**CO-1**: The content of this course offers students an exposure to the postcolonial writing and acquaint them with the writings from erstwhile European colonies that portray the life in postcolonial societies and reveal some of the fundamental issues associated with postcolonial studies.

**CO-2:** Achebe's Things Fall Apart puts forward the story of colonial encounter with the natives of Africa resulting in the gradual destruction of the native cultural tradition, while Rushdie's Haroun and the Sea of Stories presents a postcolonial political allegory in the garb of fantasy.

## DSE-1A: MODERN INDIAN WRITING IN ENGLISH TRANSLATION

**CO-1**: Indian Writing in translation is fast emerging as a very important discourse of study in the syllabi of different universities of India and also the world. The variety in offer in the present syllabus covers Premchand, Sharatchandra Chattopadhay, Mahasweta Devi and M.K.Gandhi.

**CO-2**: The dominance of Bengali authors in the list is only an advantage as it gives the students more space to identify with some canonical Bengali texts and culture and identify better with the translated counterparts after having read the originals. In a country which has twenty three official regional languages it is increasingly significant to have translated versions in English.

## DSE–2A: PARTITION LITERATURE

**CO-1**: The course content introduces the students to a branch of literature dealing with partition theme, particularly in the Indian context.

**CO-2:** In studying the texts dealing with the post-partition realities in India and Pakistan- the two nations that came into being with the independence of the Indian sub-continent- the students get acquainted with the issues concerning colonialism, anti-colonial nationalism, the notion of identity, home and homelessness, communalism and the separatist politics born of the self-other binary perception. The Shadow Lines by Amitav Ghosh, Khushwant Singh's Train to Pakistan, Saadat Hasan Manto's Toba Tek Singh, Dibyendu Palit's Alam's Own House help students to develop a humanistic vision of truth that look beyond the shadow lines of separation.

## DSE–3A: LITERARY THEORY

**CO-1**: If there was one issue which was conspicuous by its absence in the different syllabi of English Literature in India, it, certainly was literary theory. It is imperative for a student taking one's graduation in English Honours to be abreast with some of the important Theoretical premises all over, The choice of Marxism, Post-structuralism, Feminism, and Postcolonial Studies certainly is worthy of appreciation as it allows the students to be abreast with these theoretical precepts which will come in handy for their future prospects which may include future research aspirations.

## DSE–4A: LITERARY CRITICISM AND HISTORY OF ENGLISH LANGUAGE

**CO-1**: This course introduces the students to two different branches of the study of English literature. Literary criticism elucidates many critical, aesthetic concepts essential for good literary appreciations. The area of British literary criticism from Sidney to Eliot empowers the learners to encounter any literary text with a depth of understanding and revelatory expressions. Beginning from Sidney the students come across theorization on literature offered by literary artists turned critics of literature. These writings dealing with literary principles, function of literature, the literary processes and modes of appreciation of literature as put forward by classicists like Dryden, Pope and Eliot on one hand, and romantists like Wordswoth and Coleridge endow the students with some of the fundamental ways of approaching and understanding literature.

**CO-2**: The second component of the course, though put under some new garbs, is the traditional philology. The trajectory of historical growth of the English language they pursue opens up their overall linguistic outlook necessary for their total performance in the present curriculum.

## SEC-I: TRANSLATION STUDIES AND CREATIVE WRITING

**CO-1**: In a multi-lingual country like India, the Skill Enhancement Course like Translation Studies is beyond doubt the most relevant & effective one. It not only introduces the theory & fundamental tools of translation studies, but even develops a vital communication skill which should be integral to personal, social & professional interactions.

**CO-2**: In the context of our rapid globalization and increasing recognition of social and cultural pluralities, the outcome of clear & effective translation is significantly a stepping stone to build a career.

**CO-3**: The other option offered to the students in this course is creative writing which aims at acquainting the students with principles of creative articulation. It includes components that apprise the students with the craft of creative writing and those that help them writing for media and modalities necessary for making publications.

## SEC-II: FILM STUDIES & ELT

**CO-1**: Students pursuing this course develop a proficiency in appreciating a film on the basis of its content, form and structure.

**CO-2**: The course is intended to develop skills and have the ability to enter careers in the entertainment industry, broadcasting, journalism, art, advertising etc.

**CO-3**: Students pursuing this course learn about evolution of films starting from silent era to modern 3d films, about nature and form of adaptation, and develop critical responses to cinematic work based upon aesthetic and cultural values in a way radically different from stereotypical attitude to film as a form of entertainment.

**CO-4**: English Language Teaching (ELT), yet another option offered to the students under this course, is a fast growing area of study in the English teaching-learning context today. It is a very useful subject for the making of efficient English teachers as well as good language learners. It gets learners acquainted with the technicalities developed in today's language learning context, particularly English learning. The new insights it offers highly facilitate the learning process. Everyday experiences like teaching and learning, apparently so obvious, show a lot of things taking place both internally as well as outwardly. Students face little difficulty in displaying their understanding in handling some classroom problems offered to them. They sometimes come up with their fresh approaches to some lingering problems. The subject is open-ended, and has larger applications in different fields of life in the present-day globalized context.

**Bejoy Narayan Mahavidyalaya**

**Department of Sanskrit**

**Report Of**

**Program out comes, Program Specific outcome, Course outcomes**

**2018-2019**

## Program out comes

| Program outcomes | Description |
|---|---|
| PO-1 Developing intellectual ability | Translator, grammar, prose, poet, drama, short story, criticisms, study in Indian and western literature, language knowledge. |
| PO -2 Communication skills | Ensuring high standard of Behavioral attitude through literary Subjects and shaping the students, social responsible citizens, Human values, social injustice, women & Dali sensation. |
| PO-3 Job opportunity | Jyotishi, Priest, Researcher, Social service, Science &Technology, Professor, Editor, Anchor, Reporter, Writer, school teacher, Higher education, competitive examination. |

## PROGRAMME SPECIFIC OUTCOME

- 1.It gives importance on the inheritance of great cultural heritage of India, which gives a broader vision to the learners to understand their life.
- 2.The syllabus gives an overall idea of Sanskrit literature and provides the students the information ofHistory of Sanskrit literature.

➔ 3.It acquaints the learners with the preliminary concepts of various disciplines like the Vedic literature, Epic literature, Philosophy, Medical science, Vedic Mathematics, Vastu Sastra, Poetics, etc.

➔ 4.The knowledge of Philology gives opportunity to the learners to know the linguistic patterns as well as socio-cultural conditions of various linguistic groups.

➔ 5. It prepares the students to face the examination and the challenges of real life as well.

➔ 6. The information and knowledge, incorporated in the ancient texts inspire the students for interdisciplinary research activities, which lead to the sustainable development of the nation.

➔ 7.It acquaints the learners with the technical and scientific literature in Sanskrit. TheThe technical literature comprises Poetics, Rhetoric, Prosody, etc.

➔ 8. The lessons on Sanskrit Grammar give a solid foundation to learn the structure of Sanskrit language.

➔ 9. The learners are acquainted with the basic information on Computer.

➔ 10. It possesses all the potentialities to develop human resources as it inculcates the spirit of ethical values,

## Course Outcome

| SEM-1 | Course Code | Course Name | Course Outcome |
|---|---|---|---|
| | CC-1 | Classical Sanskrit Literature(Poetry) | 1. This course aims to get students acquainted with Classical Sanskrit Poetry.<br>2. This course provides the students the |

| | | | |
|---|---|---|---|
| | | | information of History of Sanskrit literature,<br>especially the development of Sanskrit literature.<br>3. The course also seeks to help students tonegotiate texts independently. |
| | CC-2 | Critical Survey of<br>Sanskrit<br>Literature | 1) This course aims to get acquaint the students<br>with the journey of Sanskrit literature from Vedic<br>literature to Purāṇa.<br>2) It also intends to give an outline of different<br>Śāstric traditions, through which the students will<br>be able to know the different genres of Sanskrit<br>Literature and Śāstras. |

| **SEM-2** | **Course Code** | **Course Name** | **Course Outcome** |
|---|---|---|---|
| | CC-3 | Classical Sanskrit Literature (Prose) | 1) This course aims to acquaint students with comprehensive information of Classical Sanskrit Prose literature. Origin and development of prose, Important prose romances and fables Sanskrit, etc., have also been included here to acquaint the students with the history of Sanskrit Prose literature.<br>2) Besides the information of history this course also seeks to help students to select the Sanskrit texts for independent literary study. |

| | | | |
|---|---|---|---|
| | CC-4 | Self-Management in the Gītā | 1) The objective of this course is to study the philosophy of self-management in the Śrīmadbhagavadgītā.<br>2) This course helps the students for creative writing and analytical study.<br>3) This also guides the students to find out the relevance of Śrīmadbhagavadgītā in present context.<br>4) It helps the students to understand the broader perceptive of life.<br>5. It helps the students to know various ways of maintaining balance between thought and action |

| **SEM-3** | **Course Code** | **Course Name** | **Course Outcome** |
|---|---|---|---|
| | CC-5 | Classical Sanskrit Literature (Drāmā) | 1) This course aims to acquaint students with three most famous dramas of Sanskrit literature which represent three stages in the growth of Sanskrit drama.<br>2) Mudrārāksasa of Višakhadatta is a drama,written on the political background which acquaints the students with a different genre of Sanskrit drama |
| | CC-6 | Poetics and literary criticism | 1) The study of Sāhityaśāstra (Sanskrit Poetics) embraces all poetic arts and includes concepts like alaṁkāra, rasa, rīti, vakrokti, dhvani, aucitya etc.<br>The entire domain of Sanskrit poetic |

| | | | |
|---|---|---|---|
| | | | has flourished with the topics such as definition of poetry and divisions, functions of word and meaning, theory of rasa and alaṁkāra (figures of speech) and chandas (metre), etc. All these familiarize the students with the fundamental technical structures of Sanskrit literature.<br>2) This develops capacity for creative writing and literary appreciation. |
| | CC-7 | Indian Social Institutions and Polity | 1) Social institutions and Indian Polity have been highlighted in Dharma-śāstra literature. The aim of this course is to make the students acquainted with various aspects of social institutions and Indian polity as propounded in the ancient Sanskrit texts such as Saṁhitās, Mahābhārata, Purāṇa, Kauṭilya's Arthaśāstra and other works known as Nītiśāstra. |

| **SEM-4** | **Course Code** | **Course Name** | **Course Outcome** |
|---|---|---|---|
| | CC-8 | Indian Epigraphy, Paleography and Chronology | 1) This course aims to acquaint the students with the epigraphical journey in Sanskrit, the only source which directly reflects the society, politics, geography and economy of the time.<br>2) The course also seeks to help students to know the different styles of Sanskrit writing. |
| | CC-9 | Modern Sanskrit Literature | 1) The purpose of this course is to expose students to the rich & profound tradition of modern creative writing in Sanskrit, enriched by new genres of |

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|---|---|---|---|
| | | | writing. |
| | CC-10 | Sanskrit and World Literature | 1) This course is aimed to provide information to students about the spread & influence of Sanskrit literature and culture through the ages in various parts of the world in medieval & modern times. |

| **SEM-5** | **Course Code** | **Course Name** | **Course Outcome** |
|---|---|---|---|
| | CC-11 | Vedic Literature | 1) This course on Vedic literature aims to introduce various types of Vedic texts. Students will also be able to read one Upaniṣad, namely, Muṇḍaka, where primary Vedānta-view is propounded. |
| | CC-12 | Sanskrit Grammar | 1) To acquaint the students with general Sanskrit Grammar. |
| | | | |

| **SEM-6** | **Course Code** | **Course Name** | **Course Outcome** |
|---|---|---|---|
| | CC-13 | Indian Ontology and Epistemology | 1) This course aims to get the students acquainted with the cardinal principles of the Nyāya-Vaiśeṣika philosophy through the Tarkasaṁgraha and to enable students to handle philosophical texts in Sanskrit.<br>2) It also intends to give them an understanding of essential aspects of Indian Philosophy |
| | CC-14 | Sanskrit Composition and | 1) This paper aims at teaching composition and other related |

| | | | |
|---|---|---|---|
| | | Communication | information based on Laghusiddhāntakaumudī Vibhaktyartha Prakarana |

**BEJOY NARAYAN MAHAVIDYALAYA**

**DEPARTMENT OF HISTORY**

**B.A. Honours in History (under CBCS curriculum notified by The University of Burdwan)**

## Programme Specific Outcomes (PSO)

From the Academic Session 2017-18 CBCS was introduced by the BURDWAN University, which is our affiliating university at present. The first batch of student under the newly introduced semester system is, therefore, supposed to complete graduation in the year 2019. It thus appears difficult to measure programme specific outcomes on definite terms. Besides, the University itself is yet to provide concrete Programme Specific outcomes to its affiliated Colleges. However, our esteemed teachers of the Department of History pondered over the current syllabus and tried to chalk out some specific outcomes of B.A. three year, six semesters Honours Degree Programme of their own. Such expected Programme Specific Outcomes may be listed as follows:

Sound Knowledge of different Historical Periods: Under the CBCS papers in each semester are devoted to the study of particular Historical phase in the historical in the events along with the study of a few major works by some master Historians of that period. These not only help the students to understand a historical period better, but also reduce the load of study in the concerned area.

Knowledge of the Development of Historical perspective: While pursing Honours course of studies in History it is mandatory that a student develops proper knowledge of the historical events. In this sphere also the present syllabus appears to be illuminating, as it’s provides the students with standard and upto date knowledge of historical events, impact, war and history, result.

The students may acquire knowledge of the historical events of the Ancient, Medieval, Modern and European history in new aspects.

Development of the Historical Perspectives: The current syllabus is well chosen to represent different events from different angles. They are not only meant to make the students familiar with the dominant events of different ages, but also to open out new perspectives, the student may acquire a knowledge of the changing nature of politics or kingdoms of the changing times.

## COURSE OUTCOMES

The Course outlines of the discipline of History are divergent and contemporary. After careful examination of the courses, the department of History has pointed out the following outcomes of the selected courses as sample.

### Semester – I (CC-01)

UNIT-1:
Reconstructing Ancient Indian History
UNIT-2:
Phases of Pre-historic Cultures
UNIT-3:
The Harappan civilization
UNIT-4:
Cultures in transition
UNIT-5:
Changing political formations (circa 300 BCE to circa CE 300)
UNIT-6:
Society Economy and Culture in Early India

### Expected Course Outcome: Semester - CC-01

**CO-1:** Concept of Early Indian historical geography.

**CO-2**: Concept of pre-historic human culture.

**CO-3**: Foundation of knowledge according to Harappan civilization.

**CO-4**: Concept of culture transition and formation the great Indian culture in Ancient India.

**CO-5**: Concept of Ancient Indian political formation.

**CO-6**: Formation the concept of Ancient Indian Society, Economy and culture.

## Semester-1 (CC-02)

UNIT-1
Evolution of human Society& Food production: Beginnings of agriculture and animal husbandry
UNIT-2
Bronze Age Civilizations in general with reference to Mesopotamia (upto the Akkadian Empire)- economy, social stratification, state structure and religion
UNIT-3
Nomadic groups in Central and West Asia:Debate on the advent of iron and its implications
UNIT-4
Polis in ancient Greece: origin, features,nature and class composition; Sparta and Athens; decline of the Polis
UNIT-5
Peloponnesian War: Origin; Resources of belligerents; Course of war; Melos, Mytilene, Periclean strategy; Sicilian expedition
UNIT-6
Greek Culture and Religion: Sophists, Socrates, Games, Drama, Art and Architecture, Greek Gods

## Course outcomes CC-02

**CO-1**: Concept of History of human evolution.

**CO-2**: Idea of economy, society, religion and political formation of the Bronze Age with the example of Mesopotamia.

**CO-3**: Concept of Nomadic groups in Central and West Asia.

**CO-4**: Concept of Polis in ancient Greece with special reference to Sparta and Athens.

**CO-5**: Knowledge of Peloponnesian war.

**CO-6**: Concept of Greek culture, Religion, Society, Art and Architecture.

## Semester-2 (CC-03)

UNIT-1
Studying Early Medieval India
UNIT-2
Political Structures
UNIT-3
Arrival of Islam in India
UNIT-4
Agrarian Structure and Social Change
UNIT-5
Trade and Commerce
UNIT-6
Religious and Cultural Development

## Course outcome CC--03

**CO-1**: Concept of Early Medieval India.

**CO-2**: Idea of Political structure in early medieval time.

**CO-3**: Concept of Islam arrival in India and its effect.

**CO-4**: Idea of Agrarian structure and social change in this time.

**CO-5**: Concept of trade and commerce in early Medieval time.

**CO-6**: Concept of Religion and Cultural development in early Medieval India.

## Semester-2 (CC-04)

UNIT-1
Roman Republic
UNIT-2
Religion, culture, literature and Philosophy in ancient Rome
UNIT-3
Crises of the Roman Empire & transition to Principate
UNIT-4
Religion and culture in medieval Europe
UNIT-5
Economic developments in Europe
UNIT-6
Societies in Central Islamic Lands

## Course outcome CC-04

**CO-1**: Concept of Ancient Roman Republic.

**CO-2**: Concept of Roman religion, culture, literature and Philosophy in ancient Rom.

**CO-3**: India of crises of the Roman Empire and its effect.

**CO-4**: Concept of religion and culture in medieval Europe.

**CO-5**: Concept of economic developments in medieval Europe.

**CO-6**: Idea of societies in Islamic Lands

## Semester-3 (CC-05)

UNIT-1
Sources for studying/Interpreting the Delhi Sultanate
UNIT-2
Sultanate Political Structures
UNIT-3
Regional Political structures
UNIT-4
Sultanate Society and Economy-1
UNIT-5
Sultanate Society and Economy-2
UNIT-6
Religion and Culture

## Course outcomes CC-05

**CO-1**: Knowledge of Delhi Sultanate sources.

**CO-2**: Concept of Sultanate Structure.

**CO-3**: Concept of regional political Structure.

**CO-4**: Idea of early sultanate society and Economy.

**CO-5**: Idea of later Sultanate Society and Economy.

**CO-6**: Concept of Religion and Culture of Sultanate.

## Semester-3 (CC-06)

UNIT-1
Transition from feudalism to capitalism
UNIT-2
Early colonial expansion: motives, voyages and explorations; the conquests of the Americas
UNIT-3
Renaissance
UNIT-4
Origins, course and results of the European Reformation in the 16th century.
UNIT-5
Economic developments of the sixteenth century
UNIT-6
Emergence of European state system: Spain; France; England

## Course outcome CC-06

**CO-1**: Concept of transition feudalism to capitalism in Europe.

**CO-2**: Idea of Early colonial expansion.

**CO-3**: Concept of Renaissance and its origin, nature and effect.

**CO-4**: Concept of European Reformation in the 16th century.

**CO-5**: Concept of economic development of the 16th century Europe.

**CO-6**: Idea of new state system in Europe.

## Semester-3 (CC-07)

UNIT-1
Sources and Historiography
UNIT-2
Establishment of Mughal rule
UNIT-3
Akbar & Consolidation of Mughal Empire
UNIT-4
Mughal Empire Under Aurangazeb
UNIT-5
Patterns of Regional Politics
UNIT-6
Mughal Art, Architecture & Painting

## Course outcome CC-07

**CO-1**: Concept of sources and Historiography of Mughal History.

**CO-2**: Idea of establishment of Mughal rule.

**CO-3**: Concept of Akbar, Jahangir and Shahjahan & consolidation of Mughal Empire.

**CO-4**: Idea of Mughal Empire under Aurangzeb.

**CO-5**: Concept of patterns of Regional Politics in Mughal era.

**CO-6**: Concept of Mughal Art, Architecture & Painting.

## Semester-4 (CC-08)

UNIT-1
17th century European crisis: economic, social and political dimensions
UNIT-2
The English Revolution: major issues; political and intellectual currents
UNIT-3
Rise of modern science in relation to European society from the Renaissance to the 17th century
UNIT-4
Mercantilism and European economics; 17th and 18thcenturies
UNIT-5
European politics in the 18th century: parliamentary monarchy; patterns of Absolutism in Europe
UNIT-6
Prelude to the Industrial Revolution

## Expected course outcome CC-08

**CO-1**: Concept of 17th century crisis on special reference to social and political aspects.
**CO-2**: Rise of modern science.
**CO-3**: About Mercantile theory.
**CO-4**: The concept of Industrial Revolution.
**CO-5**: Concept of Absolutism in Europe.

