



Phone : (03213) 272 275

BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)

NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in e.mail ID : bnmv2012@yahoo.in

Ref. No.

Date. 01-08-22

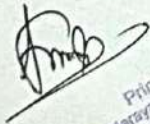
B.A. Honours in Sanskrit (CBCS)

Program out comes (PO)

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 & Dalit 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 (PSO)

- 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 of History of Sanskrit literature.


Principal
Bejoy Narayan Mahavidyalaya
P.O. - Itachuna, Dt. - Hooghly.


Head, Deptt. of Sanskrit
Bejoy Narayan Mahavidyalaya
P.O. - Itachuna, Dist. - Hooghly

- 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. The 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 (CO)

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. 2. This course provides the students the

Santukumar

			information of History of Sanskrit literature, especially the development of Sanskrit literature. 3. The course also seeks to help students tonegotiate texts independently.
	CC-2	Critical Survey of Sanskrit Literature	1) This course aims to get acquaint the students with the journey of Sanskrit literature from Vedic literature to Purāṇa. 2) It also intends to give an outline of different Śāstric traditions, through which the students will be able to know the different genres of Sanskrit 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. 2) Besides the information of history this course also seeks to help students to select the Sanskrit texts for independent literary study.

Sanku Kumar

	CC-4	Self-Management in the Gītā	1) The objective of this course is to study the philosophy of self-management in the Śrīmadbhagavadgītā. 2) This course helps the students for creative writing and analytical study. 3) This also guides the students to find out the relevance of Śrīmadbhagavadgītā in present context. 4) It helps the students to understand the broader perceptive of life. 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. 2) Mudrārāksasa of Viśakhadatta 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 alaṃkāra, rasa, rīti, vakrokti, dhvani, aucitya etc. The entire domain of Sanskrit poetic

Sandhya

			has flourished with the topics such as definition of poetry and divisions, functions of word and meaning, theory of rasa and alaṃkāra (figures of speech) and chandas (metre), etc. All these familiarize the students with the fundamental technical structures of Sanskrit literature. 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 Dharmaśāstra 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 Saṃhitās, 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. 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

Sadhu

			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 Tarkasaṃgraha and to enable students to handle philosophical texts in Sanskrit. 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

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B.A. Honours in Bengali (CBCS)

PROGRAM OUTCOMES

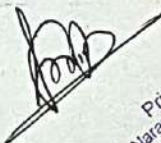
CBCS: বাংলা ভাষা ও সাহিত্য

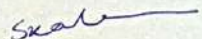
- * সাহিত্য মানুষের কথা বলে। মানবিক বিদ্যার সঙ্গে গভীরভাবে যুক্ত থাকে। অসহায় উপেক্ষিত মানুষের জীবনছবি তুলে ধরে। সহাবস্থানের এমন পাঠ সভ্য হওয়ার আঁতুড়ঘর।
- * স্নাতক স্তরের সাহিত্যে এমন অসহায়, উপেক্ষিত ও নারীদের সঙ্গে মানবিক অনুভূতি সংযোগ স্থাপনে সহায়তা করে।
- * সিবিসিএস পাঠক্রমের ছোট প্রশ্নোত্তর পরবর্তী ক্ষেত্রে প্রতিযোগিতামূলক পরীক্ষার প্রস্তুতি নিতে সাহায্য করে।
- * সিবিসিএস এর বিষয়বৈচিত্র স্নাতকোত্তরে পড়াশোনায় সহায়তা করে।
- ** সমকালীনতার সঙ্গে বিষয়ের আন্তর্জাতিকতা কাজের বাজারে ছাত্রছাত্রীদের উপযোগী করে তোলে।

PROGRAMME SPECIFIC OUTCOMES

বাংলায় সাম্প্রদায়িক স্নাতক ডিগ্রির পাঠ্যক্রম সম্পূর্ণ করার মাধ্যমে:

- এক) বাংলাভাষী ছাত্রছাত্রীদের মধ্যে বাংলা ভাষার উৎপত্তি, বিবর্তন, বৈচিত্র এবং সমৃদ্ধির স্পষ্ট ধারণা গড়ে ওঠে।
- দুই) বাঙালি সাহিত্যিকদের রচনাকর্ম ও বাংলা ভাষায় রচিত বিভিন্ন শিল্পরীতির সাহিত্য --- কবিতা, গল্প, উপন্যাস, প্রবন্ধ প্রভৃতির মধ্য দিয়ে নান্দনিক রসসৃষ্টির ক্ষমতা গড়ে ওঠে।
- তিন) ঘনিষ্ঠ সাহিত্য পাঠের মধ্য দিয়ে ছাত্রছাত্রীরা প্রতিভাবান সাহিত্যিকদের সঙ্গে ঘনিষ্ঠ 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 পাঠ্যক্রম থেকে বাঙালি জাতির উৎপত্তি, সংস্কৃতির ইতিহাস, ভূগোল, মানসিকতা সম্পর্কে সুস্পষ্ট ধারণা করতে পারে। ব্যক্তিত্ব নির্মাণের ভিত্তিও গড়ে তোলে।


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Bejoy Narayan Mahavidyalaya
P.O.- Itachuna, Dt.- Hooghly.


Head of the Department
Bengali
BEJOY NARAYAN MAHAVIDYALAYA
P.O.- Itachuna, Dist.- Hooghly.

COURSE OUTCOMES

SEMESTER-I

CC-1

ক) প্রাচীন যুগের সাহিত্য-ইতিহাসের পাঠাংশ চর্চাপদ ভারতীয় ধর্ম ইতিহাসের শিক্ষা দেয়। বৌদ্ধ ধর্মের অবক্ষয় - সহজিয়া বৌদ্ধদের নিজ ধর্মচর্চার পরিসর নির্মাণের প্রয়াসী হয়ে গৃঢ় 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 আত্মদান ও বাঙালিয়ানার প্রক্ষেপে স্বতন্ত্রতা। ইসলামী বাংলা সাহিত্য ও চৈতন্যজীবনীকাব্যগুলিতে মানুষকথা।

CC-2

ক) ছন্দশাস্ত্রের নির্বিড় পাঠের মধ্য দিয়ে কাব্যকবিতার বহিরঙ্গ সৌন্দর্যের অনুধাবন।

খ) অলঙ্কারের আত্মদানে সংস্কৃত ও বাংলা সাহিত্যের উপাদানগত বিশেষত্ব আত্মদান।

SEMESTER-II

CC-3

ক) বৈষ্ণব ও শাক্ত পদাবলি সাহিত্যের একাধিক কবির রচনায় কলাকৈবল্যের পাশাপাশি সমাজজীবনের প্রতিফলন। একইসঙ্গে পরমাত্মা-জীবাত্মার অন্যান্য 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-অর্থনৈতিক-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 আত্মদানের প্রায়োগিক প্রেক্ষায় বীরাজনার পাঠ। উনিশ শতকের নারী জাগরণের ইতিবাচক প্রতিফলনে কাব্যগ্রন্থটি ছাত্রছাত্রীদের ভবিষ্যৎ দৃষ্টিভঙ্গি তৈরিতেও উৎসাহব্যঞ্জক।

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Head of the Department
Bengali
BEJOY NARAYAN MAHAVIDYALAYA
P.O.- Itachuna, Dist - Hooghly

SEMESTER-IV

CC-8

ক) রবীন্দ্রকবিতা ও আধুনিক কবিতার রসস্বাদনের 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

ছোটগল্পের আঙিনায় রবীন্দ্রনাথের গল্পগুলির আব্বাদন। 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 আগ্রসর হতে পারে।

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DEPARTMENT OF ENGLISH

B.A. Honours in English

PROGRAMME OUTCOME (PO)

PO-1: 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.

PO-2: 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 microtests 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.

PO-3: Besides there are Discipline Specific Courses that are intended to offer advance knowledge on specialized topics in the core course domain.

PO-4: 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.

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Bejoy Narayan Mahavidyalaya
P.O.- Itachuna, Dt.- Hooghly.

Head, Department of English
Bejoy Narayan Mahavidyalaya

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO-1: 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.

PSO-2: This syllabus presents a holistic approach to literature in English covering Indian Classical Literature, European Classical Literature, Indian Writing in English, British Poetry, Drama (16th – 17th Centuries), and Rhetoric & Prosody, American Literature, Popular Literature, British Poetry and Drama (17th – 18th Centuries), British Literature (18th Century), British Romantic Literature, British Literature (19th Century), Women's Writing, British Literature (Early 20th Century), Modern European Drama, and Postcolonial Literatures.

PSO-3: 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

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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, Banbhata 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

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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.

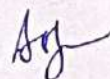
CO-2: The students get introduced to the modernist fervour, its methodologies like stream of consciousness, free verse and much more. With Osborne the students get to look at the postmodernist culmination in accepting the chaos that would fast become a way of life.