## Semester-4 (CC-9)

UNIT-1
Foundations of Company'sRule
UNIT-2
Legitimization of Company's rule in India
UNIT-3
Rural Economy and Society
UNIT-4
Trade and Industry
UNIT-5
Renaissance and Reforms
UNIT-6
Popular Resistance

## Expected course outcome CC-9

**CO-1**: Establishment of British company rule in India.
**CO-2**: Concept of different Land - Revenue system.
**CO-3**: Concept of Industrialization in company rule and Moneylenders in India.
**CO-4**: Concept of Bengal Renaissance and social religious movements in India.
**CO-5**: Some revolt against British company.

## Semester-4 (CC-10)

UNIT-1
The aftermath of 1857
UNIT-2
The early phase of Indian Freedom Movement
UNIT-3
The Gandhian era
UNIT-4
Towards freedom
UNIT-5
Communal Politics
UNIT-6
The Nehru era

## CC-10 - Expected course outcome

CO-1: Concept and nature of the revolt 1857.
CO-2: Histography of Indian Nationalism.
CO-3: The contribution of Indian National Congress in Indian freedom struggle.
CO-4: Role of Gandhi in Indian politics.
CO-5: Role of Subhash Bose in Indian freedom struggle.

## Semester-5(CC-11)

UNIT-1
The French Revolution and its European repercussions Crisis of Ancien regime
UNIT-2
Napoleon Bonaparte and the French Revolution
UNIT-3
Restoration and Revolution (1815-1848)
UNIT-4
Industrialization and socio economic transformation Industrial Revolution
UNIT-5
Age of Nationalism Unification of Italy and Germany
UNIT-6
The Eastern Question

## Expected Course Outcome:CC-11

**CO-1**: Concept of French Revolution (1789) about the constitution, voting right, parliamentary democracy, first bourgeoise revolution, decline of the theory of 'divine right' of the French king.

**CO-2**: The flag of idea of the French revolution (liberty, equality and fraternity) uphold by Napoleon.

**CO-3**: Concept about the Vienna Settlement (1815), fall of Napoleon, reparation against Vienna Settlement; The July Revolution (1830), The February Revolution (1848).

**CO-4**: Concept of the Industrialization, why it to place first in England, spread in Europe (France & Germany), its socio-economic impact.

**CO-5**: Conception of Nationalism, nationalism gave birth of two new states – Germany & Italy.

**CO-6**: From the spirit of Nationalism the scenario of the eastern part of Europe was changed, called Eastern Question, which ultimately turn towards The First World War (1914-1919).

## Semester-5 (CC-12)

UNIT-1
Time, Space & Human Agency
UNIT-2
Importance of sources in History
UNIT-3
Philosophy and Theory of History
UNIT-4

Indian & Western Historiography
UNIT-5
History and other disciplines
UNIT-6
Research Process in History

## CC 12 - Expected course outcome

CO-1: Concept and definition of History.
CO-2: Relationship between History and other disciplines.
CO-3: Different schools of History.
CO-4: How to write a Research paper.
CO-5: Concept of data collection and interpretation.

## Semester-5 (DSE-1)

UNIT-1
The land environs and places
UNIT-2
People and Society
UNIT-3
Political development of Bengal-an overview
UNIT-4
Economic life in Bengal
UNIT-5
Religions and art in Bengal
UNIT-6
Literature and traits of regional culture

## Semister-5 - DSE-1 - Expected Course Outcomes

**CO-1**: Concept of Historical geography of ancient Bengal.

**CO-2**: Concept of Bengal people,society and culture transaction.

**CO-3**: Idea of Political development of Bengal under Shashanka, Pal and Sen era.

**CO-4**: Concept of Economic life in ancient Bengal.

**CO-5**: Concept of religion and art in ancient Bengal.

**CO-6**: Concept of literature and traits of regional various culture in Ancient Bengal.

## Semester-5 (DSE-2)

UNIT-1
Establishment of East India Company's rule in Bengal
UNIT-2
Changes in Social and Economic life up to 19th Century
UNIT-3
Impact of company's Rule
UNIT-4
Cultural Scenario in 19th Century
UNIT-5
Emergence of Nationalism
UNIT-6
Changes in the 20th Century

## Expected Course Outcome: DSE -2

**CO-1**: Concept about the relation between the East India company and Nawab of Bengal, Nawab defeated, established company's rule in Sube-Bangla (Bengal, Bihar, Odissa). Change in pattern of Revenue system of the British and its effect on rural economy of Bengal.

**CO-2**: Concept of Urbanization, particularly growth and development of Calcutta. Several pleasant movement.

**CO-3**: Conception about Western education in place of indigenous education system, women education, emergence of Bengali middle class, the Bengal Renaissance, its drawbacks, role of Rammohan, Vidyasagar,etc.

**CO-4**: New conception emerged in the cultural site, music, theatre, performing art, science and technology. History of medicine- indigenous and western.

**CO-5**: Conception about the swadeshi movement (1905), Muslim league, Gandhi as a leader, various movement by Gandhiji.

**CO-6**: A new concept of 20th century; influence of nationalism in various literature, utsab & melas, theatre of the 20th century, Rabindranath, nazrul and Saratchandra.

## Semester-6 (CC-13)

UNIT-1
First World War and its aftermath
UNIT-2
Imperial Expansion
UNIT-3
Challenges to the new European order
UNIT-4
The Road to 2nd World War
UNIT-5
United Nations Organization
UNIT-6
Second World War

## Expected Course Outcome: CC -13

**CO-1**: Conception about the Foreign Policy of Germany (after 1870), the German penetration towards East, the New Eastern Question of 19th century.

**CO-2**: Outbreak of the first World War, the causes- different news of the histories, the new concept of Socialism- Karl Max, the Socialist Revolution in Russia (1917) Leadership of Lenin & Stalin, End of the First World War, the treaty of 1919 & the formation of League of Nations. Peace for twenty years in the world. Conception about the NEP in Soviet.

**CO-3**: Union, development of Soviet, at the same time Hitler emerged as a German Powerful Man, concept of Nazism in Germany and Fascism in Italy developed.

**CO-4**: Concept about the causes of the 2nd World War, the formation of Roam-Barley-Tokyo power.

**CO-5**: Conception about the outbreak of the 2nd World War, different views of Historians, the most important question was “Is Germany Solely Responsible for the 2nd World War?”

**CO-6**: Conception about the formation of U.N.O, its different organizations.

## Semester-6 (CC-14)

UNIT-1
Post War Development
UNIT-2
Decolonization and the emergence of the Third world
UNIT-3
Cold War Escalates
UNIT-4
Perspectives on Development and under development
UNIT-5
Modernity and cultural transformation
UNIT-6
Changing World

## Expected Course Outcome: CC-14

**CO-1**: Concept about the International Scenario after 1945, End of 2nd World War.

**CO-2**: Concept about Nationalism, particularly in Asia, Africa & Latin America. Formation of OPEC, ASEAN, SAARC, SEATO.

**CO-3**: Definition of Cold War, various discourse about the Cold War. The world divided into two powerful block – 1) Socialist Camp: under the leadership of Soviet Union 2) Capitalist camp: under the leadership of U.S.A, NATO & Warsaw Pact.

**CO-4**: Concept about the Global Economy GATT WTO IMF World Bank, India in this stage entered into the Global Economy, Multinational Company emerged.

**CO-5**: Concept about Technical & information Revolution. Concepts about the changing pattern in Media, Culture.

**CO-6**: Concept about the collapse & Soviet Block, Glasnost & Perestroika, Uni-Polarisation in favor of U.S.A, Birth & growth of Terrorism, Ethnic Clashes.

## Semester-6 (DSE-3)

UNIT-1
Pre-colonial China
UNIT-2
Anglo Chinese relations till the Opium War
UNIT-3
Rebellion, Restoration and Nationalism
UNIT-4
Pre-MejiJapan
UNIT-5
Meiji Restoration
UNIT-6
Expansion of Japan up to the First World war

## Course outcome DSE -3

**CO-1**: Concept of society, religion, administration and economy in pre-colonial china.

**CO-2**: Idea of Anglo Chinese relation till the Opium War and its effect on chinese socio-economic & political life.

**CO-3**: Idea of chinese rebellion, restoration & nationalism.

**CO-4**: Concept of society, religion, economy and administration in pre Meiji Japan.

**CO-5**: Concept of Meiji Restoration and its effect on Japan and world.

**CO-6**: Concept of Expansion of Japan up to the First World war.

## Semester-6 (DSE-4)

UNIT-1
Nationalism in China
UNIT-2
The Kuomintang and the Nationalist government
UNIT-3
The Communist Victory in China
UNIT-4
Japan and World war I

## Course outcomes DSE- 4

**CO-1:** Concept of Chinese nationalism

**CO-2**: About May 4th movement

**CO-3**: Rise of Chinese communist party and conflict between Kuomintang and CCP

**CO-4**: Rise of red China and its impact on world politics

**CO-5**: Role of Japan in 1st and 2nd world war.

**DEPARTMENT OF POLITICAL SCIENCE: COURSE OUTCOME/PROGRAMMEOUTCOME/PROGRAMME SPECIFICOUTCOME**

1. **COURSE OUTCOME:**
1. **WESTERN POLITICAL THOUGHT**

CO1- **Ancient Greek political thought with focus on Plato- justice; Aristotle- theory of state.**

**CO2-Examining the features of Medieval Political Thought.**

**CO3-Renaissance and Machiavelli: Concept of power and Secularization of politics. CO4-Critically examining Hobbes: Concept of Sovereignty; Locke: Foundation of Liberalism; Rousseau: General Will.**

**CO6- Marx and Engels: Dialectical and Historical Materialism; Lenin: Imperialism.**

**CO7-Critically examining J.S.Mill and Isaiah Berlin: Concept of Liberty.**

**2.POLITICAL THEORY**

**CO1-Analsing what is politics and political Theory; Importance of political theory: Decline and Resurgence.**

**CO2-Explaining the different approaches to the study of political science: a) Traditional b) Behavioural and Post-Behavioural c) Marxists.**

**CO3-The Concept of Sovereignty: a) Monistic b) Pluralist c) Popular.**

**CO4-Liberty and Equality: Meaning and their Inter-relationships.**

**CO5- Theory of Justice: Rawls.**

**CO6-Ideology- Meaning and Variants: a) Anarchism b) Liberalism and Neo-Liberalism c) Fascism; The end of Ideology Debate- Daniel Bell and Francis Fukuyama.**

**CO7- Theory of State: a) Idealist b) Liberal c) Marxist d) Gandhian.**

**2. INDIAN POLITICAL THOUGHT:**

**CO1-Ancient Indian Political Thought: Features; Kautilya's theory of Saptanga and the Concept of 'Dandaniti'.**

**CO2- Main features of medieval Muslim Political Thought.**

**CO3-Raja Ram Mohan Roy: perception of British Colonial Rule and their role as**

**Modernizers.**

**CO4-Bankim Chandra Chattopadhyay, Vivekananda: Nationalism.**

**CO5- Mohandas Karamchand Gandhi: Satyagraha; trusteeship**

**CO6- Rabindranath Tagore; State, Society and Nation.**

**CO7-B.R. Ambedkar: Social Justice.**

**4. INDIAN GOVERNMENT AND POLITICS**

**CO1- The Constituent Assembly: its Composition and role**

**CO2- The Preamble and its Significance**

**CO3- Fundamental Rights and Duties (b) Directive Principles of State Policy**

**CO4-Nature of Indian Federalism: Centre-States relations – Legislative, Administrative and Financial.**

**CO5- Union Legislature: LokSabha and RajyaSabha – Organization, Functions and Law-making Procedures; the Speaker; Procedure of Constitutional Amendment**

**CO6- Union Executive: President and Prime Minister: Powers and functions; Governor and Chief Minister: Powers and function.**

**CO7- Judiciary: Supreme Court and High Courts – Composition and Functions;**

**CO8- Party System in India: Features and Trends; Coalition Governments**

**CO9- Electoral Process: Election Commission – Composition and Functions; Electoral Reforms.**

**5. COMPARATIVE POLITICS**

**CO1- Transition from Comparative Government to Comparative Politics - Scope and Objectives of**

**Comparative Politics**

**CO2- Conventions and the Rule of Law in UK; Bill of Rights in the USA**

**CO3- Unitary Systems: UK and France; Federal Systems: USA**

**CO4-Parliamentary and Presidential Systems: UK and USA and China**

**CO5-Party System in UK and USA and France, Nigeria, Mexico.**

**CO6- Legislatures in UK and USA: Composition and Functions.**

**CO7- Judiciary in UK, USA and France**

**6. PUBLIC ADMINISTRATION**

**CO1- Public Administration: Meaning, dimensions and significance of the; Evolution of Public Administration as a Discipline; Identity crisis of Public Administration.**

**CO2- Classical Theories: Scientific Management (F.W. Taylor); Administrative**

**Management (Gullick, Urwick); Ideal type bureaucracy (Weber)**

**CO3-Neo-Classical Theories: Human Relations (Elton Mayo); Decision Making Theory (Herbert Simon); Motivation Theory (Herzberg, Maslow)**

**CO4-Contemporary Theories: Ecological Approach (Fred Riggs); Innovation and**

**Entrepreneurship (Peter Drucker)**

**CO5-Concepts of Administration: Hierarchy, Span of Control, Unity of Command, Line and Staff, Centralization-Decentralization, Devolution, Delegation**

**CO6- Major approaches in Public Administration – New Public Administration, New Public Management, New Public Service Approach, Feminist Perspective.**

**7. LOCAL GOVERNMENT IN INDIA**

**CO1- 73rd Amendment Act and its implications for rural local-self Government in India.**

**CO2-74th Amendment Act and its implications for urban local-self Government in India.**

**CO3- Rural Administration in West Bengal: Panchayati Raj Institutions; Role of BDO.**

**CO4- Urban Administration in West Bengal: Municipalities and Municipal Corporations.**

**CO5-District Administration: Role of DM, SP & SDO.**

**CO6- State Administration in West Bengal: Chief Secretary; Divisional Commissioner;**

**CO7- Administrative Reforms in India: Impact of Globalization – RTI, Lokpal and Lokayukta.**

**8. INTERNATIONAL RELATIONS**

**CO1- Nature and Scope of International Relations; Idealist, Realist, and Neo-Realist approaches in International Relations.**