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 Chattopadhyay, 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 Wordsworth 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.

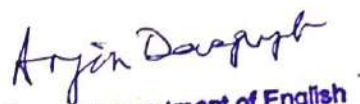
CO-2: The course is intended to develop skills and have the ability to enter careers in the entertainment industry, broadcasting, journalism, art, advertising etc.

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.



Principal
Bejoy Narayan Mahavidyalaya
P.O. - Itachuna, Dist. - Hooghly.


Head, Department of English
Bejoy Narayan Mahavidyalaya

01.08.2022



Phone : (03213) 272 275

BEJOY NARAYAN MAHAVIDYALAYA

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P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in e-mail ID : bnmv2012@yahoo.in

Ref. No. B.A. General Course Santhali Papers (under CBCS curriculum of The University of Burdwan) Date 01-08-2022

PROGRAMME OUTCOME (Po)

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.

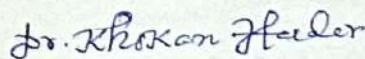
COURSE OUTCOMES (Co)

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.


Principal
Bejoy Narayan Mahavidyalaya
P.O. - Itachuna, Dt. Hooghly.



Dr. Khokan Halder
Officer-in-Charge
Department of Santali
B.N. Mahavidyalaya

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

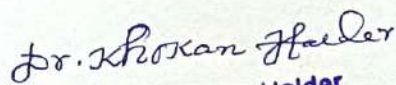
CO-1: The course includes some plays, both one-act and full-length. Presenting dramas in the classroom ensures sincere learner involvement, though this year's online teaching mode is largely deprived of it. With modern closet dramas there is hardly any difficulty. Plays like _Darege Dhon_ by Pandit Raghunath Murmu, _Lo Bir_ by Jadunath Tudu, _Bir Birs_ 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.



Principal
Bejoy Narayan Mahavidyalaya
P.O. - Itachuna, DL - Hooghly.

01.08.2022



Dr. Khokan Halder
Officer-in-Charge
Department of Santali
B.N. Mahavidyalaya



BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)
NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnrmv.ac.in e-mail ID : bnrmv2012@yahoo.in

Ref. No.

Date. 01.08.2022

Department of History

B.A. Honours Degree Programme under Burdwan University (CBCS)

Programme Outcomes (PO)

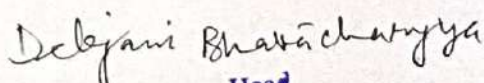
From the Academic Session 2017-18 CBCS was introduced by the Burdwan University, which is our affiliating university at present. Expected Programme Outcomes may be listed as follows:

PO-1: 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.

PO-2: Knowledge of the Development of Historical perspective: While pursuing 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 up to 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.

PO-3: 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.


Principal
Bejoy Narayan Mahavidyalaya
P.O. Itachuna, Dist. Hooghly.


Head
Dept. of History
Bejoy Narayan Mahavidyalaya
P.O. Itachuna, Dist. Hooghly.

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.

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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.

Shubhacharya

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.

Shashan Chaturvedi

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

Ashwini Charym

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.

Dr. Bhakti Choudhary

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.

Bhakti Chaturvedi

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 Aurangzeb

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.

Pravin Chaturvedi

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 18th centuries

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.

Abhul Chatterjee

Semester-4 (CC-9)

UNIT-1

Foundations of Company's Rule

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.

Pratik Choudhary

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: Histogram 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.

JBhakti choudhary

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 bourgeoisie 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

Heaven's classroom

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.

Shweta Chakraborty

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.

Bhattacharya

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.

Bhakti Chatterjee

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 views of the historians, the new concept of Socialism- Karl Marx, 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.

Abhatis Chakya

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.

Ashutosh Chaturvedi

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-Meiji Japan

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.

Debjani Bhattacharyya

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.



Principal
Bejoy Narayan Mahavidyalaya
P.O.- Itachuma, DL- Hooghly.

Debjani Bhattacharyya
Head
Dept. of History
Bejoy Narayan Mahavidyalaya
P.O.- Itachuma, DL- Hooghly
2022



Phone : (03213) 272 275

BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)
NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in e.mail ID : bnmv2012@yahoo.in

Ref. No.

Date. 01-08-2022

PROGRAMME TITLE: B.A. IN POLITICAL SCIENCE (HONOURS) (CBCS)

PROGRAMME OUTCOME (PO)

PO-1: 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.

PO-2: 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.

PO-3 : 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 of the 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 through street plays based on specific socio political issues such as domestic violence, disillusioned youth of the materialistic world etc.

PO-4 : Communication: Establishment of linkages between academics and civil society at large so as to successfully address socio political problems. The fortnightly wall journal is a means for keeping the entire 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.

PO-5: 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 and also by participating in the Youth Parliament competition organised by the Department of Parliamentary Affairs, Government of West Bengal.

Principal
Bejoy Narayan Mahavidyalaya
P.O. Itachuna, Dt.- Hooghly.

Head
Department of Political Science
Bejoy Narayan Mahavidyalaya
Itachuna, Hooghly-712147

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO-1: Understanding the nature and developments in national and international politics

PSO-2: Analysing the Indian constitutional provisions, major legislations and reforms.

PSO-3: Critical evaluation of social, economic and political variables for a proper understanding of the plurality of Indian society

PSO-4: Building overall consciousness regarding national political history, international relations and present Indian and Western political thinkers.

PSO-5: Encouraging a comprehensive, comparative understanding of specific world constitutions such as UK, USA, China, Russia, Switzerland and France.

PSO-6: Developing knowledge of administrative studies with special reference to Indian administrative structures and practices.

PSO-7: Examining India's foreign relations with her neighbours and great powers.

PSO-8: Use of case study method for analysing the working of important international and regional organisations like UN, EU, ASEAN etc.

Regular developmental meetings are held which is presided by principal and all agenda of improvement of academics are discussed to achieve the PSO's.

- Concerned Faculty keeps a check on the students not only in academic matters but also in their personal and emotional affairs.

- The faculty keeps a vigilant eye on course structure and suggests the change to the university as and when required.

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01.08.2022

The POs, PSOs and COs objectives are determined and evaluated through a Regular Examinations Process, Class Tests, Seminars, Assignments, Viva-Voice and Consultation that involve three core constituents: Students, Alumni, and Faculty.

Student input is obtained through student feedback, student evaluation forms, individual faculty-student interaction, interviews and interaction with college student central association (CSCA).

Student input is taken on regular basis at the end of each semester.

Attainment of each of the PSO's and CO's can be judged from the following:

- Increase in pass percentage of student.
- Percentage of student qualifying BA Political Science and other competitive exam is increasing.
- Rise in the number of student going for PG programme in required institution in the state.
- Increase in number of student for different placement after the completion of the degree programme.
- Percentage of failures in different courses is reducing after degree.

Rm

DEPARTMENT OF POLITICAL SCIENCE: COURSE
OUTCOME/PROGRAMME OUTCOME/PROGRAMME SPECIFIC OUTCOME

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-Analysing 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: Lok Sabha and Rajya Sabha – 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 movements 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.

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CO-3: Vocabulary of research: Concept, Variable, Proposition, Hypothesis, Theory.

CO-4: Components of Research Design: Problemation, Hypothesis formulation, Data collection, and testing of hypothesis.

CO-5: Major Methods and techniques of Data Collection: Survey method, Interview, and Case Study.

13. INDIAN FOREIGN POLICY

CO-1: Key Determinants of India's Foreign Policy-Geography, Parliament, Cabinet, PMO.

CO-2: India's Foreign Policy towards her neighbours; recent engagement with Pakistan, Bangladesh and Nepal, Bhutan.

CO-3: India and the major powers-USA, China, Russia.

CO-4: Recent trends in India's Foreign Policy.

14. CONTEMPORARY ISSUES IN INDIA

CO-1: Caste System in India – Its changing nature and dynamics.

CO-2: Women – Discrimination and violence against women.

CO-3: Secularism and Communalism

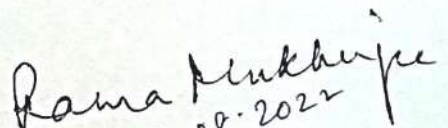
CO-4: Political Economy of Poverty and Inequality

CO-5: Rights of Persons with Disabilities (PWDs) in India.

CO-6: Social Backwardness and Protective Discrimination

CO-7: Disaster Risk Reduction and Development Planning.


Principal
Bejoy Narayan Mahavidyalaya
P.O.- Itachuna, Dt.- Hooghly.


01.08.2022

Head
Department of Political Science
Bejoy Narayan Mahavidyalaya
Itachuna, Hooghly-712141



BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)
NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in ★ e.mail ID : bnmv2012@yahoo.in

Ref. No.

Date. 01-08-2022

B.A. Honours in Philosophy under The University of Burdwan (CBCS)

PROGRAMME OUTCOMES (PO):

PO-1: The relationship between philosophy and the wider world: The goal of philosophy is to conduct an exhaustive investigation into the connections between all of the things and people in the world, as well as to investigate and comprehend the meaning of the content as a whole.

PO-2: The significance of Value and Responsibility:

We should better understand each person's value to the world. It is commonly held that every member has something unique to offer the world, and they are all essential in some way. Given the significance of each individual member, people everywhere must be respected.

PO-3: The philosopher operates as a guide: In many challenging circumstances throughout our lives, we have been placed in a moral bind between doing what is right and wrong. Even now, we are unsure of what action to take. At that moment, we require the assistance of a friend, a philosopher, and a guide on the level of Sri Krishna to triumph over our moral struggles and arrive at an accurate understanding of who we are.

PO-4. The relationship between morality, logic, and society: To improve the quality of life for people, we must maintain peace. Everyone in society carries some responsibility for the children who will follow us, and we must recognise our interdependence. Every decision must be made with the welfare of others in mind, and we should prioritise the progress of society as a whole. It is not impossible if we combine ethical ideals with strong reasoning.

PO-5. We have to build a civilised society. Every community member must exercise self-discipline and make good on his or her commitments to the group to meet the essential requirement for the development of a civilised society, which is that every individual must regulate his or her own behaviour. Forming a civilised community is contingent on each individual fulfilling their responsibilities without regard to the potential for gain or loss.

Principal
Bejoy Narayan Mahavidyalaya
P.O. - Itachuna, DL - Hooghly.

Head
Department of Philosophy
Bejoy Narayan Mahavidyalaya

**B.A. Honours in Philosophy PROGRAMME SPECIFIC
OUTCOMES (PSO):**

- PSO-1:** Introducing the general features of Indian philosophy and different schools of Indian Philosophy.
- PSO-2:** Critical analysis of different thoughts of western philosopher.
- PSO-3:** Understanding the value of life, nature of relation between human and non-human world etc.
- PSO-4:** Comparative study between characteristics of Philosophy and Darshana.
- PSO-5:** Differentiating between Deductive and Inductive reasoning.
- PSO-6:** Understanding the nature of Philosophy of Religion and the fundamental features of major Religions.
- PSO-7:** Interpreting different philosophical thoughts in the Twentieth Century: Indian & Western.
- PSO-8:** Elaborating the Human Rights and different Political Ideas.

Pranab Kumar
01.08.2022

B.A Honours in Philosophy (CBCS)

COURSE OUTCOMES (CO):

SEMESTER-I

CC-1 Outlines of Indian Philosophy-I:

- CO1. Is Indian Philosophy Can be treated as Pessimistic Philosophy?
- CO2. What is Ksana?
- CO3. On what ground does the Carvaka reject anumana as a pramana?
- CO3. Distinguish between svarthanumana and parathanumana.
- CO4. What is dravya, according to the Jainas?
- CO5. Discuss Samavaya as an independent padartha of the Vaisesikas.
- CO6. Is it at all possible to get liberation? If yes, how is it possible?

CC-2 Outlines of Western Philosophy-I:

- CO1. Do you think water is the fundamental element of the universe?
- CO2. How does Descartes explain the relation between mind and body?
- CO3. What is the literal meaning of 'Cogito Ergo Sum'? Following Descartes bring out its full meaning and significance.
- CO4. What is substance, according to Spinoza? How does he equate substance with God with nature? Discuss.
- CO5. Distinguish following Aristotle between Form and Matter.
- CO6. Discuss following Leibniz between the truths of reason and truths of fact.
- CO7. Critically explain the Cartesian dualism of mind and body.
- CO8. Is experience only source of all ideas? Discuss.

SEMESTER-II

CC-3. Outlines of Indian Philosophy-II

- CO1. Explain swarupalaksana and tatasthalaksana of Brahman after Sankara.
- CO2. What are the arguments in favour of the existence of prakriti?
- CO3. What is cittavrtti? Explain five types of cityavrtti after Patanjali.
- CO4. Do you believe the existence of Prakrti, according to Samkhya?
- CO5. Give a brief account of anupalabdhipramana after Bhattamimansa.
- CO6. What is astangayoga? Explain.
- CO7. Is there any relation between Jiva and Isvara?
- CO8. Is there any need for yama and niyama in today's society?

CC-4 Outlines of Western Philosophy-II:

- CO1. Why is Locke called a representative realist?
- CO2. What is personal identity?
- CO3. How does Kant show that Space and Time are intuitions, not concepts?
- CO4. Why does Hume hold that there is no necessary connection between cause and effect?
- CO5. Are synthetic a priori judgments possible?

Pranab Kirtania

01-08-2022

SEMESTER-III

CC-5 Indian Ethics:

- CO1. What is sakaama karma? How is, according to the Gita, niskama karma possible?
- CO2. What is Mahavrata? Explain five Mahavratas according to Jaina ethics.
- CO3. Explain the Vedic notion of Rta.
- CO4. Explain the concept of Sthitaprajna after the Gita.
- CO5. Explain the central tenets of Carvakasukhavada.

CC-6 Western Ethics:

- CO1. Is environmental ethics play any leading role for protecting environment?
- CO2. What is fundamental difference between ethics and law?
- CO3. Is traditional norms are sufficient to resolve the moral issues in our daily life?
- CO4. Do you believe that if responsible person work with honesty for the society then society not to be harmed?
- CO5. Do you support capital punishment?

CC-7 Indian Logic:

- CO1. What is sannikarsa?
- CO2. Despite svarthanuman, why pararthanumana needed?
- CO3. Give an account of Para-Samanya and A-Para-Samanya, after Annambhatta.
- CO4. What is asiddhyahetvabhasa?
- CO5. What is vyapti?

SEC-1 Philosophy in Practice:

- CO1. What according to Kant, are the roles of sensibility and understanding in the formation of knowledge?
- CO2. Mention the subjects of epistemic enquiry in Indian Philosophy.
- CO3. How do the philosophers of the West make a distinction between knowledge and belief?
- CO4. Bring out the dualistic realism of Samkhya philosophy.
- CO5. Give a brief description of the problem of substance discussed in Western Metaphysics.

SEMESTER-IV

CC-8 Western Logic:

- CO1. What is the theoretical basis for using Venn diagram method to distinguish it from invalid argument?
- CO2. What is the contraposition? Give an example.
- CO3. What is the propositional function, explain with the help of example.
- CO4. Explain why on the Boolean interpretation 'I' and 'O' proposition are not sub-contraries.
- CO5. In what figures, if any, can a valid standard form of categorical syllogism have its middle term distributed in both premises?

Pranab Kirtania

CO6. State how the mood and the figure of a standard form categorical syllogism are determined.

CC-9 Psychology:

- CO1. What is forgetfulness? Explain the causes of forgetting.
- CO2. Explain the structure and functions of Central Nervous System.
- CO3. What is IQ? Explain Binet-Simon Test of Intelligence.
- CO4. Critically explain Trial and Error Theory of Learning.
- CO5. What is Psychology? Explain the nature of Psychology as a science.

CC-10 Philosophy of Religion:

- CO1. What is monotheism?
- CO2. Analyse Emile Durkheim's sociological theory of religion.
- CO3. Explain critically the Freudian theory of religion.
- CO4. Distinguish between natural evil and moral evil. Does the existence of evil in the world contradict the conception of God as all good?
- CO5. State and examine the cosmological argument for the existence of God.

SEC-2 Philosophy of Human Rights:

- CO1. How important is the right of protection of people in the society?
- CO2. Is freedom of expression very important for human being?
- CO3. What is meant by "natural rights tradition"?
- CO4. Do you think that equality and liberty are necessary conditions of human rights?
- CO5. What is meant by the right to life?

SEMESTER-V

CC-11 Socio-Political Philosophy:

- CO1. What is the best kind of society?
- CO2. What is the best kind of society? State your own view.
- CO3. Discuss the role of mores' as forces of social control. What is the best sort of Government? State your view.
- CO4. Explain the main features of Liberal Democracy
- CO5. Distinguish between an association and an institution.

CC-12 Western Logic II:

- CO1. What is the difference between induction and deduction?
- CO2. Explain the a priori theory of probability.
- CO3. Explain the pragmatic theory of truth briefly.
- CO4. What is induction by simple Enumeration?
- CO5. Explain the notion of ostensive definition.
- CO6. What is a scientific explanation?