**CO2- National Power: Concepts and Elements**

**CO3- Balance of Power and Collective Security**

**CO4- Origin and End of the Cold War**

**CO5- Post Cold War global issues: (a) Globalization (b) Human Rights (c) Terrorism**

**CO6- Disarmament: NPT, CTBT, and NSG.**

**CO7- Foreign Policy and Diplomacy: Concepts, Determinants and Objectives**

**CO8-Indian Foreign Policy: Basic Tenets.**

**9. SOCIOLOGY AND POLITICS**

**CO1- Political Sociology and Sociology of Politics: Nature and Scope.**

**CO2- Political Culture: Meaning, Components and Types; Political Socialization: Meaning,Role and Agencies.**

**CO3-Political Participation: Meaning and Components.**

**CO4-Concepts of Power and Authority; Types of Authority.**

**CO5- Feminism: Meaning, Significance and Different Schools.**

**CO6- Environment and Politics; Environment Movements: An Overview; Eco-Feminism.**

**CO7-Religion and Politics; Concept of Secularism.**

**CO8-State and Civil Society: Media, Society and Politics.**

**10. INTERNATIONAL ORGANIZATIONS**

**CO1- Evolution of international organizations.**

**CO2- United Nations: its Emergence; General Assembly and Security Council; Secretariat;**

**Secretary General; International Court of Justice: Composition and Functions.**

**CO3- Peacekeeping and Peacebuilding Role of the UN.**

**CO4-Regional Economic Organizations-APEC &OPEC.**

**CO5-Regional security organizations-NATO & ARF.**

**CO6-Regional Organizations: SAARC and ASEAN, BRICS – Goals and Functioning.**

**11. SOCIAL MOVEMENTS IN INDIA**

**CO1- Social Movements: Definition; Distinction between "new" and "old" social**

**Movements.**

**CO2-Positive discrimination and Dalit movements (Panthers) in India.**

**CO3- Trade Union movements in India: an overview of strength and weaknesses.**

**CO4- Peasant moments in India: Case Study (Telengana and Tebhaga).**

**CO5- Women's movements in India: key issues.**

**CO6- Environmental Movements in India: Chipko, Narmada Bachao Andolan.**

**12 .ELEMENTARY RESEARCH METHODS IN POLITICAL SCIENCE**

**CO1a.Meaning and Objective of social science research.**

**b. Theoretical foundations of research: A brief outline of Positivism, Post-Positivism,**

**And their critiques.**

**CO2- Methodology of research: Qualitative and Quantitative.**

**CO3- Vocabulary of research: Concept, Variable, Proposition, Hypothesis, Theory.**

**CO4- Components of Research Design: Problemation, Hypothesis formulation, Data collection and testing of hypothesis.**

**CO5- Major Methods and techniques of Data Collection: Survey method, Interview, and Case Study.**

**13. Indian Foreign Policy**

**CO1-Key Determinants of India's Foreign Policy-Geography, Parliament, Cabinet, PMO.**

**CO2- India's Foreign Policy towards her neighbours; recent engagement with Pakistan,Bangladesh and Nepal, Bhutan.**

**CO3- India and the major powers-USA, China, Russia.**

**CO4- Recent trends in India's Foreign Policy.**

**14. Contemporary Issues in India**

**CO1- Caste System in India – Its changing nature and dynamics.**

**CO2- Women – Discrimination and violence against women.**

**CO3- Secularism and Communalism**

**CO4- Political Economy of Poverty and Inequality**

**CO5- Rights of Persons With Disabilities (PWDs) inIndia.**

**CO6- Social Backwardness and Protective Discrimination**

**CO7- Disaster Risk Reduction and Development Planning.**

**PROGRAMME OUTCOME**

**PO1-Political Science and Society:** understanding the inter relationship between policy decisions and its effects on society.This is achieved through a comprehensive teaching of the practice of public administration in India.

**PO2-Critical thinking:** the ability to analyse and predict socio political phenomena based on the study of existing socio economic determinants and past experiences. This goal is achieved by training students in the different methods and tools of investigation such as empirical research methods, survey research and data analysis of subject responses.

**1.PO3 - Effective citizenship:** the course curriculum inculcates among students a basic understanding of the rights and duties of citizenship and thereby to act as responsible citizens through the observation ofthe rights and duties of citizenship and thereby to act as responsible citizens through the observation of important days such as Independence Day, Republic Day and also spreading awareness in society throughstreet plays based on specific socio political issues such as domestic violence, disillusioned youth of the materialistic world etc.

**PO4 - Communication**: Establishment of linkages between academics and civil society at large so as tosuccessfully address socio political problems. The fortnightly wall journal is a means for keeping theentire student population up to date with political occurrences both global and domestic. Debates, seminars and panel discussions are also regularly organised on relevant themes and participation is sought from experienced resource persons. Some of the events in this regard have been an interactive session on the Presidential Election In America with members of the American Senate, Senator Wayne Harper, a Utah State Senator (Republican Party) and Mrs.Aruna Miller, a Maryland House Delegate (Democratic Party) and Mr. Greg Pardo, Assistant Public Affairs Officer, US Consulate Kolkata; a panel discussion and debate on :

***Role of the Media in Politics in 21st Century India.***

**PO5- Individual and team work:** Function effectively as an individual and as a member/leader in different social settings. This aim is achieved through team research and presentations, especially inter college student seminars which have addressed themes such as ***Diverse Paradigms of Indian Democracy:***

***Crises and Challenges*** and ***The Indian Parliament: A critical Retrospect*** and also by participating in the Youth Parliament competition organised by the Department of Parliamentary Affairs, Government of West Bengal.

## POLITICAL SCIENCE DEPARTMENT
## PROGRAMME SPECIFIC OUTCOME

PS0 1 - Understanding the nature and developments in national and international politics

PSO2 - Analysing the Indian constitutional provisions, major legislations and reforms.

PSO3- Critical evaluation of social, economic and political variables for a proper understanding of the plurality of Indian society

PSO3 -Building overall consciousness regarding national political history, international relations and present Indian and Western political thinkers.

PSO4 - Encouraging a comprehensive, comparative understanding of specific world constitutions such as UK, USA, China and France.

PSO5 - Developing knowledge of administrative studies with special reference to Indian administrative structures and practices.

PSO6 - Examining India's foreign relations with her neighbours and great powers.

PSO7 -Use of case study method for analysing the working of important international and regional organisations like UN, ASEAN etc.

**DEPARTMENT OF PHILOSOPHY: COURSE OUTCOME/ PROGRAMME OUTCOME/ PROGRAMME SPECIFIC OUTCOME**

**COURSE OUTCOME:**

1. **Outlines of Indian Philosophy:**
   - i) Is Indian philosophy Pessimistic?
   - ii) Can we overcome our sufferings by following Carvaka Philosophy?
   - iii) Do you believe in rebirth?
   - iv) Is it at all possible to get liberation? If yes, how is it possible?
   - v) Do you support Samkhya School for not admitting God as the creator of this world?
   - vi) How does Ramanuja refute Sankara's doctrine of Maya?

2. **Outlines of Western Philosophy:**
   - i) Is experience only source of all ideas? Discuss.
   - ii) Is knowledge merely true belief? Discuss.
   - iii) How does Descartes explain the relation between mind and body?
   - iv) How Berkeley does rejects Locke's notion of abstract ideas?
   - v) What are three levels of Hegel's dialectic method?

3. **Indian Ethics :**
   - i) Is it always wrong to do something bad?
   - ii) What is mean by Niskama Karma? Is it possible at all?
   - iii) What is Moksha-the Supreme end?
   - iv) What is the role of the principle of non-violence for making developed society?
   - v) What is the bondage in Jaina philosophy? How to get liberation from it?

4. **Western Ethics :**
   - i) Why is ethics relevant?
   - ii) Why do we need rules in our life?
   - iii) 'Goodwill is good in itself' what is the implication of this statement?
   - iv) Why should we care about the environment?
   - v) If I do not have free will, can I be responsible for what I do?
   - vi) On what grounds criminal should we party should be punished?

5. **Indian Logic :**
   - i) What is the necessity to admit the nirvikalpaka pratyaksa?
   - ii) How can vyıpti be established?
   - iii) What is the necessity to admit svarthanumana ?
   - iv) What is savyabhicara hetvabhasa?
   - v) Explain, after Annarnbhatta, the laksana of karya.

**6. Philosophy in Practice :**

i) What is the difference characteristics Between Philosophy of the West and Darshana of the East?
ii) Can we fulfilled all conditions for a propositional knowledge?
iii) Do you think Chala is a valid instrument in debate for participants?
iv) Is prakriti the primary cause of the world?
v) Do you believe that human experience is partly constituted by human mind ?

**7. Western Logic:**

i) Why should we study logic?
ii) Do we need to study logic properly to make good arguments?
iii) Distinguish between deductive and inductive arguments.
iv) Distinguish between rules of implication and rules of replacement.
v) What is the distinguishing mark of induction?
vi) Is a word merely a noise when it is spoken, or a set of marks when it is written?

**8. Psychology:**

i) 'Psychology is the science of behaviour'- Do you believe it? Make point' in favour of your response.
ii) Explain Introspection as psychological method.
iii) What is meant by the Organization of the Sense Field?
iv) What are the marks of good memory?
v) Do you think that the Trial and Error Theory of Learning is effective method?

**9. Philosophy of Religion:**

i) If God is good and created everything, how come there is evil?
ii) What does it mean by 'God is immanent'?
iii) What is the difference between Theology and Philosophy of Religion?
iv) Do you think that, we can follow properly the Jaina concept of non-violence?
v) Is there any relation between religion and magic?

**10. Philosophy of Human Rights :**

i) What is meant by "natural rights tradition"?
ii) Do you think that equality and liberty are necessary conditions of human rights?
iii) How important is the right of protection of people in the society?
iv) Is freedom of expression very important for human being?
v) What is meant by the right to life?

**11. Socio-Political Philosophy:**

i) What's the best kind of society? State your own view.
ii) What is the best sort of Government? State your own view.
iii) What is the best kind of society?
iv) Distinguish between an association and an institution.
v) Discuss the role of mores' as forces of social control.
vi) Explain the main features of Liberal Democracy.

**12. Kaṭhopaniṣad :**

i) Why do we need a teacher like Sri Krishna and Yama in our life?
ii) Is life precious after death?
iii) State the difference between Sreya and preya.
iv) How does Yama compare this body and soul with Ratha and Rathi?
v) Is Nachiketa an Adhikari purusa to get the knowledge of Brahman?

13. **B. Russell: The Problems of Philosophy**:

i) What is the difference between appearance and reality?
ii) According to Russell, what is the main function of philosophy?
iii) What is sense data according to Russell?
iv) Do you think that Russell's Sense Data Theory is the basis of Representative Realism?

**14. Philosophy in the Twentieth Century: Indian :**

i) Why does Rabindranath hold that his religion is 'the Religion of Man'?
ii) What does Rabindranath mean by the finite man?
iii) How can we apprehend God's existence according to Iqbal?
iv) Explain the doctrine of Maya according to Vivekananda.
v) What is Purna Yoga according to Sri Aurobindo?

**15. Philosophy in the Twentieth Century: Western :**

i) What are the arguments in favour of a defence of common sense by G.E. Moore?
ii) Is there any relation between knowledge by Acquaintance and knowledge by description?
iii) Is appearance deceptive according to A. J. Ayer?
iv) What is the difference between Authenticity and Inauthenticity according to M. Heidegger?
v) Is there complementary or contradictory relationship between being and nothingness?

**16. Rabindranath Tagore: Sadhana :**

i) How man is related with this universe?
ii) Why suffering becomes important to us? How is it related with our joy?
iii) When we get the state of heaven according to the God Jesus? State after Rabindranath Tagore's Sadhana.
iv) What is the value of Love?
v) What is the aim of our ultimate being?
vi) How do the men realize his ultimate being or the ultimate reality?

**17. Hume: An Enquiry Concerning Human Understanding:**

i) What is Hume's view regarding the purpose and nature of Metaphysics?
ii) Distinguish between Impression and Ideas according to Hume.
iii) What does you mean by Association of ideas?
iv) Discuss how Hume tries to show that custom is the great guide of human life.
v) Is there any necessary connection between cause and effect?

**PROGRAMME OUTCOME:**

PO1: **Philosophy and the world:** Philosophy seeks to thoroughly analyse the relationship between every object and person in the world and to consider and understand what the content as a whole.

PO2: **Value and Responsibility:**

We should understand the value of each member of the world. It is believed that every member is valuable in this world and they are each playing their own role. Every member is very important so it is necessary to respect everyone in the world.

PO3: **The guiding philosopher:** In many difficult situations in our life we have faced moral dilemmas between right and wrong. We even confuse what should we do? At that time, we need a friend, philosopher and guide like Sri Krishna to overcome our moral conflicts and get the actual knowledge of ourselves.

PO4**. Ethics, logic and society:** we need to maintain peace for improving lifestyle of people in the society. We have y to understand that in society we are all interdependent and everyone is responsible to our future generations. We should make every decision with respect to others, we should make decisions on overall development of the society. It is possible if we apply correct reasoning with morality.

PO5. **We have to control our behavior to build a civilized society**. The basic condition for building a civilized society is that every person in the society should control his own behavior and fulfill his responsibilities properly to the society. Every person should do his own duty without thinking of profit and loss, then a real civilized society will be formed.

**PHILOSOPHY DEPARTMENT PROGRAMME SPECIFIC OUTCOME:**

PSO1: Introducing the general features of Indian philosophy and different schools of Indian Philosophy.

PSO2: Critical analysis of different thoughts of western philosopher.

PSO3: Understanding the value of life, nature of relation between human and non-human world etc.

PSO4: Comparative study between characteristics of Philosophy and Darshana.

PSO5: Differentiating between Deductive and Inductive reasoning.

PSO6: Understanding the nature of Philosophy of Religion and the fundamental features of major Religions.

PSO7: Interpreting different philosophical thoughts in the Twentieth Century: Indian & Western.

PSO8: Elaborating the Human Rights and different Political Ideas.

## BEJOY NARAYAN MAHAVIDYALAYA

## DEPARTMENT OF SANTALI

# B.A. General Course Santhali Papers (under CBCS curriculum of The University of Burdwan)

## PROGRAMME OUTCOME

A 3-year General Degree Course in Santali language and literature was introduced in the College from the Session of 2019-2020. Santali being one of the 22 Indian languages recognised in the Constitution of the country, assumes a great significance with a vast body of its native speakers across a larger stretch of Eastern India. There are at present about 2 crore people using the language spread over from Madhya Pradesh to Tripura. It boasts of a large body of literature of its own with prominent writers like Raghunath Murmu, Sadhu Ramachandra Murmu, Badal Hembram, et al. Introducing such a potential, expanding area of knowledge poses a great challenge in a rural, academic set-up with limited human and material resources. Such a course creates a fresh interest amongst the local youths who come to study in the College. The academic pursuit of such a popular ethnic language at a higher level helps to create a wide-spread awareness amongst the ethnic group here using the language. This has already augmented their racial identity and pride in their own language, literature and culture leading to their overall empowerment.

## COURSE OUTCOMES

## Semester I

## CC-1A

**CO-1**: It has introduced learners to the oral literature in Santali which enriches their knowledge of their culture and tradition already in distress. Through this course they get acquainted with the Santali authors, their books, journals and magazines.

**CO-2**: They come to know about the Santali society and its age-old culture and history. The formal grammatical knowledge of the language as well as the history of the language too helps them to tide over many sorts of difficulties and problems, social, economic, linguistic and political they face in real life.

**CO-3**: Their study offers them the opportunity to improve their language further, and create a great scope for works for them in several spheres of life.

## Semester II

## CC-1B

**CO-1**: Here they are offered several Santali classic works from Sadhu Ramachandra Murmu, Sarada Prasad Kisku, Gorachand Tudu and Narayan Soren. Their poetry have given them the feel for the beauty and role of nature in their ethnic life style. Literature offers a close look into their humble, day-to-day life all about them.

## Semester III

## CC-1C

**CO-1**: The course includes some plays, both one-act and full-length. Presenting dramas in the classroom ensures sincere learner involvement, though this year's online teaching mode is largely deprived of it. With modern closet dramas there is hardly any difficulty. Plays like _Darege Dhon_ by Pandit Raghunath Murmu, _Lo Bir_ by Jadunath Tudu, _Bir Birsa_ by Rabilal Tudu, _Sidhu Kanhu Hool_ by Kaliram Soren inspire the young learners in the spirit of patriotism and long history of struggle and sacrifices associated with their race.

**CO-2**: Some one-act plays like 'Maya Sutam' by Badal Hembram, 'Koche Karba' by Solomon Murmu, 'Sisirjam' by K. C. Tudu present some pictures of the tribal justice system along with the abject poverty of their lives still today.

**BEJOY NARAYAN MAHAVIDYALAYA**

**DEPARTMENT OF ECONOMICS**

**B.A./B.Sc Honours in Economics (under CBCS curriculum of The University of Burdwan)**

## PROGRAMME OUTCOMES

**PO-1**: Economics as a subject of Social science-Understanding the subject matter as a separate branch of study just like any other scientific subject.

**PO-2**: Power of analyzing-The students are able to analyze different economic problems and finding their easy solution by proper theory and justification.

**PO-3**: Effective Application-The course is designed in such a way so as to help the students to apply the theories in solving certain economic problems.

**PO-4**: Skill of leadership-This special skill is developed among the students by organizing various debates, seminars and workshops on relevant topics on a regular basis.

**PO-5**: Instigating the essence of team work- this is achieved through organizing field works and preparing reports on the basis of field works, where students collect data on the concerned topics with the help of fellow mates locally.

## PROGRAMME SPECIFIC OUTCOMES

**PSO-1**: Understanding the nature and scope of the subject.

**PSO-2**: Understanding the working mechanisms of various markets in the economy.

**PSO-3**: Getting acquainted with statistical and mathematical tools and their application.

**PSO-4**: Understanding the problems of Indian Economy and its problems.

**PSO-5**: Developing the knowledge of Money market and its mechanisms.

**PSO-6**: Getting acquainted with the notion of Development Economics and Public Economics and their consequences on the economy.

## COURSE OUTCOMES

### 1. Introductory Microeconomics

**CO-1**: General concepts in Economics and a distinction between Macro and Micro Economics with a scope the subject.

**CO-2**: Focus on consumer behavior explaining concepts of Marshallian Approach, Indifference curve Approach, revealed Preference Approach and the concept of Elasticity of demand.

**CO-3**: Focus on Producer behavior with an emphasis on production function, equilibrium of the producer and cost function.

**CO-4**: Features of Perfect Competition, equilibrium in such markets, price determination, uniqueness and stability of equilibrium, effect of tax imposition and effect of change in cost.