DSE-1 – Special Text: Kathopaniṣad

- CO1. Explain the first boon ('vara') prayed by Naciketa to Yama.
- CO2. State the difference between Sreya and preya.
- CO3. Why does Yama consider Naciketa as adhikari of 'ātmajnana'?

Pranab Kesturia

- CO4. What happens to a family when a guest does not get properly satisfied?
CO5. What is the significance of the word 'om'?

DSE-2 Special Text: B. Russell: The Problems of Philosophy

- CO1. Is there any reason for believing in the uniformity of nature, according to Russell?
CO2. Explain, following Russell, the distinction between the appearance of a table and the real table (if there is one).
CO3. Explain Russell's view that proper names are really descriptions.
CO4. Explain Russell's neo-realism.
CO5. How does Russell analyse the inductive principle?

SEMESTER-VI

CC-13 Philosophy in the Twentieth Century: Indian:

- CO1. How does Rabindranath explain our infinite existence?
CO2. Why does Rabindranath hold that his religion is 'the Religion of Man'?
CO3. How does Sri Aurobindo emphasise the Bliss aspect of Saccidananda?
CO4. Explain the doctrine of Maya according to Vivekananda.
CO5. What is the nature of Reality, according to Sri Aurobindo?

CC-14 Philosophy in the Twentieth Century: Western:

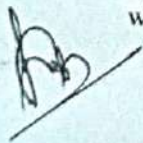
- CO1. Distinguish between practical verifiability and verifiability in principle, following Ayer.
CO2. What are the arguments in favour of a defence of common sense by G.E. Moore?
CO3. How does Heidegger distinguish between 'authenticity' and 'inauthenticity' of human existence?
CO4. What does Sartre mean when he says that "being human" is "to be free"?
CO5. Give a brief account of Wittgenstein's theory of meaning.

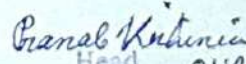
DSE-3 Rabindranath Tagore: Sadhana:

- CO1. How do the men realise his ultimate being or the ultimate reality?
CO2. How do we overcome the conflict between will and wishes?
CO3. What is meant by self-deception on a large scale?
CO4. Where does the value of civilisation lie?
CO5. How freedom and non-freedom both reside in love?
CO6. What is the aim of our self?

DSE-4 Hume: An Enquiry Concerning Human Understanding:

- CO1. Distinguish after Hume the relations of ideas and matters of fact. Discuss after Hume, how we come to know the relations of ideas?
CO2. Discuss how Hume tries to show that custom is the great guide of human life.
CO3. Is causal relation a necessary connection, if not, explain what, according to Hume, is the real nature of the relation.
CO4. Critically examine Hume's refutation of the view about the experience of mental power.
CO5. Is our idea of the power copied from the influence of volition over the organs of the body or from any sentiment or consciousness of power within ourselves?


Principal
Bejoy Narayan Mahavidyalaya
P.O. - Kuchan, Dt. - Hoshiarpur


Head 01.08.22
Department of Philosophy
Bejoy Narayan Mahavidyalaya



BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)
NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in ✱ e.mail ID : bnmv2012@yahoo.in

Ref. No.

Date. 01.08.2022

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

Programme Outcomes (PO)

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

- PO-1:** To understand the basic laws and explore the fundamental concepts of physics
- PO-2:** To understand the concepts and significance of the various physical phenomena.
- PO-3:** To carry out experiments to understand the laws and concepts of Physics.
- PO-4:** To apply the theories learnt and the skills acquired to solve real time problems.
- PO-5:** To acquire a wide range of problem-solving skills, both analytical and technical and to apply them.
- PO-6:** To enhance the student's academic abilities, personal qualities and transferable skills this will give them an opportunity to develop as responsible citizens.
- PO-7:** To motivate the students to pursue PG courses in reputed institutions.
- PO-8:** This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques specially the importance of accuracy of measurements.
- PO-9:** Providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, heat, optics, electricity and electronics.
- PO-10:** 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.
- PO-11:** 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.

Principal
Bejoy Narayan Mahavidyalaya
P.O. Itachuna, Dt. Hooghly.

Head
Department of Physics
Bejoy Narayan Mahavidyalaya
Itachuna, Hooghly



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(GOVT. SPONSORED)
NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

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Ref. No.

Date.

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

Course Outcomes (CO)

The outcome of the following courses:

Core Courses:

CC-I: (Mathematical Physics-I):

CO-1: The course gives the opportunity to learn basic mathematical methods to solve the various problems in physics.

CO-2: The topics include the calculus of functions, Vector calculus, curvilinear coordinate systems, idea of probability function and Dirac delta function.

CO-3: This course is very useful to understand the essence of mathematical tools to demonstrate the various physical phenomena in every branch of science and engineering.

CC-II: (Mechanics):

CO-1: The students would learn about the behaviour of physical bodies as it provides the basic concepts related to the motion of all the objects around us in our daily life.

CO-2: The course builds a foundation of various applied field in science and technology; especially in the field of mechanical engineering.

CO-3: The course comprises of the study vectors, laws of motion, momentum, energy, rotational motion, gravitation, fluids, elasticity and special relativity.

CC-III: (Electricity and Magnetism):

CO-1: 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.

CO-2: The course contains vector analysis, electrostatics, magnetism, electromagnetic induction and Maxwell's equations.

CO-3: The course is very useful for the students in almost every branch of science and engineering.

CC-IV: (Waves and Optics):

CO-1: The course comprises of the study of superposition of harmonic oscillations, waves motion (general), oscillators, sound, wave optics, interference, diffraction, polarization.

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21.08.2022



Phone : (03213) 272 275

BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)
NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in ★ e.mail ID : bnmv2012@yahoo.in

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CO-2: 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.

CO-3: The practical knowledge of wave motion doing experiments: Tuning fork, electric vibrations.

CO-4: They would also learn optical phenomena such as interference, diffraction and dispersion and do experiments related to optical devices: Prism, grating, spectrometers.

CC-V: (Mathematical Physics-II):

CO-1: Students would learn some advanced mathematical methods to solve the various problems in physics.

CO-2: The topics include Fourier series, Frobenius Method and Special Functions, some special integrals, Theory of errors and partial differential equations.

CO-3: The practical (Laboratory) class associated with this course gives the opportunity to learn introductory computational language Scilab and to solve various physics problems using Scilab simulation.

CC-VI: (Thermal Physics):

CO-1: The course makes the students able to understand the basic physics of heat and temperature and their relation with energy, work, radiation and matter.

CO-2: The students also learn how laws of thermodynamics are used in a heat engine to transform heat into work.

CO-3: The course contains the study of laws of thermodynamics, thermodynamic description of systems, thermodynamic potentials, kinetic theory of gases.

CO-4: In laboratory class, students would gain practical knowledge about heat and radiation such as Thermal conductivity experiments, thermodynamics, thermo-emf, etc. and temperature-dependent resistance etc.

CO-5: The course is very useful for the students specially in the branch of low-temperature physics and thermal physics.

CC-VII: (DIGITAL SYSTEMS AND APPLICATIONS):

CO-1: This course helps the students to gain basic ideas of the construction and working of electronic devices and circuits and to understand the fundamentals of communication systems.

CO-2: The course includes the study of number systems, Boolean algebra, logic gates, combinational circuits, sequential circuits, memory devices and IC technology. The course is of much practical purpose for the students to learn basics of digital electronics.



Phone : (03213) 272 275

BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)

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CO-3: The digital electronics has wide applications in computing, process control, signal processing, communication systems, digital instruments etc. The associated practical or Laboratory class also gives in-hand experience for handling different digital elements such as logics gates, ICs and thereby making combinational circuits.

CC-VIII: (Mathematical physics-III):

CO-1: Students would learn mathematical methods to solve the various problems in physics.

CO-2: The topics include the calculus of functions, Fourier transform, Laplace transform, special functions and special integrals, partial differential equations, complex analysis and variables.

CO-3: 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):

CO-1: Students would know about the basic principles in the development of modern physics.

CO-2: 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.

CO-3: In this course students would be able to understand Basic experiments of modern physics such as: Determination of Planck'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):

CO-1: The students would gain the knowledge of Basic Electronics circuits, network theorems and measuring instruments:

CO-2: 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.

CO-3: 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.



Phone : (03213) 272 275

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website : www.bnmv.ac.in e.mail ID : bnmv2012@yahoo.in

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CC-XI: (Quantum Mechanics & Applications):

CO-1: Quantum mechanics provides a platform for the physicists to describe the behaviour of matter and energy at atomic and subatomic level. The course plays a fundamental role in explaining how things happen beyond our normal observations.

CO-2: The course includes the study of Schrodinger equations, particle in one-dimension potential, quantum theory of H like atoms, atoms/molecules in electric and magnetic fields and many electrons atoms.

CO-3: The understanding of the course will be very much necessary several branch in physics such as Advanced physics, Condensed matter physics (Theory & Experimental), Nanoscience& Technology and Material physics etc.

CO-4: In the Laboratory class, students would learn the use of Scilab simulations in solving some Quantum Mechanical problems.

CC-XII: (Solid State Physics):

CO-1: Students will be able to develop an understanding of the crystal lattice, different types of crystal structures, symmetries. The student would gain insight about the interior of the substances using X-ray diffraction in crystals.

CO-2: This course also includes elastic waves, phonons, and lattice vibrational properties. Beside this, in depth understanding of condensed matter physics, including Dielectric and Ferroelectric, Piezoelectric properties, magnetic properties of solids and superconductivity is emphasized.

CO-3: The laboratory class also gives in hand experience of measurement of different properties such as dielectric, magnetic and electrical properties of solids.

CO-4: The students have the opportunity to use the basic principles of condensed matter physics in frontier areas of research and development in the field of material science, nanoscience and nanotechnology.

CO-5: This course also is of immense importance for the students seeking R & D opportunities in the field of theoretical condensed matter physics, material science, device fabrication, nanoscience and nanotechnology etc.

CC-XIII: (Electromagnetic Theory):

CO-1: It gives an opportunity for the students to learn about the fundamental of electromagnetic wave and its behavior during propagation in various mediums.

CO-2: The course contains vector analysis, electrostatics, magnetism, electromagnetic induction and Maxwell's equations.



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(GOVT. SPONSORED)

NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in e-mail ID : bnmv2012@yahoo.in

Ref. No. **CO-3** The course is very useful for the students in almost every branch of science and...
engineering.

CO-4: 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):

CO-1: 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.

CO-2: 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.

CO-3: The course is helpful for the students to understand the dynamics of the bulk material in macroscopic as well as microscopic levels. It is also useful to understand the relation between microscopic and macroscopic systems.

CO-4: Students would gain practical knowledge about heat and radiation, thermodynamics, thermo emf, etc. and perform various computational experiments.

DSE (Discipline Specific Elective) Course:

DSE-1: (Advanced Mathematical Physics):

CO-1: Students would be able to understand the mathematical methods essential for solving the advanced problems in physics.

CO-2: It would be helpful in the development of the ability to apply the mathematical concepts and techniques to solve the problems in theoretical and experimental physics. The knowledge of mathematical physics would be beneficial in further research and development as it serves as a tool in almost every branch of science and engineering.

CO-3: The Course includes advanced mathematical topics such as Linear vector space (LVS), Matrices, Cartesian Tensor and General Tensors. Scilab/C++ based simulations experiments on some important mathematical physics problems are very useful for students.

DSE-2 (Classical Dynamics):

CO-1: In this course students would learn an alternative approach of the Newtonian mechanics using various mathematical formulations to describe the motions of macroscopic objects using generalized coordinates, momentum, forces and energy.



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CO-2: Student will realize the importance of scalar formulation such as Lagrangian, Hamiltonian, and Variational Principle etc. to find the equation of motion of different physical motion.

CO-3: The course also gives opportunities to learn the Special Theory of Relativity as advanced relativistic mechanics beyond Newtonian mechanics.

CO-4: The classical mechanics would be helpful in understanding of advanced branches of modern physics.

DSE-3:(Nuclear and Particle Physics):

CO-1: In this course students would know about the general properties of nuclei, nuclear forces and detectors, radioactive decay and nuclear reactions.

CO-2: The course expands the knowledge of students especially, the various applications of nuclear physics.

CO-3: 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):

CO-1: In this course students would know about the dynamical systems and their distinguished characteristics. This course builds up the idea of phase space.

CO-2: 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.

Skill Enhancement Course (SEC):

SEC-1(Renewable Energy & Energy Harvesting):

CO-1: This course is focused on the ways of different alternative source of energy rather than conventional energy.

CO-2: Hence, the students will learn about fossil fuels, Nuclear energy, tidal energy, solar energy, Wind energy harvesting, Ocean energy, Geothermal energy and Hydro-energy as alternative source of energy.

CO-3: As all such source of energy are natural, hence, students will also be environment friendly and environment-conscious at the same time. The students will also get some advantages in higher education and R & D sectors regarding Geophysics and environment Physics.



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NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

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SEC-2:(Electrical Circuits and Network Skills):

CO-1: It enables the students to learn the basic about electric components and the electric circuit.

CO-2: Students would gain practical knowledge about AC and DC electricity and measurements such as: Resistance, Voltage, current etc.

CO-3: The topic also gives an opportunity for the students to learn about the working principle of Electric motor, electric transformer and Generator.

Depart
Bejoy Narayan
Itachuna, Hooghly
21-08-22



BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)

NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in ✱ e.mail ID : bnmv2012@yahoo.in

Ref. No.

Date. 01-08-2022

B. Sc. (CBCS) Six Semester Physics General Course

Course Outcomes (CO)

The outcome of the following courses:

Discipline Specific Core (DSC) courses, Physics:

DSC-1A: (Mechanics):

CO-1: The students would learn about the behaviour of physical bodies as it provides the basic concepts related to the motion of all the objects around us in our daily life.

CO-2: The course builds a foundation of various applied field in science and technology; especially in the field of mechanical engineering.

CO-3: The course comprises of the study vectors, laws of motion, momentum, energy, rotational motion, gravitation, fluids, elasticity and special relativity.

DSC-1B: (Electricity and Magnetism):

CO-1: 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.

CO-2: The course contains vector analysis, electrostatics, magnetism, electromagnetic induction and Maxwell's equations.

CO-3: The course is very useful for the students in almost every branch of science and engineering.

DSC-1C: (Thermal Physics & Statistical Mechanics):

CO-1: The course makes the students able to understand the basic physics of heat and temperature and their relation with energy, work, radiation and matter.

CO-2: The students also learn how laws of thermodynamics are used in a heat engine to transform heat into work.

CO-3: The course contains the study of laws of thermodynamics, thermodynamic description of systems, thermodynamic potentials, kinetic theory of gases and Statistical Mechanics.

Skyaminder Ghosh
Head
Department of Physics
Bejoy Narayan Mahavidyalaya
Itachuna, Hooghly



BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)

NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

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CO-4: In laboratory class, students would gain practical knowledge about heat and radiation such as Thermal conductivity experiments, thermodynamics, thermo-emf, etc. and temperature-dependent resistance etc. The course is very useful for the students specially in the branch of low-temperature physics and thermal physics.

DSC-1D: (Waves and Optics):

CO-1: The course comprises of the study of superposition of harmonic oscillations, waves motion (general), oscillators, sound, wave optics, interference, diffraction, polarization.

CO-2: 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.

CO-3: 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.

Discipline Specific Elective (DSE) papers:

DSE-1A: (Element of Modern Physics):

CO-1: Students would know about the basic principles in the development of modern physics.

CO-2: 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.

CO-3: 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.

CO-4: In addition, 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 .

DSE-1B: (Nuclear and Particle Physics):

CO-1: In this course students would know about the general properties of nuclei, nuclear forces and detectors, radioactive decay and nuclear reactions.



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- Ref. No. CO-2: The course expands the knowledge of students especially, the ~~Data~~ applications.. of nuclear physics.
- CO-3: 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.

Skill Enhancement Course (SEC):

SEC-1(Renewable Energy & Energy Harvesting):

CO-1: This course is focused on the ways of different alternative source of energy rather than conventional energy.

CO-2: Hence, the students will learn about fossil fuels, Nuclear energy, Tidal energy, solar energy, Wind energy harvesting, Ocean energy, Geothermal energy and Hydro-energy as alternative source of energy. As all such source of energy are natural, hence, students will also be environment friendly and environment-conscious at the same time.

CO-3: The students will also get some advantages in higher education and R & D sectors regarding Geophysics and environment Physics.

SEC-3: (Computational Physics Skills):

CO-1: The course provides an opportunity to the students to learn about the fundamentals of computer applications in solving the problems in different branches of Physics and Mathematics.

CO-2: They would learn basics of C-programming and FORTRAN-90/95 programming languages and their applications which can be useful in their future carrier in the field of research and technology.

SEC-4:(Electrical Circuits and Network Skills):

CO-1: It enables the students to learn the basics about electric components and the electric circuits.

CO-2: 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.

CO-3: Students can apply their knowledge/skills in the field of electrical projects and network designing in R & D sectors and many industrial causes.