### 2. Statistics

**CO-1**: Tabular and Diagrammatic representation of data.

**CO-2**: Measures of Central Tendency like mean, median and mode with their properties.

**CO-3**: Measures of Dispersion, measuring income inequality with an idea of Lorenz curve and Gini coefficient.

**CO-4**: Measures of Skewness and Kurtosis and relation between Central and non-central moments.

**CO-5**: Simple correlation and regression analysis.

**C0-6**: Multiple and Partial correlation of three variable case with simple numerical example.

**CO-7**: Purpose and use of Index Number and tests for Index Number.

**CO-8**: Nature and decomposition of Time Series, analysis of Trend and non-linear growth curves.

### 3. Introductory Macroeconomics

**CO-1**: Introduction with scope and nature of Macroeconomics.

**CO-2**: The National Income and product accounts-general terms and some basic concepts.

**CO-3**: Consumption Function –Keynesian Consumption Function and its properties.

**CO-4**: Simple Keynesian model of Income determination and comparative static analysis.

**CO-5**: Features of money market with different versions of Keynes and Tobin.

**CO-6**: Interaction between commodity market and money market.

## 4. Mathematical Economics

**CO-1**: Single and multivariate function with their application in economics.

**CO-2**: Unconstrained optimization and its application.

**CO-3**: Constrained optimization and its application.

**CO-4**: Integration of function and application.

**CO-5**:- Techniques of dynamic analysis.

## 5. Intermediate Microeconomics

**CO-1**: Imperfect competition in markets of monopoly, price discrimination, monopsony and monopolistic competition.

**CO-2**: Theory of Oligopoly and non-collusive and collusive oligopoly models

**CO-3**: Theory of factor –pricing of wage, rent and profit.

**CO-4**: General equilibrium and Economic welfare analysis.

## 6. Intermediate Macroeconomics

**CO-1**: Investment function of Keynes with different theories of investment.

**CO-2**: The Classical view of Macroeconomics.

**CO-3:** The complete Keynesian model.

**CO-4**: Theory of inflation and concepts like inflationary gap .Phillips curve.

**CO-5**: Different theories of economic growth like Harrod-Domar.

**CO-6**: Role of expectation in Economics.

**CO-7**:  Some issues of Open economy.

## 7 .Mathematical Economics

**CO-1**: Concepts of Determinants and Matrices.

**CO-2**: Linear Programming and it's application in Economics.

**CO-3**: Basic concepts of input-output analysis.

**CO-4**: Basic concepts of Game Theory.

**CO-5**: Decisions under uncertainty.

## 8. Indian Economics

**CO-1**: Economic development in India since independence.

**CO-2**: Population and its impact on Human development.

**CO-3**: Growth and Distribution.

**CO-4**: Macroeconomic policies and their impact.

**CO-5**:  Policies and Performance in Agriculture.

**CO-6**: Policies and performance in Industry.

## 9. Statistical Methods

**CO-1**: Basic concepts in Set Theory.

**CO-2**: Probability Theory and its Theorems.

**CO-3**: Random variable and its related concepts.

**CO-4**: Univariate probability distribution.

**CO-5**: Sampling Theory and sampling distribution.

**CO-6**: Problems of Estimation.

**CO-7**: Testing of Hypothesis.

## 10 .Development Economics

**CO-1**: Economic development and growth and its different measures.

**CO-2**: Development and underdevelopment as a historical process.

**CO-3**: Persistence of underdevelopment and way to develop.

**CO-4**: Different strategies of development.

**CO-5**: Poverty and inequality and some related concepts.

**CO-6**: Relation between migration and development.

## 11 .International Economics

**CO-1**: Trade and its idea and concepts.

**CO-2**: Some pure Theories of trade like Ricardo, Hecksher –Ohlin and some Theorems.

**CO-3**: Different policies in trade.

**CO-4**: Balance of payment accounting.

**CO-5**: National Income and current account balance.

**CO-6**: International currency system and exchange rate.

**CO-7**: Pegged Exchange rate and B.O.P.

## 12. Money and Banking

**CO-1**: Introduction and basic concepts of money.

**CO-2**: Financial Institutions, markets, instrument and Financial Innovation.

**CO-3**: Interest rate determination.

**CO-4**: Banking system in India.

**CO-5**: Central Banking and Monetary Policy.

13. Basic Econometrics

**CO-1**: Nature and scope of Econometrics.

**CO-2**: Some statistical concepts.

**CO-3**: Simple linear regression model of Two-variable case.

**CO-4**: Multiple linear regression model.

**CO-5**: Violation of Classical Assumption and their consequences, detection and remedies.

**CO-6**: Specification Analysis of omission of a relevant variable.

# DEPARTMENT OF Botany
# Course Outcome
# B.Sc. Three year, Honours Degree Programme
# Under Burdwan University

The Course outlines of the discipline of Botany are divergent. After careful examination of the courses, the department of Botany has pointed out the following outcomes of the courses as-

This is to inform you that through reports of students regarding course output, it is analyzed that plant world is beneficial for nature. Students must go to the fields, which is the habitat of plants where they learn about various aspects and beneficial roles of plans for the society.

Some parts of syllabus they studied in botany has implements for folk medicine in her area. They also helps the local farmers for better crop improvement. That's the way she help the local people and in this way they are satisfied.

Students felt that the content of the syllabus helps them to communicate with biological information to differentiate endemic species. It provides a new knowledge of interdependence between man and nature that is vital for food production, sustaining biodiversity and maintaining clean air and water in a changing climate. The knowledge provides techniques to protect our crop loss in general and specifically fruits and vegetables in field as well as storage place. Field study provides direct source of firsthand knowledge. That can help us to explore our environment and build up aesthetic sense that grow the potentiality of exploration, observation, judgments and drawing inferences and problem solving ability to us. In this way these help us to build up our nation.

Her feeling in plant taxonomy is partly appropriate. They experienced that every branch in plant science should deal with the naming and classification of plants as proper scientific name is essential for any kind of research in plant science. They also got knowledge about the interaction of plants and animals with the environment for the sustainable use of natural resources. They also has told about the permanent documents of our plant resources specially the angiosperm flora. The view of evolutionary trend in plant kingdom, they learnt about the origin of vascular cryptogams i.e., pteridophytes from aquatic green algae through bryophytes.

# DEPARTMENT OF Botany
## Course Specific Outcome
## B.Sc. Three year, Honours Degree Programme
## Under Burdwan University

From the Academic Session 2017-18, CBCS was introduced by The University of Burdwan,which is our affiliating University at present. The Course outlines of the discipline of Botany are divergent. After careful examination of the courses, the department of Botany has pointed out the following outcomes of the courses as-

## SEM-I

**Core Course I: Microbiology and Phycology**

As per their reports, different parts of syllabus like Algae, bacteria,viruses and others enhance their knowledge under the guidance of learned faculties of Botany department. They are interested to share their knowledge for the surroundings. They have acquired the technical knowledge about various field of microbiology practical, most of which will help them in future research in this field.

**Core Course II: Archegoniate**

The present day plant biologists believes them as a single, polyphyletic group, lumping them into a category of plants like organisms called "Cryptogams" as they lack flowers and yet possess many of the other characteristics of plants. They have acquired knowledge about the evolution through plant kingdom, especially among Cryptogams. The present day plant biologists believes them as a single, polyphyletic group, lumping them into a category of plants like organisms called "Cryptogams" as they lack flowers and yet possess many of the other characteristics of plants.

## SEM-III

**Core Course V: Plant Ecology and Phytogeography**

Their knowledge is important as the rate of habitat destruction increases and climate change precipitates rapid changes in species ranges and all aspects of their ecology. They have learned that human activity is responsible for increases heat trapping green house gas levels in Earth's atmosphere that causes long term rise of the planets temperature.

**Core Course VI: Plant Systematics**

Their feeling in plant taxonomy is partly appropriate. She learnt that every branch in plant science should deal with the naming and classification of plants. Because proper scientific name is essential for any kind of research in plant science for the progressive students.

**Core Course VII: Economic Botany**

They studied in botany and implements some of them for cultivation of economically important in her area. They also helps the surrounding farmers for better crop improvement. That's the way they can help the local people and in this way she is very happy.

# SEM-V

**Core Course XI: Plant Physiology**

It is very helpful in farmers of agriculture,horticulture,floriculture etc. for weed control as well as tissue culture and parthenocarpic fruits production Auxin is used. Ethylene is used for fruits ripening. ABA is used in Senescence etc. Synthetic phytohormones can be used in different technologies involving plant propagation from cuttings, grafting, micro propagation and tissue culture and control of weeds, prevention of sprouting of potato tuber, floral initiation and fruit development etc.

**Core Course XII: Plant Metabolism**

The practical syllabus of this core course will help them to various research work, regarding plant science, in higher studies. Their practical experience of various protocol must help them in future.

**Overall, the practical application of the knowledge which they acquired is very essential in society. Students have visited to the fields, which is the habitat of plants where they learn about various aspects and beneficial roles of plans for the society. This ultimately at last helps to buildupour nation. It may be concluded that in many aspects of plant science they got appropriate knowledge which may help them for future progress.**

**DEPARTMENT OF ZOOLOGY**

**BEJOY NARAYAN MAHAVIDYALAYA,**

# B.Sc. Honours in Zoology

## PROGRAMME OUTCOME (PO)

Our college is affiliated under The University of Burdwan, The Choice Based Credit System (CBCS) was introduced in the academic session 2017-2018. Therefore, it is not justified to give the expert remark or to enlighten significantly about the programme outcome by sharing views with the students who have just completed only four semesters. Still with merge experience of the students and gentle discussion of the teachers with them have been able to extract a glimpse of the programme outcome of the Department of Zoology which is given below:

**PO-1:** There is a tendency to provide symmetry in the Honours and General stream so that both can avail the chance to get berth in Post Graduate course or be competent enough to appear in different competitive examinations throughout India.

**PO-2**: As the system is a choice based system, the students have option to choose the subject of choice. This apparent pliable system has the opportunity to avoid the stringent old base system.

**PO-3**: This system has tried to distribute the load of the subject in a symmetric manner so that it can reduce the burden propounded at a time.

**PO-4**: Certain activities like dissertation/term paper/assignment and excursion could cater the student for field work research, nature care etc. and to equip them in different techniques and instrumentation.

**PO-5**: There are certain applied part of zoology in the form of sericulture, sericulture aquarium fish farming which have traditional and modern value to make the students job oriented.

**PO-6**: Students gain knowledge and skill in the fundamentals of animal sciences, understands the complex interactions among various living organisms.

**PO-7**: The course may help the students to acquire gradual knowledge from base to its intrigue in a successful manner.

**PO-8**: The method and pattern of question may be helpful to make a student equipped for any public or competitive examination.

## PROGRAMME SPECIFIC OUTCOME (PSO)

**PSO-1**: Understand the nature and basic concepts of cell biology, taxonomy, physiology, ecology, microbiology, parasitology, endocrinology and economic zoology.

**PSO-2**: Analyze complex interactions among the various animals of different phylum, their distribution and their relationship with the environment.

**PSO-3**: Apply the knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms. Correlates the physiological processes of animals and relationship of organ systems.

**PSO-4**: Understands the complex evolutionary processes and behavior of animals.

**PSO-5**: Understanding of wild life conservation processes and importance of biodiversity and protection of endangered species.

**PSO-6**: Gain knowledge of agro based small scale industries like sericulture, aquarium fish farming, sericulture, apiculture.

**PSO-7**: Understands the concepts of genetics and its importance in human health.

**PSO-8**: Apply the knowledge and understanding of Zoology to practical aspects.

**PSO-9**: Perform procedures as per laboratory standards in the areas of Ecology, Immunology, and Histology and Developmental biology.

**PSO-10**: Gains knowledge about research methodologies and skills of problem solving methods.

## COURSE OUTCOME (CO)

### CO1: Non-Chordates

a) Gain a knowledge about Animal kingdom specially subkingdom Protozoa & Metazoa.
b) Location & importance of coral reef in nature & its economic importance.
c) Gain a detail knowledge of Classification, Excretion, Respiration, Nervous system& development of higher metazoa.
d) Gain a special knowledge of metamorphosis in insects &echinoderms & social life of insects like termite.
e) Gain knowledge of identifying different species taxonomically, staining some of species and comparative study of some of the groups.

### CO2: Chordates

a) Gain a detail knowledge about classification of phylum Chordata.
b) Knowledge about special behavior like migration in fish & birds, parental care in amphibia, biting mechanism in snake.
c) Knowledge about aerodynamics in birds & echolocation in mammals.
d) Gains knowledge of functional anatomy of vertebrates from fishes to mammals.
e) Knowledge about distribution of animals in the world & division of world into different realms accordingly.
f) Achieving Practical knowledge to identify species taxonomically, studying some special features as well as comparative analysis of different significant groups.

**CO3: Ecology**

a) Gain sound knowledge on Population Ecology, Community Ecology and Ecosystem ecology.
b) Interaction of biota and abiota.
c) Knowledge on conservation and procedures of conservation.
d) Detail understanding on Tiger conservation.
e) Practically learned to do life tables. They are able to draw survivorship curve and draw conclusion from that.
f) Able to do sampling in quadrat method and from that data they can do Shannon-Wiener index and can infer about any community.
g) Expertise on study of any aquatic ecosystem.

**CO4: Cell Biology**

a) Gain a detail knowledge of prokaryotic & eukaryotic cell, cell organelles.
b) Gain a practical knowledge of Cell division & study of chromosomal changes during cell division.
c) Gain knowledge of cellular signaling and cell interaction.
d) Gather practical knowledge of preparation of cell divisional stages and identify specialized structures in bold cells.

**CO5: Animal physiology**

a) Gain fundamental knowledge of animal physiology.
b) Detailed concepts of action potential and its propagation.
c) Learn the concepts of endocrine systems and gain knowledge about hormones.
d) Gain fundamental knowledge of physiology of homeostasis.
e) Gain practical knowledges of muscle function, reflex action, histological preparation and histological studies of tissues of various organs.

**CO6: Fundamentals of Biochemistry**

a) Interactions and interdependence of physiological and biochemical processes.
b) Gain basic knowledge about various bio molecules and their role in metabolism.
c) Understanding through scientific enquiry into the nature of physical and biochemical functions of the cells.
d) Gain practical knowledges of quantitative and qualitative measurement of biomolecules, separation techniques and studing enzyme actions.

**CO7: Immunology**

a) Understanding types of immunity, antigens-antibodies and their properties.
b) Understanding immune mechanisms in disease control, vaccination, and process of immune interactions.
c) Gather practical knowledge of lymphoid tissues, blood cell morphology, histochemical analysis.
d) Working process of different lymphoid organ.
e) Practical knowledge on blood grouping and idea on different blood cell.

**CO8: Genetics**

a) Mendelian and non Mendelian inheritance
b) Concept behind genetic disorder, gene mutations-various causes associated with inborn errors of metabolism.

c) Gain concepts of mutation, sex determination, special inheritance pattern, transposition and bacterial and viral recombination.
d) Becomes expertise through practical experience about aberration, chromosomal disorders, linkage analysis and genetic analysis techniques.

**CO9: Molecular Biology**

a) Sustain a basic knowledge about Nucleic acids, DNA replication, Transcription, Translation of prokaryotes and Eukaryotes as well.
b) Familiar with the gene modifications (post-translational modifications) and gene regulation.
c) Learn principles of molecular techniques such as PCR, Northern blot, Southern blot, Western blot etc.
d) Practical knowledge to handle spectrophotometer and Agarose Gel Eletrophoresis.
e) Gain experience on preparing liquid, solid media for bacteria culture and determining antibiotic sensitivity and resistance zones of bacteria.

**CO10: Developmental biology**

a) Develop the basic concepts of development, implication of embryonic development and post developmental aspects,
b) Gains knowledge about gametogenesis, cleavage mechanisms, gastrulation and role of hormones in metamorphosis and regeneration.
c) Gather practical knowledge about developmental stages and specialised structures in vertebrate and invertebrate models.

**CO11: Evolutionary biology**

a) Knowledge of eras and evolution of species.
b) Explain the genetic basis of evolution, correlate the theories with the evidences.
c) Knowledge regarding human origin, mode of evolution and its significance.
d) Gathering practical knowledge of fossil, comparison of characters to prove evolution and mathematical model of population study

**CO12: Microbiology**

a) Learn some basics on microbiology and their classification.
b) Have a lot of information on morphology of bacteria and virus.
c) Have a good understanding on pathogenicity of microorganisms and microbial diseases.
d) Have experience on diagnostic microbiology and bacteria culture.
e) Gain some basic knowledge on preparing liquid, solid media for bacteria culture and determining their biochemical characterization.
f) Have a good experience on staining of bacteria and microbial examination of milk.

**CO13: Animal biotechnology**

a) Imparts the knowledge to culture animal cells in artificial media.
b) Knowledge of animal cells in culture, growth of cell lines.
c) Application of DNA technology and molecular biology for research
d) Gain practical knowledge about restriction map, transformation efficiency, sequencing techniques, blot techniques, finger printing techniques and PCR

**CO14: Biology of Insects**

a) Gather a general idea about taxonomy, morphological features, and physiology of insects.
b) Knowledge about social behavior of insects like termites, bees & ants.
c) Gain Practical knowledge about harmful insects like pest causing economic loss and vectors spreading diseases like cholera, malaria, encephalitis, dengue, filaria etc. enables to take protective measures.
d) Gather practical knowledge regarding collection, preservation and identification of insects and their different body parts. Pest study and life cycle study

**CO15: Animal Behavior**

a) Imparts conceptual knowledge of vertebrates, their adaptations and associations in relation to their environment.
b) Explain the relationship of behaviour and cognition.
c) Explain rhythmic behaviours and social behaviours.
d) Collect practical knowledge of nesting of birds and insects, tactic movements, circadiun function and ectogram construction

**CO16: Wild life Conservation**

a) Key threats to biodiversity.
b) Describe habitat management.
c) Understanding of Conservation will help protection of wildlife.
d) Explain wildlife trade that may enhance the economy.
e) Understanding of wildlife conservation, trade and management.
f) Gather and learn practical knowledges regarding faunal identification, equipment studies, identification of animal by special marks, nests, scats etc.