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(GOVT. SPONSORED)
NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

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Date. 01-08-2022

B. Sc. (CBCS) Six Semester Physics General Course

Programme Outcomes (PO)

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

- PO-1: To understand the basic laws and explore the fundamental concepts of physics
- PO-2: To understand the concepts and significance of the various physical phenomena.
- PO-3: To carry out experiments to understand the laws and concepts of Physics.
- PO-4: To apply the theories learnt and the skills acquired to solve real time problems.
- PO-5: To acquire a wide range of problem-solving skills, both analytical and technical and to apply them.
- PO-6: To enhance the student's academic abilities, personal qualities and transferable skills this will give them an opportunity to develop as responsible citizens.
- PO-7: To motivate the students to pursue PG courses in reputed institutions.
- PO-8: This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques specially the importance of accuracy of measurements.
- PO-9: Providing a hands-on learning experience such as in measuring the basic concepts in properties of matter, heat, optics, electricity and electronics.
- PO-10: 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.
- PO-11: 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, VEC, IITs, NITs, IIPR etc.


Principal
Bejoy Narayan Mahavidyalaya
P.O. Itachuna, Dt. Hooghly


Head of Department
Department of Physics
Bejoy Narayan Mahavidyalaya
Itachuna, Hooghly



Phone : (03213) 272 275

BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)

NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

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Ref. No.

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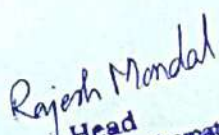
PROGRAMME TITLE: B.SC. IN MATHEMATICS (HONOURS) (CBCS)

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.


Principal
Bejoy Narayan Mahavidyalaya
P.O.- Itachuna, Dt.- Hooghly.


Rajesh Mondal
Head
Department of Mathematics
Bejoy Narayan Mahavidyalaya
Itachuna, Hooghly

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: " <i>ja vidya, sa bimuktaya</i> ".

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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.

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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, 2nd 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 $\mathbb{R}^n$ 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

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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 divergence

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 ϵ - δ definition on sequence and its application to real valued functions.

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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's theorem, 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: $\sin x$, $\cos x$, $\ln(1+x)$, $1/(ax+b)$, $(1+x)^n$ 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.

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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.

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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, Parseval'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

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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

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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 its characterizations and its behavior under continuous mapping.

CO-5: Learn Compactness in a metric space along with its 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.

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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



Principal
Bejoy Narayan Mahavidyalaya
P.O. - Itachuma, DL - Hooghly.



Rajesh Mandal
Head 01-08-22
Department of Mathematics
Bejoy Narayan Mahavidyalaya
Itachuma, Hooghly



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NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in ★ e.mail ID : bnmv2012@yahoo.in

Ref. No.

Date. 01-08-2022

DEPARTMENT OF STATISTICS

Programme Outcomes (PO)

(CBCS) B.Sc General (Statistics)

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

- **PO-1:** To understand the basic theories and explore the fundamental concepts of statistics and its scope.
- **PO-2:** To understand the concepts and significance of the various statistical data and encourage them to develop the basic ideas in data analysis using statistical software.
- **PO-3:** To apply the theories learnt and the skills acquired to solve real life problems.
- **PO-4:** To acquire a wide range of problem-solving skills based on real life datasets in various fields.
- **PO-5:** To enhance the student's academic abilities, personal qualities and transferable skills this will give them an opportunity to develop as responsible citizens.
- **PO-6:** To motivate the students to pursue PG courses and further higher education in reputed institutions.
- **PO-7:** 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.
- **PO-8:** Students may get job opportunities in higher education, research organizations, industries as – statistical investigator, data analyst, statistical programmer, data scientist and many others.

Gajendra Bhattacharya

Dept. of Statistics
Bejoy Narayan Mahavidyalaya
P.O.- Itachuna, Dist.- Hooghly

Principal
Bejoy Narayan
P.O.- Itachuna, Dist.- Hooghly



BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)
NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in e.mail ID : bnmv2012@yahoo.in

Ref. No.

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Course Outcomes (CO)

The outcome of the different courses in this programme are as follows:

Statistical Methods (TH + PRAC) CC-1/GE-1

CO-1: This course contains (definition and scope of Statistics, Concepts of statistical population and sample, Data sets, measures of central tendency, measures of dispersion, bivariate data, theory of attributes and related topics) both theory and practical problems, so students can build an introductory concept about statistics.

CO-2: This particular course concerns about the collection, organization, analysis, interpretation, and presentation (tabular and graphic) of data. From the portion - measures of dispersion, students can develop the basic ideas about range, quartile deviation, mean deviation, standard deviation, coefficient of variation, moments, skewness and kurtosis.

CO-3: This course also contains some important topics, which are very much essential for the students for their future development and motivating them to perform some research work based on real life datasets in near future such as - scatter diagram, simple, partial and multiple correlation, Spearman rank correlation, simple linear regression, principle of least squares and fitting of polynomials and exponential curves, theory of attributes and related topics. It is known that in regression analysis, the problem of interest is the nature of the relationship itself between the dependent variable (response) and the (explanatory) independent variable.

Introductory Probability (TH + PRAC) CC-2/GE-2

CO-1: This is a theory and practical based course, students can have the opportunity to learn some important subtopics, and as an introductory part of probability theory students can develop some basic terminology, such as, random experiments, sample space, events and algebra of events.

CO-2: Students can learn Classical, statistical, and axiomatic definitions of probability, conditional probability and many related concepts along with Bayes' theorem, Convergence in probability and its related areas including Central Limit Theorem.

CO-3: Several standard probability distributions have been introduced in this particular course.

CO-4: Learning Probability Examples in Real Life - Forecasting the weather, Sports outcomes, Card games and other games of chance, Insurance, Traffic signals, medical

Gyarek Bhattacharyya

Dept. of Statistics
Bejoy Narayan Mahavidyalaya
P.O.- Itachuna, Dist.- Hooghly

diagnosis, Election results, Lottery probability, Shopping recommendations, Stock market predictions, etc. So, this course is very much essential & helpful for the students.

Basics of Statistical Inference (TH + PRAC) CC-3/GE-3

CO-1: This is a theory and practical based course, containing the subtopics, which are - population and sample, parameter and statistic, population distribution and sampling distribution, statistical inference, Some useful distributions for statistical inference, categorical data and related tests, non-parametric tests, ANOVA. Basically, Statistical inference makes propositions about a population, using data drawn from the population with some form of sampling.

CO-2: From this course students can understand that the key difference between parametric and nonparametric test is that the parametric test relies on statistical distributions in data whereas nonparametric do not depend on any distribution. Students can also learn Analysis of variance (ANOVA), which is a collection of statistical models and their associated estimation procedures (such as the "variation" among and between groups) used to analyse the differences among means.

Applied Statistics (TH + PRAC) CC-4/GE-4

CO-1: This is a theory and practical based course, containing the subtopics, which are - economic time series, index numbers, measures of inequality and development, statistical quality control (SQC), demographic methods, life (mortality) tables, measurement of population growth. Time series are used in statistics, signal processing, pattern recognition, econometrics, mathematical finance, weather forecasting, earthquake prediction, electroencephalography, control engineering, astronomy, communications engineering, and largely in any domain of applied science and engineering

CO-2: Students can learn index number, which is an economic data figure reflecting price or quantity compared with a standard or base value. The base usually equals 100 and the index number is usually expressed as 100 times the ratio to the base value. SQC is the application of statistical methods to monitor and control the quality of a production process. This helps to ensure that the process operates efficiently, producing more specification-conforming products with less waste scrap.

CO-3: In this course students can also develop their ideas about vital statistics and related topics. Vital statistics is accumulated data gathered on live births, deaths, migration, foetal deaths, marriages and divorces. Efforts to improve the quality of vital statistics will therefore be closely related to the development of civil registration systems in countries. So, this course is very fruitful for the students.

Probability and Probability Distributions –II (TH+PRAC) DSE-1

CO-1: This is a theory and practical based course, containing the subtopics, which are - Continuous random variables and related topics, univariate transformations with applications,

Gejwal Bhattacharya

Dept. of Statistics
Bejoy Narayan Mahavidyalaya
P.O.- Itachura, Dist.- Hooghly

two dimensional random variables, Mathematical Expectation, Probability generating function, Moments, Moment generating function, Correlation coefficient, Conditional expectation and variance, Probability Inequalities, Standard continuous probability distributions, Bivariate Normal Distribution and related topics.

CO-2: This course is based on little advanced level probability theory and probability distributions. The concept of the probability distribution and the random variables which they describe underlies the mathematical discipline of probability theory, and the science of statistics. There is spread or variability in almost any value that can be measured in a population (e.g., height of people, durability of a metal, sales growth, traffic flow, etc.); almost all measurements are made with some intrinsic error; in physics, many processes are described probabilistically, from the kinetic properties of gases to the quantum mechanical description of fundamental particles. For these and many other reasons, simple numbers are often inadequate for describing a quantity, while probability distributions are often more appropriate. This course is so much necessary for the students to understand the Probability theory in advance mode.

Time Series Analysis (TH+PRAC) DSE-1

CO-1: This is a theory and practical based course on time series analysis in advanced mode, containing the subtopics - Introduction to time series data with real life applications, Modelling time series, Components of a time series, Estimation of trend, Effect of elimination of trend on other components of the time series, Estimation of seasonal component by Method of simple averages, Notions of multiplicative models: ratio to Trend, Introduction to stochastic modelling, Box-Jenkins modelling, Forecasting.

CO-2: Time series analysis comprises methods for analyzing time series data in order to extract meaningful statistics and other characteristics of the data. Time series forecasting is the use of a model to predict future values based on previously observed values. While regression analysis is often employed in such a way as to test relationships between one or more different time series, this type of analysis is not usually called "time series analysis", which refers in particular to relationships between different points in time within a single series. Time series have applications in many fields. Time Series Analysis is used for many applications, such as economic forecasting, sales forecasting, budgetary analysis, stock market analysis, yield projections, process and quality control, etc. This course is so much essential for the students in advance mode which may help them in higher education.

Survey Sampling and Indian Official Statistics (Th+Prac) DSE-2

CO-1: This is a theory and practical based course, having the subtopics - Concept of population and sample, complete enumeration versus sampling, sampling and non-sampling errors, Types of sampling, basic principle of sample survey, simple random sampling with and without replacement, definition and procedure of selecting a sample, Estimates of population mean, total and proportion, variances of these estimates, estimates of their variances and sample size determination, Stratified random sampling, Systematic Sampling, Introduction to Ratio and regression methods of estimation and related topics, An outline of present official statistical system in India and related topics, Consumer price Index,

General Bhattacharya
Dept. of Statistics
Bejoy Narayan Mahavidyalaya
P.O.- Itachuna, Dist.- Hooghly

Wholesale price index number and index of industrial production, National Income. These are very much necessary for the students.

CO-2: Students can develop their concepts in wide range from the particular course. They can also learn some basic concepts, such as - What is the need for sample surveys? Sample selection, Advantages of sample surveys, Disadvantages of sample surveys (Sampling errors, Complexity involved, Survey pattern, Need for statistical expertise), etc. This course is important for the students.

Demography and Vital Statistics (Th + Prac) DSE -2

CO-1: This is a theory and practical based course, from where students can learn the important portions, such as - Population Theories: Coverage and content errors in demographic data, use of balancing equations and Chandrasekaran-Deming formula to check completeness of registration data, adjustment of age data, use of Myer and UN indices, population composition, dependency ratio, introduction and sources of collecting data on vital statistics, errors in census and registration data, measurement of population, rate and ratio of vital events, measurements of Mortality, stationary and stable population, life (Mortality) Tables, measurements of Fertility, measurement of Population Growth, population estimation, projection and forecasting, fitting of Logistic curve for population forecasting.

CO-2: Vital statistics, also known as vital events or vital records, are an important source of demographic data. They explain statistically such events as births, deaths, marriages, divorces, etc. Vital statistics are of much importance for the people and nation, viz -Vital statistics, also known as vital events or vital records, are an important source of demographic data. Vital Statistics system is the entire procedure of compiling by civil registration, enumeration, or implied estimation, information over the occurrence frequency of vital events, preferred characteristics of the events and the persons associated, and the collecting, investigating, evaluating, and distribution of such data in abstracted statistical form. This course is essential for the students.

Numerical Analysis (TH) SEC-1

CO-1: This is a theoretical course based on real life applications, students can learn - approximation of numbers and functions, absolute and relative errors, interpolation and related topics, numerical differentiation and its applications, numerical integration, numerical solution of equations.

CO-2: Numerical analysis finds application in all fields of engineering and the physical sciences, and in the 21st century also the life and social sciences, medicine, business and even the arts. So, this course is very useful for the students.

Research Methodology (TH) SEC -2

CO-1: This is a theoretical course based on real life situations, from this course students can acquire the respective concepts, such as -basic concepts about research, role of Research in

Gaurav Bhattacharya
Dept. of Statistics
Bejoy Narayan Mahavidyalaya
P.O.- Itachuna, Dist:- Hoochiv

important areas, characteristics of scientific method, process of research, types of research, survey methodology and data collection, review of various techniques for data analysis, develop a questionnaire, collect survey data pertaining to a research problem, formats and presentations of reports. Research methodology is the specific procedures or techniques used to identify, select, process, and analyse information about a topic. The methodology section answers two main questions: How was the data collected or generated? How was it analysed? This course is very much efficient for the students who want to continue their research work in near future.

Monte Carlo Method (Th) SEC-3

CO-1: This is a theoretical course based on practical situations, students have the opportunity to learn some important portions, which are - using the computer for random number generation, a brief look at some popular approaches, simulating a coin toss, a die roll and a card shuffle, CDF inversion method, simulation from standard distributions, finding probabilities and moments using simulation, Monte Carlo integration, generating from Binomial and Poisson distributions, and comparing the histograms to the PMFs, generating from Uniform (0,1) distribution, and applying inverse CDF transforms, simulating Gaussian distribution using Box-Muller method, approximating the expectation of a given function of a random variable using simulation, graphical demonstration of the Law of Large Numbers, approximating the value of π by simulating dart throwing.

CO-2: Monte Carlo methods, or Monte Carlo experiments, are a broad class of computational algorithms that rely on repeated random sampling to obtain numerical results. Monte Carlo methods are especially useful for simulating phenomena with significant uncertainty in inputs and systems with many coupled degrees of freedom. Areas of application include: Physical sciences, Engineering, Climate change and radiative forcing, Computational biology, Computer graphics, Applied statistics, Artificial intelligence for games, Design and visuals, Finance and business, Library science, etc.

Statistical Data Analysis Using R (Th) SEC-3

CO-1: This course is completely based on R software, which is freely available. R is a programming language for statistical computing and graphics supported by the R Core Team and the R Foundation for Statistical Computing. Students can learn the respective portions, viz, Introduction to R, Using R as a calculator, Insert some Standard functions, e.g., sin, cos, exp, log in R, The different types of numbers in R: Division by zero leading to Inf or -Inf, NaN, NA., Variables, creating a vector, Functions to summarise a vector: sum, mean, sd, median etc, Using R as a graphing calculator, simple linear regression using $\text{lm}(y \sim x)$, Matrix operations in R, Loading data from a file, Problems on discrete and continuous probability distributions.

CO-2: Statistical data analysis is a procedure of performing various statistical operations. Statistical data analysis generally involves some form of statistical tools, which a layman cannot perform without having any statistical knowledge. There are various software packages to perform statistical data analysis. This software includes Statistical Analysis

Gejwal Bhattacharyya
Dept. of Statistics
Bejoy Narayan Mahavidyalaya
P.O.- Itachuna, Dist.- Hooghly.

System (SAS), Statistical Package for the Social Sciences (SPSS), Stat soft, etc. But, in this particular course students have to use R software. This course is so much favourable for the students who want to learn advance programming languages.

Design of Experiment (Th) SEC-4

CO-1: This is a theoretical course based on practical situations, students have a chance to learn the portions from this particular course, such as - Experimental designs, Concepts about Treatments, Experimental units & Blocks, Experimental error, Basic principles of Design of Experiments, Uniformity trials, fertility contour maps, choice of size and shape of plots and blocks in Agricultural experiments, Uses in Industrial Experiments, Basic designs: CRD, RBD, LSD - layout, model and statistical analysis, relative efficiency, Analysis with one missing observation in RBD and LSD. Design of experiments (DOE) is defined as a branch of applied statistics that deals with planning, conducting, analysing, and interpreting controlled tests to evaluate the factors that control the value of a parameter or group of parameters. DOE is a powerful data collection and analysis tool that can be used in a variety of experimental situations.

CO-2: One can use DOE when more than one input factor is suspected of influencing an output. For example, it may be desirable to understand the effect of temperature and pressure on the strength of a glue bond. DOE can also be used to confirm suspected input/output relationships and to develop a predictive equation suitable for performing what-if analysis. Experimental design can be used at the point of greatest leverage to reduce design costs by speeding up the design process, reducing late engineering design changes, and reducing product material and labor complexity. Designed Experiments are also powerful tools to achieve manufacturing cost savings by minimizing process variation and reducing rework, scrap, and the need for inspection. This course is so vital for the students.

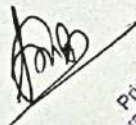
Data Base Management Systems (Th) SEC-4

CO-1: This is a theoretical course based on real life situations, students can learn various important areas from this specific course, such as, Overview of Database Management System, Introduction to Database Languages, advantages of DBMS over file processing systems, Relational Database Management System and related topics, Modifying relations, Database Structure: Introduction, Levels of abstraction in DBMS, Types of Data Models Hierarchical databases, Network databases, Relational databases, Object oriented databases.