**CO17: Parasitology**

a) Explain the phenomenon of living together and symbiosis.
b) Describe parasitism.
c) Describe the life histories of some protozoan and helminths.
d) Describe parasitic arthropodes.
e) Gather practical knowledge regarding identification, staining and isolation of parasites

**CO18: Endocrinology**

a) Gain a detail knowledge of structure and function of endocrine glands including neuroendocrine glands and feedback mechanism.
b) A specific knowledge of mechanism of hormone action in the cell, disorders of endocrine glands, & role of hormones in homoeostasis.
c) A practical knowledge of demonstration of hormone assay through ELISA**,** anatomical and histological study of glands and tissue processing.

**CO19: Reproductive biology**

a) Gain detail knowledge of structure, function, development and differentiation of gonads.
b) A specific knowledge oh hormonal regulation of pregnancy, parturition & lactation
c) Specific knowledge of causes & management of infertility in male and female.
d) Gain practical knowledge of sections of male and female reproductive structures as well as vaginal fluid study.

**CO20: Apiculture**

a) Learned knowledge about method of apiculture, control & preventive measures of bee diseases & enemies and economic importance of products of apiculture such as honey, bee-wax.
b) Enriched knowledge of Apiculture will provide scope of self- employment.

**CO21: Sericulture**

a) Gives knowledge of silk worm rearing.
b) Mulberry cultivation.
c) Pests and diseases associated with silk worm.
d) Various process involved in silk production.
e) Prospects of sericulture in India, how get employment in sericulture industry.

**CO22: Aquarium fish keeping**

a) Provides knowledge of ornamental fish breeding which is highly professional and attractive avenue for youth.
b) Get knowledge regarding food and feeding of aquarium fishes.
c) Setting and maintenance of aquarium.

**CO23: Medical diagnostic techniques**

a) Gives knowledge related to the techniques involved in detection of various diseases.
b) Pathology associated with various diseases
c) Idea on chromosomal status of different genetic syndrome.

**CO24: Applied Zoology**

a) Describe general taxonomic rules on animal classification.
b) Classify phylum using characters and examples.
c) Acquire knowledge on artificial insemination poultry farming and fish induced breeding.
d) Concepts on host parasitic relationship.
e) Knowledge on different vector of human diseases.
f) Bionomics of stored grain pest.

**CO25: Aquatic biology**

a) Understands concepts of fisheries, fishing tools and site selection.
b) Idea on adaptation of marine organisms.
c) Physico-chemical parameters and nutrient cycles of lakes.
d) Get knowledge on water quality assessment.

**CO26: Animal Diversity**

a) Provide concepts of basic characteristics of invertebrate and vertebrates.
b) Concepts of respiratory system in invertebrate phylum.
c) Knowledge about flight mechanism in bird.
d) Gathering knowledge by observing real and preserved specimens.
e) Knowledge of poisonous and non-poisonous snakes
f) Concepts of permanent slide preparation.

**CO27: Comparative anatomy and developmental biology of vertebrates**

a) Detail knowledge of Respiratory, Circulatory, Digestive, Reproductive system of vertebrates.
b) Knowledge on comparative anatomy of different system of vertebrate phylum.
c) Concepts on embryonic development in different vertebrate animals.
d) Concepts on different sense organ.
e) Basic concepts on girdle and limb bones.
f) Basic concepts on skull.
g) Concepts on different developmental stages with slide and photograph.
h) Knowledge on gametes by identification of slide.

**CO28: Physiology and Biochemistry**

a) Details knowledge about nerve and muscle function.
b) Concepts on digestion, excretion and reproduction.
c) Structural correlation on endocrine gland.
d) Concepts on carbohydrate, lipid and protein structure; details of different metabolic pathway.
e) Idea on histological structure of different endocrine glands.
f) Experience on biochemical test

**CO29: Genetics and Evolutionary biology**

a) Knowledge on chromosome.
b) Concepts on different chromosomal mutation.
c) Knowledge about chromosomal map distance.
d) Concepts on different evolutionary changes.
e) Idea on chromosomal status of different genetic syndrome.
f) Different phylogeny study.

# BEJOY NARAYAN MAHAVIDYALAYA
## DEPARTMENT OF PHYSICS

# Course Outcome (CO)

B. Sc. (CBCS) Six Semesters Physics Honours Course

The outcome of the following courses:

**CC-III: (Electricity and Magnetism):** It gives an opportunity for the students to learn about one of the fundamental interactions of electricity and magnetism, both as separate phenomena and as a singular electromagnetic force. The course contains vector analysis, electrostatics, magnetism, electromagnetic induction and Maxwell's equations. The course is very useful for the students in almost every branch of science and engineering.

**CC-IV: (Waves and Optics):** The course comprises of the study of superposition of harmonic oscillations, waves motion (general), oscillators, sound, wave optics, interference, diffraction, polarization. The course is important for the students to make their career in various branches of science and engineering, especially in the field of photonic engineering and holography.

The practical knowledge of wave motion doing experiments: Tuning fork, electric vibrations. They would also learn optical phenomena such as interference, diffraction and dispersion and do experiments related to optical devices: Prism, grating, spectrometers.

**CC-VIII: (Mathematical physics-III):** Students would learn mathematical methods to solve the various problems in physics. The topics include the calculus of functions, Fourier transform, Laplace transform, special functions and special integrals, partial differential equations, complex analysis and variables. Various practical problems related to applications of mathematical tools to solve the problems, using Scilab simulations in physics would be learned by students.

**CC-IX: (Element of Modern Physics):** Students would know about the basic principles in the development of modern physics. The topics covered in the course build a basic foundation of undergraduate physics students to study the advance branches: quantum physics, nuclear physics, particle physics and high-energy physics. The course contains the study of Planck's hypothesis, photoelectric effect, Compton effect, matter waves, atomic models, Schrodinger wave equations, and brief idea of nuclear physics. The course also contains the concept of radioactivity, the mechanism of fission and fusion.

In this course students would be able to understand Basic experiments of modern physics such as: Determination of Plank's and Boltzmann's constants, Determination of ionization potential, Wavelength of H-spectrum, Single and double slit diffraction, Photo electric effect and determination of e/m.

**CC-X: (Analog Systems and Applications):** The students would gain the knowledge of Basic Electronics circuits, network theorems and measuring instruments: They would know about

common solid state devices: Semiconductor diodes, transistors and amplifier. The topics also include the application of OP-AMP, which are foundation blocks of digital electronics.

In this course students would be able to understand Basic experiments of semiconductor physics such as: characteristic features of Diode, Zener diode, Transistor, OP-Amp. Students would be experienced about various use of OP-Amp by hands on experiments.

**SEC-2 :(Electrical Circuits and Network Skills):** it enables the students to learn the basic about electric components and the electric circuit. Students would gain practical knowledge about AC and DC electricity and measurements such as: Resistance, Voltage, current etc. The topic also gives an opportunity for the students to learn about the working principle of Electric motor, electric transformer and Generator.

**CC-XIII**: **(Electromagnetic Theory):** It gives an opportunity for the students to learn about the fundamental of electromagnetic wave and its behavior during propagation in various mediums. The course contains vector analysis, electrostatics, magnetism, electromagnetic induction and Maxwell's equations. The course is very useful for the students in almost every branch of science and engineering. Students would gain practical knowledge about polarization of electromagnetic wave and measurements such as: specific rotation of sugar solution, analyze elliptic polarization, Stefan's constant by Stefan's law of radiation etc.

**CC-XIV: (Statistical Mechanics)**: The course makes the students able to understand the basic physics of heat and temperature and their relation with energy, work, radiation and matter. The students also learn how laws of thermodynamics are used in a heat engine to transform heat into work. The course contains the study of laws of thermodynamics, thermodynamic description of systems, thermodynamic potentials, kinetic theory of gases, theory of radiation and statistical views. The course includes the study of Basic postulates, application of classical distribution to ideal gases, imperfect gases, quantum statistics and black body radiation. The course is helpful for the students to understand the dynamics of the bulk material in macroscopic as well asmicroscopic levels. It is also useful to understand the relation between microscopic and macroscopic systems. Students would gain practical knowledge about heat and radiation, thermodynamics, thermo emf, etc. and perform various computational experiments.

**DSE-3: (Nuclear and Particle Physics)**: In this course students would know about the general properties of nuclei, nuclear forces and detectors, radioactive decay and nuclear reactions. The course expands the knowledge of students especially, the various applications of nuclear physics. The course builds a foundation for the students to carry out research in the field of nuclear physics, high energy physics, nuclear astrophysics, nuclear reactions and applied nuclear physics.

**DSE-4: (Applied Dynamics):** In this course students would know about the dynamical systems and their distinguished characteristics. This course builds up the idea of phase space. This course helps students to understand the underneath reasons as well as the mechanism or the physics of Chaos and Fractals. The course builds the basic behavior of fluid and its dynamical approaches.

# BEJOY NARAYAN MAHAVIDYALAYA
## DEPARTMENT OF PHYSICS

# Programme Specific Outcome (PSO)

This undergraduate course in Physics of Burdwan University (started from the session 2017-2018) would provide the opportunity to the students of our mahavidyalaya:

- To understand the basic laws and explore the fundamental concepts of physics
- To understand the concepts and significance of the various physical phenomena.
- To carry out experiments to understand the laws and concepts of Physics.
- To apply the theories learnt and the skills acquired to solve real time problems.
- To acquire a wide range of problem solving skills, both analytical and technical and to apply them.
- To enhance the student's academic abilities, personal qualities and transferable skills this will give them an opportunity to develop as responsible citizens.
- To motivate the students to pursue PG courses in reputed institutions.
- This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques specially the importance of accuracy of measurements.
- Providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, heat, optics, electricity and electronics.
- The course as a whole opens up several career doors for the students interested in various areas of science and technology in private, public and government sectors.
- Students may get job opportunities in higher education, research organizations, physics consultancy, and many others. Some of the institutions where physics students can start their carrier are: BARC, DRDO, NPTC, IISc, ISRO, ONGC, BHEL, PRL, NPL, SINP, VECC, IITs, NITs, IIPR etc.

# BEJOY NARAYAN MAHAVIDYALAYA

# DEPARTMENT OF CHEMISTRY

## B. Sc Chemistry (Honours)

## PROGRAMME OUTCOMES

The undergraduate (UG) course offered by the Department of Chemistry, Bejoy Narayan Mahavidyalaya follows the CBCS syllabus prescribed by the UGC. The course is a combination of general and specialized education, simultaneously introducing the concepts of in depth learning. After successful combination of a 3 year degree course in Chemistry Honours, the students should be able to

***PO-1:*** Achieve the skills required to succeed for doing jobs in Govt. and private sectors of academia, research and industry.

***PO-2*:** Identify and solve complex scientific problems in research at national and international level.

***PO-3:*** Understand the concept of chemistry to inter relate and interact to other subjects like mathematics, physics, biological science etc.

***PO-4:*** Learn the laboratory skills and safely transfer and interpret the knowledge entirely in the working environment.

***PO-5:*** The course fulfils to produce competent chemists who can think and work independently in chemical laboratories or can fit themselves in chemical industries.

***PO-6:*** Investigate chemical problems using scientific tools for analysis and interpretation of data.

***PO-7:*** Select, design and apply appropriate experiment techniques along with IT tools to solve chemical problems.

***PO-8:*** Communicate effectively through report writing, documentation and effective presentations.

***PO-9:*** The present curriculum will not only advance their knowledge and understanding of the subject, but will also increase the ability of critical thinking, development of scientific attitude, handling of different instruments, improve practical skills, enhance communication skill, social interaction, increase awareness in environment related issues and recognize the ethical value system.

***PO-10:*** To provide knowledge and skills to the students that will enable them to undertake further studies in chemistry on related areas or multi disciplinary areas that can be helpful for self employment, entrepreneurship or further studies in the same domain.

## PROGRAMME SPECIFIC OUTCOMES (PSO)

***PSO-1:*** Understanding the nature and basic concepts of bonding in molecules, chemical behaviour, stereochemistry of molecules and many interactions within the molecule and with other molecules, and application of different compounds in the field of material sciences, pharmaceutical and agricultural industries.

***PSO-2:*** The course will make them aware of natural resources and help them to make eco-friendly environment.

***PSO-3:*** Hands on training in various fields will develop practical skills, handling equipments and interpreting spectral data.

***PSO-4*****:** Knowledge gained through theoretical and lab based experiments will generate technical personnel as analytical chemists, bench chemists for the laboratories and industries, instrument operators in chemical and biochemical laboratories.

***PSO-5:*** The course curriculum incorporates basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral presentation and thus make the student a skilled communicator.

***PSO-6:*** The course curriculum has been designed to provide opportunity to act as team player by contributing in laboratory, field based situation and industry.

***PSO-7:*** It is expected that the course curriculum will develop an inquisitive

characteristics among the students through appropriate questions, planning and reporting experimental investigation.

**PSO-8:** To execute new ideas in the field of research and development using principles and techniques of science learned through activities such as expert lecturers, workshops, seminars and field projects.

**PSO-9:** Employ writing conventions appropriate to the discipline and Record keeping and managing the records.

**PSO-10:** Graduates are expected to be responsible citizen of India and be aware of moral and ethical baseline of the country and the world. They are expected to define their core ethical virtues good enough to distinguish what construes as illegal and crime in Indian constitution. Emphasis be given on academic and research ethics, including fair Benefit Sharing, Plagiarism, Scientific Misconduct and so on.

**PSO-11:** Introduction to the students on modern tools for scientific approach.

**PSO-12:** Graduates are expected to possess basic psychological skills required to face the world at large, as well as the skills to deal with individuals and students of various socio cultural, economic and educational levels. Psychological skills may include feedback loops, self-compassion, self reflection, goal-setting, interpersonal relationships, and emotional management.

## Course Outcomes (COs) for Chemistry

The core courses would fortify the students with in-depth subject knowledge concurrently; the discipline specific electives will add additional knowledge about applied aspects of the program as well as its applicability in both academia and industry. Generic electives will introduce integration among various interdisciplinary courses. The skill enhancement courses would further add additional skills related to the subject as well as other than subject. In brief the student graduated with this type of curriculum would be able to disseminate subject knowledge along with necessary skills to suffice their capabilities for academia, entrepreneurship and Industry.

# SEMESTER 1

| | | |
|---|---|---|
| **Course Code: CC-01 Course Title: Organic Chemistry-I (Theo)** | ***Basics of Organic Chemistry*** | On completion of the course, students will be able to:<br>➡ understand Bonding and Physical Properties including VB and MO theories.<br>➡ understand general treatment of Reaction mechanism and intermediates and get a concept<br>➡ of Stereochemistry of organic molecules. |
| **Course Code: CC-02 Course Title: Physical Chemistry-I** | ***Kinetic Theory of Gas; Deviation from Ideal Behaviour and Real Gas*** | On completion of the course, students will be able to:<br>➡ Learn kinetic model of an ideal gas.<br>➡ Learn the variation of speed of the gas molecules and theoretical treatment of this by Maxwell distribution formula, to determine various physical parameters such as pressure, kinetic energy, root mean square velocity, kinetic energy distribution, etc.<br>➡ Learn the theoretical basis of Equipartition principle and its limitation.<br>➡ Get an idea about the deviation of ideal behavior of the real gas, formulation of different equation of states (viz. van der Waals equation, Dieterici equation, Barthelot equation) to explain the behavior of real gases under different condition and also their limitations. |
| | ***Thermodynamics*** | On completion of the course, students will be able to:<br>➡ Know that any system in the universe is governed by the laws of thermodynamics, be it a living cell or be it the solar system.<br>➡ Get ideas about the principles/laws governing the physiochemical behavior of a system<br>➡ Know the application of thermodynamic principles for a system performing mechanical work and determination of change in internal energy, enthalpy, entropy, Gibbs free energy,Helmholtz free energy, etc.<br>➡ Acquire knowledge about the application of laws of thermodynamics in case of chemical reactions and learn fundamental laws governing thermo-chemistry.<br>➡ Get hands-on experience on determination of enthalpy of various physical and chemical processes. |

| | | |
|---|---|---|
| | ***Chemical Kinetics*** | On completion of the course, students will be able to:<br>➡ Know how fast a chemical reaction can occur under certain physical conditions and what are the specific roles of different parameters affecting the speed or rate of any chemical reaction.<br>➡ Understand the role of catalysts and biocatalyst (e.g. enzymes, etc.) in a catalyzed reaction.<br>➡ Solve numerical problems and experimentally determine the order, rate and activation energy of a chemical reaction. |
| **Course Code: CC-01 Course Title: Organic Chemistry-1 (Prac)** | ***Basics of Organic Chemistry*** | Upon successful completion students should be able to:<br>➡ Learn Separation based upon solubility<br>➡ Determination of boiling point<br>➡ Identification of a Pure Organic Compound by Chemical Test(s) |
| **Course Code: CC-02 Course Title: Physical Chemistry-I (Prac)** | ***PRACTICAL*** | Upon successful completion students should be able to determine and study :<br>➡ pH of unknown solution (buffer), by color matching method<br>➡ the reaction rate constant of hydrolysis of ethylacetate in the presence of an equal quantity of sodium hydroxide<br>➡ Study of kinetics of acid-catalyzed hydrolysis of methyl acetate<br>➡ Study of kinetics of decomposition of H2O2 by KI<br>➡ Determination of solubility product of PbI2 by titremetric method |

# SEMESTER 2

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| **Course Code: CC-03 Course Title: Inorganic Chemistry-I** | ***Extra nuclear Structure of atom*** | At the end of the course, students will be able to understand<br>➡ Bohr's theory, Sommerfeld's Theory,<br>➡ de Broglie equation, Heisenberg's Uncertainty Principle and its significance,<br>➡ Schrödinger's wave equation,<br>➡ Pauli's Exclusion Principle,<br>➡ Hund's rules and multiplicity,<br>➡ Exchange energy,<br>➡ Aufbau principle and its limitations |
| | ***Chemical periodicity*** | On completion of the course, students will be able to:<br>➡ Understand the nature of elements and their different properties,<br>➡ periodic variation of the properties etc. |
| | ***Acid-Base reactions*** | On completion of the course, students will be able to:<br>➡ Understand the acid-base behaviours of different organic and inorganic compounds.<br>➡ Acquire the knowledge of pH in solution of compounds and hence the application in different fields. |
| | ***Redox Reactions and precipitation reactions*** | On completion of the course, students will be able to:<br>➡ Understand the redox phenomenon of redox active substances and its applications in different fields |
| **Course Code: CC-04 Course Title: Organic Chemistry-II** | ***Stereochemistry II*** | At the end of the course, students will be able to understand:<br>➡ Chirality arising out of stereoaxis<br>➡ Concept of prostereoisomerism Conformation<br>➡ Alkanes, diols and conformation of conjugated systems |
| | ***General Treatment of Reaction Mechanism II*** | On completion, students will learn about<br>➡ Reaction thermodynamics<br>➡ Tautomerism<br>➡ Concept of organic acids and bases<br>➡ Reaction kinetics |
| | ***Substitution and Elimination Reactions*** | On completion, students will learn about<br>➡ Free-radical substitution reaction<br>➡ Nucleophilic substitution reactions and Elimination reactions |

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| **Course Code: CC-03 Course Title: Inorganic Chemistry-I (Prac)** | ***Oxidation-Reduction Titrimetric*** | Upon successful completion students should be able to estimate:<br>➡ Fe(II) using standardized KMnO4 solution<br>➡ oxalic acid and sodium oxalate in a given mixture<br>➡ Fe(II) and Fe(III) in a given mixture using K2Cr2O7 solution<br>➡ Fe(III) and Mn(II) in a mixture using standardized KMnO4 solution<br>➡ Fe(III) and Cu(II) in a mixture using K2Cr2O7<br>➡ Fe(III) and Cr(III) in a mixture using K2Cr2O7 |
| **Course Code: CC-04 Course Title: Organic Chemistry-II (Prac)** | ***Organic Preparations*** | Upon successful completion students should be able to perform the following reactions with the calculation of the yield product:<br>➡ Nitration of acetanilide<br>➡ Condensation reactions: Synthesis of 7-hydroxy-4-methylcoumarin<br>➡ Hydrolysis of amides/imides/esters<br>➡ Acetylation of phenols/aromatic amines (using Zn-dust/Acetic Acid)<br>➡ Benzoylation of phenols/aromatic amines<br>➡ Side chain oxidation of toluene and p-nitrotoluene<br>➡ Diazo coupling reactions of aromatic amines<br>➡ Bromination of acetanilide using green approach (Bromate-Bromide method)<br>➡ Green ‘multi-component-coupling’ reaction: Synthesis of dihydropyrimidone<br>➡ Selective reduction of m-dinitrobenzene to m-nitroaniline |

# SEMESTER 3

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| **Course Code: CC-05 Course Title: Physical Chemistry-II** | ***Transport Processes*** | At the end of the course the student will learn about<br>➡ Fick's Law<br>➡ Conductance and Transport number<br>➡ Viscosity<br>➡ Principles of Hittorf's and Moving-boundary method Wien effect,<br>➡ Debye-Falkenhagen effect<br>➡ Walden's rule. |
| | ***Application of Thermodynamics – I*** | On completion, students get to know about<br>➡ Partial Properties<br>➡ Chemical Potential<br>➡ Chemical Equilibrium -to derive reaction isotherm; equilibrium constants based on different standard states; dependence of equilibrium constants on temperature and pressure<br>➡ derivation of van't Hoff reaction isotherm and reaction isochore<br>➡ effect of various parameters governing the equilibrium position of a chemical reaction<br>➡ Le Chatelier principle and its thermodynamic derivation.<br>➡ Distribution Law and<br>➡ Chemical Potential of pure and mixtures of ideal substances. |
| | ***Foundation of Quantum Mechanics*** | On completion of the course, students will be able to:<br>➡ Acquire fundamental knowledge regarding Planck's hypothesis and quantization of energy level, historical chronology leading to the development of Quantum Mechanics, wave-particle, duality of light and its consequences, explanation of several physical processes such as Black-body radiation, photo-electric effect, Compton effect, specific heats of solids, etc.<br>➡ Know Schrodinger's wave equation (time-independent), several mathematical techniques viz. operator algebra and their application to determine the physical property of different model and real quantum mechanical system, such as particle in a box, simple harmonic oscillator, rigid rotor and one-electron system like hydrogen atom. |
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| **Course Code: CC-06 Course Title: Inorganic Chemistry-II (Theo)** | ***Chemical Bonding-I*** | On completion of the course, students will learn:<br>➡ Ionic and Covalent Bond explained with Bent's rule<br>➡ Dipole moments<br>➡ VSEPR theory |
| | ***Chemical Bonding-II*** | On conclusion of this topic the students learn about<br>➡ Molecular orbital concept of bonding<br>➡ Metallic Bond and<br>➡ Weak Chemical Forces |
| | ***Radioactivity*** | On completion of the course, students will be able to:<br>➡ Understand the radioactivity and related phenomena of radioactive atoms.<br>➡ Know the versatile applications of radiochemistry in different fields like in determination of age of an ancient species, reaction mechanism through isotope labeling, in medicinal chemistry etc.<br>➡ Understand the hazards of radiations and also know the safety measures |
| **Course Code: CC-07 Course Title: Organic Chemistry-III (Theo)** | ***Chemistry of alkenes and alkynes*** | With completion of this course the students will be able to understand<br>➡ Addition to C=C: mechanism (with evidence wherever applicable), reactivity, regioselectivity (Markownikoff and anti-Markownikoff additions) and stereoselectivity<br>➡ Addition to C≡C (in comparison to C=C): mechanism, reactivity, regioselectivity (Markownikoff and anti-Markownikoff addition) stereoselectivity |
| | ***Aromatic Substitution*** | On completion of the course, students will be able to:<br>➡ Understand Electrophilic aromatic substitution<br>➡ and Nucleophilic aromatic substitution |
| | ***Carbonyl and Related Compounds*** | The completion of this course enabkes the student to understand<br>➡ Addition to C=O with benzoin condensation, Cannizzaro and Tischenko reactions, reactions with ylides: Wittig reaction; oxidations and reductions: Clemmensen, Wolff-Kishner, LiAlH4, NaBH4, MPV, Oppenauer, Bouveault-Blanc, acyloin condensation; oxidation of alcohols with PDC and PCC; periodic acid and lead tetraacetate oxidation of 1,2-diols.<br>➡ Exploitation of acidity of α-H of C=O, Aldol, Friedel-Crafts, Michael, Knoevenagel, Cannizzaro, Benzoin condensation and Dieckmann condensation by greener approach |

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| | | ➡ Nucleophilic addition to α,β-unsaturated carbonyl system<br>➡ Substitution at $sp^2$ carbon (C=O system) |
| | ***Organometallics*** | On completion of the course, students will be able to:<br>➡ Understand the different types of organic reactions involving carbon metal bonds.<br>➡ Understand the role of metals in controlling the regio- and stereo- specificities of the reactions.<br>➡ Realize the industrial application of organometallic chemistry.<br>➡ Know the use of organometallic compounds in the fields of catalysis, medicine etc. |
| **Course Code: SEC-1**<br>**Course Title: Basic Analytical Chemistry** | ***Analytical Chemistry*** | On completion of the course, students will be able to understand about<br>➡ Analysis of soil, Analysis of water, Analysis of food products, Chromatography, Ion-exchange and Analysis of cosmetics |
| **Course Code: CC-05**<br>**Course Title: Physical Chemistry-II (Prac)** | ***Practical*** | Upon successful completion students should be able to study the viscosity of unknown solution<br>➡ Study of viscosity of unknown liquid<br>➡ Determine the partition coefficient for the distribution of I2 between water and CCl4.<br>➡ Determine the Keq for KI + I2 □ KI3, using partition coefficient between water and CCl4<br>➡ Conductometric titration of an acid (strong, weak/ monobasic, dibasic) against strong base.<br>➡ Study the saponification reaction conductometrically.<br>➡ Verify the Ostwald's dilution law and determination of Ka of weak acid. |
| **Course Code: CC-06**<br>**Course Title: Inorganic Chemistry-II (Prac)** | ***Iodo/Iodimetric Titrations*** | Upon successful completion students should be able to estimate:<br>➡ Cu(II), Vitamin C., arsenite by iodimetric method, Cu in brass and Cr and Mn in Steel |
| **Course Code: CC-07**<br>**Course Title: Organic Chemistry-III (Prac)** | ***Qualitative Analysis of Single Solid Organic Compounds*** | Upon successful completion students should be able to<br>➡ Detect special elements by Lassaigne's test<br>➡ check their solubility and classify them<br>➡ detect the different functional group, like, aromatic amine, nitro, amido,phenolic, carboxylic and carbonyl group<br>➡ learn to check the melting point and prepare a derivative. |

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# SEMESTER 4

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| **Course Code: CC-08**<br>**Course Title: Physical Chemistry-III (Theo)** | ***Application of Thermodynamics – II*** | After the completion of the course the students learn<br>➡ Colligative properties<br>➡ Phase rule<br>➡ First order phase transition and Clapeyron equation; Clausius-Clapeyron equation – derivation and use<br>➡ Three component systems<br>➡ Binary solutions |
| | ***Electrical Properties of molecules*** | On completion of the course, students will be able to:<br>➡ Learn how to treat solutions containing ionic species thermodynamically; get an idea about activity and activity coefficient of various ionic species present in the solution; variation of activity coefficient with ionic strength.<br>➡ Get semi-qualitative ideas about Debye-Huckel limiting law and its application and limitation.<br>➡ Learn about various electrode processes; different types of electrodes; derivation of Nernst equation using laws of Thermodynamics; derivation of expression of EMF of an electrode and EMF of a cell using Nernst equation about the betterment of the materials.<br>➡ Concentration cells with and without transference, liquid junction potential<br>➡ Learn the application of potentiometric titration as analytical techniques and solving |

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| | | numerical problems related to this topic |
| | ***Quantum Chemistry*** | After the completion of the course the students learn about<br>➡ Angular momentum<br>➡ Qualitative treatment of hydrogen atom and hydrogen-like ions<br>➡ LCAO and HF-SCF |
| **Course Code: CC-09**<br>**Course Title: Inorganic Chemistry-III (Theo)** | ***General Principles of Metallurgy*** | After the completion of the course the students learn about<br>➡ Chief modes of occurrence of metals based on standard electrode potentials.<br>➡ Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agent. Electrolytic Reduction, Hydrometallurgy.<br>➡ Methods of purification of metals: Electrolytic Kroll process,<br>➡ Parting process, van Arkel-de Boer process and Mond's process, Zone refining. |
| | ***Chemistry of s and p Block Elements*** | After the completion of the course the students learn<br>➡ Relative stability of different oxidation states, diagonal relationship and anomalous behaviour of first member of each group.<br>➡ Allotropy and catenation.<br>➡ Study of the following compounds with emphasis on structure, bonding, preparation, properties and uses. Beryllium hydrides and halides. Boric acid and borates, boron nitrides, borohydrides (diborane) and graphitic compounds, silanes. Oxides and oxoacids of nitrogen, phosphorus, sulphur and chlorine. Peroxo acids of sulphur. Sulphur-nitrogen compounds. Basic properties of halides and polyhalides, interhalogen compounds, polyhalides, pseudohalides, fluorocarbons and chlorofluorocarbons |
| | ***Noble Gases*** | After the completion of the course the students learn about<br>➡ Occurrence and uses, rationalization of inertness of noble gases, Clathrates; preparation, structures (VSEPR theory) and properties of XeF2, XeF4 and XeF6; Nature of bonding in noble gas compounds (Valence bond treatment and MO treatment for XeF2 and XeF4). Xenon-oxygen compounds. |
| | ***Inorganic Polymers*** | On completion of this topic the students learn about<br>➡ Types of inorganic polymers, comparison with organic polymers, synthesis, structural |

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| | | aspects and applications of silicones and siloxanes, Borazines, silicates and phosphazenes. |
| | ***Coordination Chemistry-I*** | On completion of this topic the students learn about<br>➡ Double and complex salts.<br>➡ Werner's theory of coordination complexes, Classification of ligands, chelates, coordination numbers,<br>➡ IUPAC nomenclature of coordination complexes (up to two metal centers),<br>➡ Isomerism in coordination compounds, constitutional and stereo isomerism,<br>➡ Geometrical and optical isomerism in square planar and octahedral complexes. |
| **Course Code: CC-10**<br>**Course Title: Organic Chemistry-IV (Theo)** | ***Nitrogen compounds*** | On completion of this topic the students learn about<br>➡ Amines<br>➡ Nitro compounds (aliphatic and aromatic)<br>➡ Alkylnitrile and isonitrile<br>➡ Diazonium salts and their related compounds |
| | ***Rearrangements*** | On completion of this topic the students learn about<br>➡ Rearrangement to electron-deficient carbon,<br>➡ Rearrangement to electron-deficient nitrogen:<br>➡ Rearrangement to electron-deficient oxygen<br>➡ Aromatic rearrangements<br>➡ Migration from nitrogen to ring carbon<br>➡ Rearrangement reactions by green approach |
| | ***The Logic of Organic Synthesis*** | On completion of this topic the students learn about<br>➡ Retrosynthetic analysis<br>➡ Strategy of ring synthesis and<br>➡ Asymmetric synthesis |
| | ***Organic Spectroscopy*** | On completion of this topic the students learn about<br>➡ UV Spectroscopy,<br>➡ IR Spectroscopy,<br>➡ NMR Spectroscopy and<br>➡ Applications of IR, UV and NMR spectroscopy for identification of simple organic molecules |
| **Course Code: SEC-2**<br>**Course Title: Pharmaceuticals Chemistry** | ***Drugs & Pharmaceuticals*** | This course mainly deals with the<br>➡ structural determination,<br>➡ synthesis and uses of some drugs such as antipyretics,analgesic,sulpha-drugs penicillin etc. |
| | ***Fermentation*** | On completion of this course students understand<br>➡ Aerobic and anaerobic fermentation |

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| **Course Code: CC-08**<br>**Course Title: Physical Chemistry-III (Prac)** | ***PRACTICAL*** | Upon successful completion students should be able to<br>➡ Determine the solubility of sparingly soluble salt in water, in electrolyte with common ions and in neutral electrolyte (using common indicator)<br>➡ .Perform the Potentiometric titration of Mohr's salt solution against standard K2Cr2O7 solution.<br>➡ Determine the Ksp for AgCl by potentiometric titration of AgNO3 solution against standard KCl solution.<br>➡ Study the Effect of ionic strength on the rate of Persulphate – Iodide reaction.<br>➡ Study the phenol-water phase diagram. |
| **Course Code: CC-09**<br>**Course Title: Inorganic Chemistry-III (Prac)** | ***Complexometric titration*** | Upon successful completion students should be able to perform the quatitative titration of<br>➡ Zn(II), Zn(II) in a Zn(II) and Cu(II) mixture, Ca(II) and Mg(II) in a mixture<br>➡ Find the Hardness of water |
| | ***Inorganic preparations*** | At the end of the course students should learn about the preparation of<br>➡ [Cu(CH3CN)4]PF6/ClO4<br>➡ Potassium dioxalatodiaquachromate(III)<br>➡ Tetraamminecarbonatocobalt (III) ion<br>➡ Potassium tris(oxalate)ferrate(III)<br>➡ Tris-(ethylenediamine) nickel(II) chloride.<br>➡ [Mn(acac)3] and Fe(acac)3] |
| **Course Code: CC-10**<br>**Course Title: Organic Chemistry-IV (Prac)** | ***Estimation of different organic compounds*** | At the end of the course students learn to estimate<br>➡ glucose by titration using Fehling's solution<br>➡ vitamin-C (reduced)<br>➡ aromatic amine (aniline) by bromination (Bromate-Bromide) method<br>➡ phenol by bromination (Bromate-Bromide) method<br>➡ formaldehyde (Formalin)<br>➡ acetic acid in commercial vinegar<br>➡ urea (hypobromite method)<br>➡ saponification value of oil/fat/ester. |

# SEMESTER 5

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| **Course Code: CC-11 Course Title: Inorganic Chemistry-IV (Theo)** | ***Coordination Chemistry-II*** | On completion of this topic the students learn about<br>➡ VB description and its limitations.<br>➡ Elementary Crystal Field Theory Magnetism and Colour, quenching of magnetic Moment<br>➡ Racah parameter.<br>➡ Selection rules for electronic spectral transitions; spectrochemical series of ligands; charge transfer spectra |
| | ***Chemistry of d- and f- block elements*** | On completion of this topic the students learn about<br>➡ Transition Elements<br>➡ Lanthanoids and Actinoids |
| **Course Code: CC-12 Course Title: Organic Chemistry-V (Theo)** | ***Carbocycles and Heterocycles*** | On completion of the course, students will be able to:<br>➡ Know about different heterocyclic compounds of different sizes especially 5 and 6-membered heterocycles.<br>➡ Know the synthesis and reactions of different heterocycles.<br>➡ Understand many biological roles of some heterocycles. |
| | ***Cyclic Stereochemistry*** | On completion of the course, students will be able to:<br>➡ Alicyclic compounds: concept of I-strain; conformational analysis: cyclohexane, mono and disubstituted cyclohexane;<br>➡ symmetry properties and optical activity; ring-size and ease of cyclisation; conformation & reactivity in cyclohexane system: consideration of steric and stereoelectronic requirements;<br>➡ elimination (E2, E1), nucleophilic substitution (SN1, SN2, SNi, NGP), merged substitution-elimination; rearrangements; oxidation of cyclohexanol, esterification, saponification, lactonisation, epoxidation, pyrolytic syn elimination and fragmentation reactions. |
| | ***Pericyclic reactions*** | On completion of the course, students learn about<br>➡ Mechanism, stereochemistry, regioselectivity in case of 1. Electrocyclic reactions 2. Cycloaddition reactions and 3. Sigmatropic reactions |
| | ***Carbohydrates*** | On completion of the course, students will be able to understand<br>➡ different reactions and conformations of Monosaccharides |
| | ***Biomolecules*** | On completion of the course, students will be able to understand about<br>➡ Amino acids, Peptides and Nucleic acids |

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| | ***Alkaloids and Terpenoids*** | At the end of this course students can get a idea on<br>➡ terpenoids and alkaloids;<br>➡ determination of structure of α-Terpenol and ephedrine. |
| **Course Code: DSE-1 Course Title: Advanced Physical Chemistry (Theo)** | ***Crystal Structure*** | On completion of the course, students will be able to:<br>➡ Get an idea about the specific heat of solids, Einstein and Debye theory related to it;<br>➡ Laws of Crystallography;x-ray diffraction as a technique to explore the atomic/molecular-level structure of a crystalline solid.<br>➡ Learn Bragg's law and crystal planes; Miller indices; Idea about Bravais lattices and detailed discussion about cubic crystal system. |
| | ***Statistical Thermodynamics*** | On completion of the course, students will be able to:<br>➡ Understand the significance of this subject and will be able to appreciate the role it plays in bridging the two pillars of Physical Chemistry – Thermodynamics and Quantum Mechanics.<br>➡ Understand the "inside out" approach of this subject and acquire the basic knowledge about ensemble, kinds of ensemble, partition function and significance of partition function and representation of different thermodynamic quantities in terms of partition function.<br>➡ Get idea about classical statistical thermodynamics and Quantum statistics on an elementary level.<br>➡ Understand the relation between entropy and arrangement of different particles in various energy levels at the atomic level.<br>➡ Learn the mathematical derivation of Maxwell-Boltzmann distribution law and should be able to solve numerical problems related with this topic. |
| | ***Special selected topics*** | On completion of the course, students will be able to:<br>➡ Specific heat of solid<br>➡ 3rd law<br>➡ Polymers<br>➡ Dipole moment and polarizability |
| **Course Code: DSE-2 Course Title: Analytical methods in chemistry (Theo)** | ***Qualitative and quantitative aspects of analysis*** | On completion of the course, students will learn:<br>➡ Sampling, evaluation of analytical data, errors, accuracy and precision, methods of theirexpression, normal law of distribution, indeterminate errors, statistical test of data; F, Q and t test, rejection of data, and confidence intervals |

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| | ***Optical methods of analysis*** | On completion of the course, students will learn:<br>➡ Origin of spectra,<br>➡ UV-Visible Spectrophotometry,<br>➡ Basic principles of quantitative analysis,<br>➡ Basic principles of quantitative analysis and<br>➡ Flame Atomic Absorption and Emission Spectroscopy |
| | ***Thermal methods of analysis*** | On completion of the course, students will be able to understand<br>➡ Theory of thermogravimetry (TG),<br>➡ basic principle of instrumentation.<br>➡ Techniques for quantitative estimation of Ca and Mg from their mixture. |
| | ***Electroanalytical methods*** | On completion of the course, students will be able to understand<br>➡ Classification of electroanalytical methods, basic principle of pH metric,<br>➡ potentiometric and conductometric titrations and learn techniques used for the determination of equivalence points and techniques used for the determination of pKa values. |
| | ***Separation techniques*** | On completion of the course, students will be able to understand<br>➡ Solvent extraction,<br>➡ Technique of extraction,<br>➡ Qualitative and quantitative aspects of solvent extraction,<br>➡ Chromatography,<br>➡ Development of chromatograms,<br>➡ Qualitative and quantitative aspects of chromatographic methods of analysis,<br>➡ Stereoisomeric separation and analysis and<br>➡ Role of computers in instrumental methods of analysis |
| **Course Code: CC-11 Course Title: Inorganic Chemistry-IV (Prac)** | ***Chromatography of metal ions*** | On completion of the course, students will be able to understand the principles involved in<br>➡ Chromatography , with experiments in Paper Chromatography Separation of Ni (II) and Co (II) and Fe (III) and Al (III) |

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| | ***Gravimetry*** | On completion of the course, students will be able to understand<br>➡ Estimation of nickel (II) using Dimethylglyoxime (DMG).<br>➡ Estimation of copper as CuSCN<br>➡ Estimation of Al (III) by precipitating with oxine and weighing as Al(oxine)3 (aluminium oxinate)<br>➡ Estimation of chloride |
| | ***Spectrophotometry*** | On completion of the course, students will be able to learn<br>➡ spectrophotometric measurement of 10Dq of 3d metal complexes and<br>➡ Determination of λmax of KMnO4 and K2Cr2O7. |
| **Course Code: CC-12 Course Title: Organic Chemistry-V (Prac)** | ***Chromatographic Separations*** | On completion of the course, students will be able to learn about<br>➡ TLC,<br>➡ Column Chromatography<br>➡ Paper Chromatography separation. |
| | ***Spectroscopic Analysis of Organic Compounds*** | On completion of the course, students will be able to learn<br>➡ how to assign labelled peaks in the 1H NMR spectra and IR spectra and<br>➡ also to record the full spectral analysis of different compounds. |
| **Course Code: DSE-1 Course Title: Advanced Physical Chemistry (Prac)** | ***PRACTICAL*** | On completion of the course, students will be able to learn about Computer Programming based on numerical methods for<br>➡ Roots of equations,<br>➡ Numerical differentiation,<br>➡ Numerical integration and<br>➡ Matrix operations |

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| **Course Code: DSE-2 Course Title: Analytical methods in chemistry (Prac)** | ***Separation Techniques - Chromatography*** | On completion of the course, students will be able to learn about<br>➡ Chromatographic Separation of mixtures, active ingredients of plants, flowers and juices<br>➡ use TLC and technique and identify them on the basis of their Rf values. |
| | ***Solvent Extractions*** | On completion of the course, students will be able to learn about<br>➡ separation of mixtures by solvent extraction,<br>➡ analysis of soil and ion exchange methods |
| | ***Spectrophotometry*** | On completion of the course, students will be able to learn<br>➡ how to determine pKa values of indicator using spectrophotometry,<br>➡ chemical oxygen demand,<br>➡ Biological oxygen demand |

# SEMESTER 6

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| **Course Code: CC-13 Course Title: Inorganic Chemistry-V (Theo)** | ***Bioinorganic Chemistry*** | On completion of the course, students will be able to:<br>➡ Understand different aspects (structures and biological functions) of the biomolecules like the metalloproteins, metalloenzymes etc containing metal ions.<br>➡ Know the different aspects like oxygen transport, electrontransport, hydrolysis of peptides in vertebrates and invertebrates. |
| | ***Organometallic Chemistry*** | On completion of the course, students will be able to<br>➡ Define and classify organometallic compounds on the basis of bond type.<br>➡ Concept of hapticity of organic ligands<br>➡ 18-electron and 16-electron rules (pictorial MO approach) and its application<br>➡ Zeise's salt, Ferrocine and Reactions of |

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| | | organometallic complexes |
| | ***Catalysis by Organometallic Compounds*** | ➡ On completion of the course, students will learn about different industrial processes like Alkene hydrogenation, Hydroformylation, Wacker Process, Synthetic gasoline and Ziegler-Natta catalysis for olefin polymerization |
| | ***Reaction Kinetics and Mechanism*** | At the end of the course, the students will be able to understand the<br>➡ Inorganic reaction mechanism. |
| **Course Code: CC-14 Course Title: Physical Chemistry-IV (Theo)** | ***Molecular Spectroscopy*** | At the end of the course, the students will be able to understand<br>➡ Interaction of electromagnetic radiation with molecules and various types of spectra and Born-Oppenheimer approximation<br>➡ Rotation spectroscopy<br>➡ Vibrational spectroscopy<br>➡ Raman spectroscopy<br>➡ Nuclear Magnetic Resonance (NMR) spectroscopy |
| | ***Photochemistry*** | On completion of the course, students will be able to:<br>➡ Get elementary ideas about the fundamental laws governing the chemical reaction induced by light<br>➡ Know the representation of various photo-physical processes by Jablonsky diagram.<br>➡ Be accustomed with the different scientific nomenclature frequently used for further extensive studies of the subject. |
| | ***Surface phenomenon*** | On completion of the course, students will be get to learn about<br>➡ Surface tension and energy<br>➡ Adsorption - Know about basic laws governing the adsorption; acquire an elementary idea about physisorption and chemisorptions.<br>➡ Have an idea about different adsorption isotherms and their theoretical derivation, thermodynamic aspects of sorption processes, role and function of heterogeneous catalysts.<br>➡ Colloids and Micelle formation |
| **Course Code: DSE-3 Course Title: Green Chemistry (Theo)** | ***Green Chemistry: Principles and applications*** | On completion of the course, students will be able to:<br>➡ Understand the source of environmental pollutions and their role in making a green world.<br>➡ Know the use of alternative energy sources, renewable feedstock and innocuous solvents.<br>➡ Understand the merits of using biodegradable materials and developing recyclable materials. |

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| | | ➡ Know about the developments of biofuels, rightfit pigments, green oxidants healthier fats and oils etc.<br>➡ Examples of Green Synthesis/ Reactions and some real world cases |
| **Course Code: DSE-4**<br>**Course Title: Dissertation followed by power point presentation** | | On learning the course, the students will be able to<br>➡ Analyze the existing problems for which research can provide solutions and select the problem for research<br>➡ Know the various chemical publishers, journals and perform literature survey<br>➡ Synthesize new chemical compounds through various methods<br>➡ Characterize the compounds using various analytical and spectroscopical studies<br>➡ Learn to write their findings in a paper form<br>➡ Learn to present their dissertation in a power point |
| **Course Code: CC-13**<br>**Course Title: Inorganic Chemistry-V (Prac)** | ***Qualitative semimicro analysis*** | On completion ofthe course students will be able to perform<br>➡ Qualitative semimicro analysis of mixtures containing four radicals |
| **Course Code: CC-14**<br>**Course Title: Physical Chemistry-IV (Prac)** | ***PRACTICAL*** | On completion ofthe course students will be able to<br>➡ Determine the surface tension of a liquid using Stalagmometer.<br>➡ Determine the CMC from surface tension measurements.<br>➡ Verifify Beer and Lambert's Law for KMnO4 and K2Cr2O7 solution.<br>➡ Determine the pH of unknown buffer, spectrophotometrically. |
| **Course Code: DSE-3**<br>**Course Title: Green Chemistry (Prac)** | ***PRACTICAL*** | On completion of the course students will be able to learn about<br>➡ Preparation of propene,<br>➡ Benzoin condensation and<br>➡ Photo reduction of benzophenone to benzopinacol in the presence of sunlight. |

**DEPARTMENT OF MATHEMATICS**

# BEJOY NARAYAN MAHAVIDYALAYA

ITACHUNA, HOOGHLY, WEST BENGAL

## PROGRAMME TITLE: B.SC. IN MATHEMATICS (HONOURS) (CBCS)

## Programme Outcomes (PO)

After successful completion of B.Sc. in Mathematics (Honours) (CBCS) course and after dealing with its hard, updated and advanced curriculum, the students will not only get the B.A./B.Sc. degree but also achieve the following abilities:

| PO No. | Descriptions |
|---|---|
| PO-1 | Acquire a strong knowledge on fundamental principle and concepts of mathematics and mathematical computing with their applications to Industries, Engineering Sciences, Biology and Environmental Sciences. |
| PO-2 | Gain a commendable foundation on various branches of mathematics and its interconnections with other disciplines to face the real life problems to become self-empowered in the society and to lead others in the society. |
| PO-3 | Develop problems solving skills, cultivating strong logical thinking, communicative skills both oral and written. |
| PO-4 | Understand the professional, ethical, legal, social issues and responsibilities and generate the efficiency to address them. |
| PO-5 | Communicate appropriately, effectively and scientifically using different tools and technology and by new findings. |
| PO-6 | Acquire knowledge to pursue the related Post-Graduate course of studies and researches in related areas both academic and others. |
| PO-7 | Applying one's knowledge of principles, which will result in a specific subject area to analyze its local and global impact. |

## Programme Specific Outcomes (PSO)

After rigorous practice and completion of this course in B.Sc Mathematics (Hons.) under CBCS, one surely hopes for the following attributes to inculcate oneself directly and indirectly:

| PSO No. | Descriptions |
|---|---|
| PSO-1 | Impart conceptual knowledge of mathematical science for formulating and analyzing and addressing the real world problems. |
| PSO-2 | To equip the students sufficiently in both analytical and computational skills in mathematical sciences in present and helps them to establish carrier in mathematics by higher studies and researches. |
| PSO-3 | Build teaching skills, subject knowledge of the course of their study which will help them to face different competitive examinations for various jobs in different fields. |
| PSO-4 | To impart a strong communicative and interpersonal skills for working in a team. |
| PSO-5 | To inculcate personality with high moral values, utmost softness and liberty which will devote oneself for the betterment of community, society and so our country. |
| PSO-6 | This course teaches the students to be hard working, strongly committed, and fully dedicated; which are necessary to reach the real goal of the education: "*ja vidya, sa bimuktaya".* |

# B.SC. IN MATHEMATICS (HONOURS) (CBCS)

## COURSE OUTCOMES (CO)

**Course: CC-01 (Calculus, Geometry & Differential Equations):**

On successful completion of this course students will be expected to:

**CO-1:** Understand the behavior of functions studying different approach of derivatives

**CO-2**: Learn about applications of definite integral to compute arc, length, area, volume etc.

**CO-3**: Know about the reflection properties of conics, translation and rotation of axes

**CO-4**: Learn classification of conics using discriminant and acquire knowledge about different conics, polar equation of conics

**CO-5**: Learn about central conicoids, generating lines, classification of quadrics

**CO-6**: Understand the concept of differential equations and their various types of solutions and distinguish among them

**CO-7**: Solve exact differential equations, non-exact differential equations using integrating factor, special integrating factor, transformation etc.

**CO-8**: Solve linear equations and equations reducible to linear form

**Course: CC-02 (Algebra):**

On successful completion of this course students will be expected to:

**CO-1**: Grasp the idea of complex numbers and its modulus and amplitude.

**CO-2**: Learn about the De-Moivre's theorem and can apply to solve various problems.

**CO-3**: Understand the relation between roots and coefficients.

**CO-4**: Learn how to find out an equation depending on the relations of roots of another equation.

**CO-5**: Learn about the Descartes rule of signs and Sturm's functions and can use it to solve problems.

**CO-6**: Learn about the Cardan's method and Ferrari's method to solve the cubic and biquadratic equations respectively.

**CO-7**: Recognize the reciprocal equations and can solve its problems.

**CO-8**: Understand the relation between AM, GM and HM and can apply to solve various problems.

**CO-9**: Learn about the Cauchy-Schwartz inequality.

**CO-10**: Grasp the idea of relations, equivalence relations and Partition.

**CO-11**: Understand the concept of functions, composition of functions, invertible functions.

**CO-12**: Learn about the well ordering property of natural numbers, division algorithm, $2^{nd}$ principal of induction and can solve related problems.

**CO-13**: Learn about the congruence relation between integers and its properties and can apply to solve various problems.

**CO-14**: Learn how to solve a system of linear equations in any number of variables

**CO-15**: Learn to find Row-reduced Echelon form by using row operations

**CO-16**: Represent the equivalent conditions for invertibility of a matrix

**CO-17**: Learn basics of vector spaces keeping $R^n$ as a model

**CO-18**: Work with eigenvalues and eigenvectors of a matrix

**CO-19**: Apply Cayley-Hamilton theorem to find the inverse of a matrix

**Course: CC-03 (Real Analysis)**

Upon completion of this course, students would be able to

**CO-1**: Understand the concept of finiteness, Countability, denumerability and Cardinality

**CO-2**: Realize the set of real numbers as a complete ordered field, by studying the algebraic, order and completeness properties

**CO-3**: Grasp the idea of boundedness and bounds of a real subset

**CO-4**: Define and identify open sets and closed sets

**CO-5**: Visualize the concept of limit points, closure, and compactness

**CO-6:** Describe the various types of intervals and their properties

**CO-7**: Grasp the concept of real sequence, and identify different types of sequences like monotone or bounded sequence

**CO-8**: Understand the concept of limit and convergence, and also the concept of diveregence

**CO-9**: Realize the significance of the Cauchy criterion

**CO-10**: Understand the concept of an infinite series, and its convergence (simple and absolute) or divergence

**CO-11**: Use different tests (Comparison test, ratio test etc.) for checking the convergence of an infinite series

**Course: CC-04 (Differential Equations and Vector Calculus)**

On successful completion of this course students will be expected to:

**CO-1**: Study real life problems by constructing ordinary differential equations

**CO-2**: Recognize and solve various ODEs of different orders and degrees by various methods

**CO-3**: Know different types of linear systems

**CO-4**: Learn Power-series solution of a differential equation

**CO-5**: Learn Vector triple product, and study limit, continuity and differentiation of vector functions

**Course: CC-05 (Theory of real functions and introduction to metric spaces):**

On successful completion of this course students will be expected to:

**CO-1**: Recall the analytic approach on limit in Differential Calculus which is $\epsilon$-$\delta$ definition on sequence and its application to real valued functions.

**CO-2**: Know the algebra of limit of functions, infinite limits and limits at infinity.

**CO-3**: Learn the continuity of real valued function and the algebra of continuous functions.

**CO-4**: Aware about the characteristic properties of continuous functions, e.g. boundedness property, intermediate-value property, interval preservation property etc.

**CO-5**: Learn the uniform and non-uniform continuity of a real valued function, its various properties and its difference from the continuous functions.

**CO-6**: Gain knowledge on differentiability of a real valued function and its algebra of differentiable functions

**CO-7**: Know the Properties of differentiable functions: extrema of a function and its applications, intermediate value properties of derived function, Rolle'stheorem, Lagrange's Mean Value theorem and its applications, Cauchy's Mean Value theorem.

**CO-8**: Habituated with Taylor's theorem and Maclaurin's theorem with different form of remainders, its application for expansion of different functions like: sinx, cosx, ln(1+x),1/(ax+b), $(1+x)^n$ etc.

**CO-9**: To learn to generalize the distance function into a metric function

**CO-10**: Learn various examples of metric spaces and identify the properties which are true in real line but not generally true in a metric space

**CO-11**: To define Open balls, Closed balls, Open Sets, Closed Sets and Limit points in a metric space

**Course: CC-06 (Group Theory-I):**

On successful completion of this course students will be expected to:

**CO-1**: Demonstrate when a binary algebraic structure forms a group.

**CO-2**: Grasp the concept of group and its possible subgroups.

**CO-3**: Identify cyclic groups and their generators for finite and infinite both cases.

**CO-4**: Learn about the Lagrange's theorem and can solve various problems.

**CO-5**: Identify the normal subgroups and simple groups.

**CO-6**: Understand the idea of factor groups.

**CO-7**: Learn the idea of external direct product and internal direct product of groups and can apply to solve simple cases.

**CO-8**: Recognize the Dihedral groups and Quaternion groups.

**CO-9**: Know about the permutation, Symmetric group and its subgroups.

**CO-10**: Learn about the Cauchy theorem.

**CO-11**: Understand the concept of group homomorphism and its properties. Also learn the idea of isomorphism between the groups and can apply it to solve various problems.

**CO-12**: Apply a range of mathematical techniques to solve a variety of quantitative problems.

**Course: CC-07 (Numerical Methods & Numerical Methods Lab):**

Upon completion of this course, students would be able to:

**CO-1**: Understand various types of error such as relative, absolute, round off, truncation etc.

**CO-2**: Solve transcendental and polynomial equation numerically

**CO-3**: Solve system of linear equations by various numerical methods

**CO-4**: Learn about interpolation & various types of interpolation formulae

**CO-5**: Gain knowledge about numerical differentiation and integration by numerical methods

**CO-6**: Solve ordinary differential equation by methods like Euler's, Runge-kutta etc.

**CO-7**: Learn to solve different problems of numerical methods by computer programming, and in the process gain some programming and digital knowledge

**Course: CC-08 (Riemann Integration and Series of Functions)**

Upon completion of this course, students would be able to

**CO-1:** Develop the technique of developing Darboux's integral from the concept of Cauchy integral learnt in 10+2 course.

**CO-2:** Learn the integration theory in analytic way which is Riemann integration, to overcome the integration theory for discontinuous functions.

**CO-3**: Can show the Equivalence of Darboux's integral and Riemann integral and know their various properties

**CO-4**: Acquire the knowledge of Riemann integrability for piecewise continuous functions and monotone functions and algebra of integrable functions.

**CO-5**: Find Mean Value theorem for integrals, primitive and fundamental theorem on integral calculus.

**CO-6**: Know the Concept of improper integrals and its convergence and different properties

**CO-7**: Find the application of improper integral: convergence of Beta and Gamma functions and their properties.

**CO-8**: Learn Pointwise and uniform convergence of a sequence and series of real valued functions.

**CO-9**: Gather efficiency on the consequences of uniform convergence for sequence and series of real valued functions which are bounded, continuous, differentiable and integrable.

**CO-10**: Develop the Fourier series, Riemann Lebesgue Lemma, Bessel's inequality, Perseval's identity, Dirichlet's conditions for expansion of a real valued function in to a Fourier

**CO-11**: Know the Power series and its convergence, Cauchy-Hadamard theorem and radius of convergence

**CO-12**: Do Differentiation and integration of power series, Abel's theorem and Weierstrass theorem.

**Course: CC-09 (Multivariate Calculus)**

Upon completion of this course, students would be able to

**CO-1**: Understand the fundamental concepts of functions with several variables & the concepts of derivatives for this type of functions

**CO-2**: Apply the concepts of derivatives to find the maxima and minima for functions of several variables

**CO-3**: Compute double and triple integrals efficiently & also learn about change of variables in double and triple integrals

**CO-4**: Apply double and triple integral to find area and volume

**CO-5**: Gain knowledge on the concept of divergence, curl and integration of vector point functions

**CO-6**: Solve problems related to line, surface and volume integrals using Gauss, Stoke's and Green's theorem

**Course: CC-10 (Ring Theory and Linear Algebra-I)**

Upon completion of this course, students would be able to:

**CO-1**: Understand the concept of ring and know the various properties of several examples of rings

**CO-2**: Identify the properties which make a ring an integral domain or a field

**CO-3**: Grasp the concept the ideals and factor rings

**CO-4**: Visualize the properties of ring homomorphisms

**CO-5**: Generalize the concept of vector spaces which they had learnt in a specific way in CC-02

**CO-6**: Find a basis of a vector space by extension, deletion and replacement theorems

**CO-7**: Realize the uniqueness of linear transformations compared to usual mappings

**CO-8**: Learn how to represent a linear transformation by a matrix and thus connect vector spaces and matrix algebra

**Course: CC-11 (Partial Differential Equations and Applications)**

Upon completion of this course, students would be able to:

**CO-1**: Study real-life problems by constructing partial differential equations

**CO-2**: Recognize and Solve various PDEs of different higher order and degree

**Course: CC-12 (Mechanics-I)**

Upon completion of this course, students would be able to:

**CO-1**: Learn the concept of equilibrium and stability of a particle

**CO-2**: Apply this knowledge in some engineering fields

**CO-3**: Learn to study Dynamical System

**Course: CC-13 (Metric Space and Complex Analysis)**

Upon completion of this course, students would be able to:

**CO-1**: Recall the basic concepts of metric spaces and its basic structures.

**CO-2**: Learn Completeness of metric spaces by introducing sequence in it and some other properties for achieving the completeness.

**CO-3**: Learn Continuity and uniform continuity of a map on metric spaces along with related characterizations.

**CO-4**: Learn Connectedness in a metric space along with it characterizations and its behavior under continuous mapping.

**CO-5**: Learn Compactness in a metric space along with it characterizations and its behavior under continuous mapping.

**CO-6**: Learn Homeomorphism, contraction map, Banach fixed point theorem and its application to ordinary differential equations.

**CO-7**: Recall the basic concept of complex numbers, its properties and function of complex variables.

**CO-8**: Learn Differentiability of a function of complex variables and Cauchy-Riemann equation.

**CO-9**: Learn Analyticity of a function of complex variables with some examples

**CO-10**: Learn Contour integral, Cauchy-Goursat theorem and Cauchy integral formula.

**CO-11**: Learn Liouville's theorem and fundamental theorem of algebra.

**CO-12**: Learn Sequence and series of complex numbers, Laurent series, Taylor's series, power series and its convergence.

**Course: CC-14 (Ring Theory and Linear Algebra II)**

Upon completion of this course, students would be able to:

**CO-1**: Understand the properties of polynomial rings

**CO-2**: Generalize the concept of divisibility, primality and irreducibility of integers in a ring set-up and understand the concept of ED, PID, UFD

**CO-3**: Learn to work with dual spaces and double dual spaces, and realize the identification of transformations in the double dual space with the vectors

**CO-4**: Understand the concept of diagonalizability and invariant subspaces

**CO-5**: Find the Jordan form and other canonical forms of a linear transformation

**CO-6**: Visualize the Inner products as a sort of product of vectors

**CO-7**: Find an orthogonal (orthonormal) basis of a vector space by Gram-Schmidt process

**CO-8**: Find the best approximation of a vector by a given subspace of the vector space

**CO-9**: Understand the concept of Self Adjoint, Normal and Unitary operators and compare it with the corresponding notions in matrix theory

**CO-10**: Visualize and work with Orthogonal projections and analyze a linear transformation by Spectral theory

# BEJOY NARAYAN MAHAVIDYALAYA

## DEPARTMENT OF NUTRITION

## B.Sc Honours in Nutrition (under CBCS Curriculum of The University of Burdwan)

## PROGRAMME OUTCOME

**PO-1**: The course is an interdisciplinary programme with knowledge of human anatomy, microbiology, biochemistry and their role in relation to food and health.

**PO-2**: Students completing the program of BSc in Food and Nutrition will have adequate knowledge of Nutrition, Nutrients, and the different scientific processes involved in the utilization of various food and nutrient components. The programme provides basic understanding of the correlation between food and health.

**PO-3**: The programme provides in-depth understanding of the role of food under specific diseased conditions.

**PO-4**: Students would have had multiple opportunities to learn the skills necessary for applying theoretical knowledge to practical life and enhance their soft skills and employability quotient.

## PROGRAMME SPECIFIC OUTCOMES

**PSO-1**: The programme helps to understand the role of nutrition at various stages of life.

**PSO-2**: The programme helps to understand about nutrition and its implications under different diseased conditions.

**PSO-3**: The course shows how nutrition is important as an integral part in the development of a community and how nowadays Nutrition and lifestyle changes towards a better future society.

**PSO-4**: The course helps to understand the microbiology of food and how it affects the storage of food items.

**PSO-5**: Outcome of the course also include better understanding of the biotechnological and genetic approach in food industries.

# COURSE OUTCOMES

| Sl. No. | Name of the course | Course code | Course outcomes |
|---|---|---|---|
| 1 | Nutritional physiology I | CC-01 | **CO-1**: Learn the anatomical structures and physiology of different systems of human body.<br>**CO-2**: Observe and examine the functions of various components of a body system under normal conditions. |
| | Practical | | **CO-1**: Learn the basic pathological experiments of human body |
| 2 | NUTRITIONAL ASPECT OF FOOD ITEMS | CC-02 | **CO-1**: Gain knowledge on different nutrients in food<br>**CO-2:** Understand the basic concepts behind food science and food preparation.<br>**CO-3:** Gain an in-depth understanding on cooking |
| | Practical | | **CO-1:** Apply scientific knowledge in assessing food products.<br>**CO-2:** Have an in-depth knowledge on application of food science. |
| 3 | Nutritional physiology II | CC-03 | **CO-1:** Learn how the human body maintain the homeostasis<br>**CO-2:** Observe and examine the functions of various components of a body system under normal conditions. |
| | Practical | | **CO-1:** Know the body composition of organs and systems.<br>**CO-2:** Learn the basic pathological experiments of |

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| | | | human body |
| 4 | Physiological aspect of nutrition | CC-04 | **CO-1:** Understand the properties of various micro and macro food components.<br>**CO-2:** Learn about the basic of nutrition and diet. |
| | Practical | | **CO-1:** Apply the knowledge of diet planning in community<br>**CO-2:** Assess the nutritional status.<br>**CO-3:** Understand the deficiencies in-depth. |
| 5 | Nutritional biochemistry | CC-05 | **CO-1:** Learn about the building blocks of food.<br>**CO-2:** Understand the metabolism of major food components.<br>**CO-3:** Comprehend the Biochemical implications of foods components. |
| | Practical | | **CO-1:** Utilize the laboratory techniques common to basic and applied food chemistry.<br>**CO-2:** Analyze the principles behind the analytical technique of food products when presented with a practical problem.<br>**CO-3:** Evaluate the chemical properties and reactions of various food components. |
| 6 | Nutrition: life cycle approach | CC-06 | **CO-1:** Understand the importance of nutrition in various stages of life.<br>**CO-2:** Evaluate the nutritional status through the lifecycle.<br>**CO-3:** Efficiently assess deficiencies. |
| | Practical | | **CO-1:** Plan a balanced menu through various stages of life.<br>**CO-2:** Assess the nutritional status. |
| 7 | Diet therapy I | CC-07 | **CO-1:** Understand the implication of diet under diseased conditions.<br>**CO-2:** Prescribe individualized diets.<br>**CO-3:** In-depth knowledge on hospital diets<br>**CO-4:** Understand the correlation between diet and |

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| | | | diseases. |
| | Practical | | **CO-1:** Plan a diet chart under normal conditions.<br>**CO-2:** Plan a balanced menu for diseased conditions. |
| 8 | NUTRITIONAL ASSESSMENT AND NUTRITION PROGRAMME | CC-08 | **CO-1:** Evaluate the major global issues related to Food and Nutrition board.<br>**CO-2:** Learn how to educate the community about nutrition and health education<br>**CO-3:** Understand different nutrition programme and their implication for the development of the community<br>**CO-4:** Generate wellness and healthy lifestyle adoption in community and throughout the country. |
| | Practical | | **CO-1:** Develop skills to conduct simple nutrition assessments to determine risk for under nutrition and over nutrition.<br>**CO-2:** In depth knowledge about the ideal body measurements and determination of disease |
| 9 | Community nutrition and epidemiology | CC-09 | **CO-1:** Understand the role of nutrition at community level.<br>**CO-2:** Learn about disease in global scale<br>**CO-3:** Learn about managing wastes and pollution control<br>**CO-4:** Evaluation of drinking water |
| | Practical | | **CO-1:** Evaluation of microbiology of water<br>**CO-2:** Assessment of disease state of the population living in different corner of the community |
| 10 | Diet therapy II | CC-10 | **CO-1:** Understand diet under hospital conditions.<br>**CO-2:** Understand the correlation between diet and diseases. |
| | Practical | | **CO-1:** Provide adequate nutrition for special diseased conditions. |

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| 11 | FOOD MICROBIOLOGY AND FOOD BORNE DISEASE | CC-11 | **CO-1:** Understand the interaction between microorganisms and food.<br>**CO-2:** Explain the significance of microorganisms in food<br>**CO-3:** Describe the disease characteristics of food borne and water borne microorganisms. |
| | Practical | | **CO-1:** Learn basic laboratory process of microbiology<br>**CO-2:** Knowledge about the basic reactions of microorganisms<br>**CO-3:** Differentiate various microorganisms. |
| 12 | MEDICAL MICROBIOLOGY AND PATHOLOGY | CC-12 | **CO-1:** Learn about pathogenic bacteria and viruses and diseases caused by them<br>**CO-2:** Knowledge about natural micro flora of human body |
| | Practical | | **CO-1:** Assessment of microorganisms in spoiled food and water<br>**CO-2:** Evaluate the antibiotic properties of microorganisms |
| 13 | NUTRACEUTICAL AND FUNCTIONAL FOOD | CC-13 | **CO-1:** Understand the role of nutraceuticals.<br>**CO-2:** Explain the significance of foods to provide immunity in human body<br>**CO-3:** Gain in-depth knowledge on the relationship between nutrition and food biotechnology |
| | Practical | | **CO-1:** Gain better understanding and Formation of article about the significance of foods against different disease condition |
| 14 | FOOD SAFETY AND FOOD STANDARD | CC-14 | **CO-1:** Gain in-depth knowledge on various quality control measures of food products.<br>**CO-2:** Importance of food specification and food – label with reference to various food additives.<br>**CO-3:** The implications of adulteration of food and |

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| | | | the toxic effects of adulteration.<br>**CO-4:** Gain in-depth knowledge on various food laws. |
| | Practical | | **CO-1:** Assess the adulterants present in the food samples. |
| 15 | THERAPEUTIC NUTRITION AND CRITICAL CARE | DSE-1 | **CO-1:** Provide adequate nutrition for special diseased conditions.<br>**CO-2:** Understand about critical care for patients |
| | Practical | | **CO-1:** Understand the working of dietary department.<br>**CO-2:** Plan diets and counsel patients effectively |
| 16 | MOLECULAR BIOLOGY | DSE-2 | **CO-1:** Understanding about DNA, RNA and nuclic acids<br>**CO-2:** In depth knowledge about formation of these important molecules in the body |
| | Practical | | **CO-1:** Gain knowledge about different instruments needed in the research laboratory<br>**CO-2:** Basic fundamentals of DNA and RNA |
| 17 | BIOSTATISTICS AND BIOINFORMATICS | DSE-3 | **CO-1:** Introduction to bioinformatics and statistics in the world of nutrition<br>**CO-2:** Knowledge about different storage data bases of genetic formula |
| | Practical | | **CO-1:** Knowledge of data interpretation<br>**CO-2:** Evaluation of bioinformatics approach for structural identification of protein and other genetic material |
| 18 | FOOD SPOILAGE AND FOOD PRESERVATION | DSE-4 | **CO-1:** Understand the importance of food preservation.<br>**CO-2:** Educate public on the importance of food preservation.<br>**CO-3:** In depth knowledge about food spoilage |
| | Practical | | **CO-1:** Knowledge about food sanitation and hygiene by visiting food industries |

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| | | | **CO-2:** In depth knowledge about food processing techniques |
| 19 | TECHNOLOGY OF FRUITS AND VEGETABLES | SEC-1 | **CO-1:** Understand the importance of fruits and vegetables<br>**CO-2:** Knowledge about different processing techniques and preservation processes of raw and processed fruits and vegetables and their products |
| 20 | IMMUNOLOGY, TOXICOLOGY AND PUBLIC HEALTH | SEC-2 | **CO-1:** Understand the basic of immune system of human body<br>**CO-2:** Learn about different toxic agents<br>**CO-3:** In depth knowledge about toxic reacts in human body and their control |