CO-2: Following are a few applications which utilize the information base administration framework -Railway Reservation System, Library Management System, Banking, Education Sector, Credit card exchanges, Social Media Sites, Broadcast communication, Account, Online Shopping, Human Resource Management, Manufacturing, Airline Reservation System, Healthcare, Data retrieval, Data manipulation, Security, Data backup and recovery, Multi-user access, Reporting and analysis.

Gajwal Bhattacharya

Dept. of Statistics
Bejoy Narayan Mahavidyalaya
P.O.- Machuna, Dist.- Hooghly



Principal
Bejoy Narayan Mahavidyalaya
P.O.- Machuna, Dist.- Hooghly.



BEJOY NARAYAN MAHAVIDYALAYA

Phone : (03213) 272 275

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NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in e.mail ID : bnmv2012@yahoo.in

Ref. No.

Date. 01.08.2022

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

Principal
Bejoy Narayan Mahavidyalaya
P.O.- Itachuna, DL- Hooghly.

Head, Deptt. of Economics
Bejoy Narayan Mahavidyalaya
P.O.- Itachuna, Dist.-Hooghly.

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.

CO-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.

Sohini Nath
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- 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.

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CO-7: Some issues of Open economy.

7. Mathematical Economics

CO-1: Concepts of Determinants and Matrices.

CO-2: Linear Programming and its 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.

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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.

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13. Basic Econometrics

CO-1: Nature and scope of Econometrics.

CO-2: Some statistical concepts.

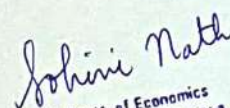
CO-3: Simple linear regression model of Two-variable case.

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.


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01.08.22



Phone : (03213) 272 275

BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)
NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in ★ e.mail ID : bnmv2012@yahoo.in

Ref. No.

Date. 01-08-22

B.Sc Chemistry Honours (CBCS)

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.

Principal
Bejoy Narayan Mahavidyalaya
P.O. - Itachuna, Dist. - Hooghly.

Shalmali Chakraborty
Hedu
Chemist
01/08/2022
B. N. M. Mahavidyalaya
Itachuna, Hooghly

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

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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.

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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: ➤ understand Bonding and Physical Properties including VB and MO theories. ➤ understand general treatment of Reaction mechanism and intermediates and get a concept ➤ 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: ➤ Learn kinetic model of an ideal gas. ➤ 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. ➤ Learn the theoretical basis of Equipartition principle and its limitation. ➤ 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, Barthelet 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: ➤ 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. ➤ Get ideas about the principles/laws governing the physiochemical behavior of a system ➤ 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. ➤ Acquire knowledge about the application of laws of thermodynamics in case of chemical reactions and learn fundamental laws governing thermo-chemistry. ➤ Get hands-on experience on determination of enthalpy of various physical and chemical processes.

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	<i>Chemical Kinetics</i>	On completion of the course, students will be able to: ➤ 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. ➤ Understand the role of catalysts and biocatalyst (e.g. enzymes, etc.) in a catalyzed reaction. ➤ Solve numerical problems and experimentally determine the order, rate and activation energy of a chemical reaction.
Course Code: CC-01 Course Title: Organic Chemistry-I (Prac)	<i>Basics of Organic Chemistry</i>	Upon successful completion students should be able to: ➤ Learn Separation based upon solubility ➤ Determination of boiling point ➤ Identification of a Pure Organic Compound by Chemical Test(s)
Course Code: CC-02 Course Title: Physical Chemistry-I (Prac)	<i>PRACTICAL</i>	Upon successful completion students should be able to determine and study : ➤ pH of unknown solution (buffer), by color matching method ➤ the reaction rate constant of hydrolysis of ethylacetate in the presence of an equal quantity of sodium hydroxide ➤ Study of kinetics of acid-catalyzed hydrolysis of methyl acetate ➤ Study of kinetics of decomposition of H_2O_2 by KI ➤ Determination of solubility product of PbI_2 by titrimetric method

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SEMESTER 2

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

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Course Code: CC-03 Course Title: Inorganic Chemistry-I (Prac)	<i>Oxidation-Reduction Titrimetric</i>	Upon successful completion students should be able to estimate: ➤ Fe(II) using standardized KMnO_4 solution ➤ oxalic acid and sodium oxalate in a given mixture ➤ Fe(II) and Fe(III) in a given mixture using $\text{K}_2\text{Cr}_2\text{O}_7$ solution ➤ Fe(III) and Mn(II) in a mixture using standardized KMnO_4 solution ➤ Fe(III) and Cu(II) in a mixture using $\text{K}_2\text{Cr}_2\text{O}_7$ ➤ Fe(III) and Cr(III) in a mixture using $\text{K}_2\text{Cr}_2\text{O}_7$
Course Code: CC-04 Course Title: Organic Chemistry-II (Prac)	<i>Organic Preparations</i>	Upon successful completion students should be able to perform the following reactions with the calculation of the yield product: ➤ Nitration of acetanilide ➤ Condensation reactions: Synthesis of 7-hydroxy-4-methylcoumarin ➤ Hydrolysis of amides/imides/esters ➤ Acetylation of phenols/aromatic amines (using Zn-dust/Acetic Acid) ➤ Benzoylation of phenols/aromatic amines ➤ Side chain oxidation of toluene and p-nitrotoluene ➤ Diazo coupling reactions of aromatic amines ➤ Bromination of acetanilide using green approach (Bromate-Bromide method) ➤ Green 'multi-component-coupling' reaction: Synthesis of dihydropyrimidone ➤ Selective reduction of m-dinitrobenzene to m-nitroaniline

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SEMESTER 3

Course Code: CC-05 Course Title: Physical Chemistry-II	<i>Transport Processes</i>	At the end of the course the student will learn about ➤ Fick's Law ➤ Conductance and Transport number ➤ Viscosity ➤ Principles of Hittorf's and Moving-boundary method Wien effect, ➤ Debye-Falkenhagen effect ➤ Walden's rule.
	<i>Application of Thermodynamics – I</i>	On completion, students get to know about ➤ Partial Properties ➤ Chemical Potential ➤ Chemical Equilibrium -to derive reaction isotherm; equilibrium constants based on different standard states; dependence of equilibrium constants on temperature and pressure ➤ derivation of van't Hoff reaction isotherm and reaction isochore ➤ effect of various parameters governing the equilibrium position of a chemical reaction ➤ Le Chatelier principle and its thermodynamic derivation. ➤ Distribution Law and ➤ Chemical Potential of pure and mixtures of ideal substances.
	<i>Foundation of Quantum Mechanics</i>	On completion of the course, students will be able to: ➤ 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. ➤ 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)	<i>Chemical Bonding-I</i>	On completion of the course, students will learn: ➤ Ionic and Covalent Bond explained with Bent's rule ➤ Dipole moments ➤ VSEPR theory
	<i>Chemical Bonding-II</i>	On conclusion of this topic the students learn about ➤ Molecular orbital concept of bonding ➤ Metallic Bond and ➤ Weak Chemical Forces
	<i>Radioactivity</i>	On completion of the course, students will be able to: ➤ Understand the radioactivity and related phenomena of radioactive atoms. ➤ 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. ➤ Understand the hazards of radiations and also know the safety measures
Course Code: CC-07 Course Title: Organic Chemistry-III (Theo)	<i>Chemistry of alkenes and alkynes</i>	With completion of this course the students will be able to understand ➤ Addition to C=C: mechanism (with evidence wherever applicable), reactivity, regioselectivity (Markownikoff and anti-Markownikoff additions) and stereoselectivity ➤ Addition to C≡C (in comparison to C=C): mechanism, reactivity, regioselectivity (Markownikoff and anti-Markownikoff addition) stereoselectivity
	<i>Aromatic Substitution</i>	On completion of the course, students will be able to: ➤ Understand Electrophilic aromatic substitution ➤ and Nucleophilic aromatic substitution
	<i>Carbonyl and Related Compounds</i>	The completion of this course enables the student to understand ➤ 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. ➤ 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 ➤ Substitution at sp^2 carbon ($C=O$ system)
	<i>Organometallics</i>	On completion of the course, students will be able to: ➤ Understand the different types of organic reactions involving carbon metal bonds. ➤ Understand the role of metals in controlling the regio- and stereo- specificities of the reactions. ➤ Realize the industrial application of organometallic chemistry. ➤ Know the use of organometallic compounds in the fields of catalysis, medicine etc.
Course Code: SEC-1 Course Title: Basic Analytical Chemistry	<i>Analytical Chemistry</i>	On completion of the course, students will be able to understand about ➤ Analysis of soil, Analysis of water, Analysis of food products, Chromatography, Ion-exchange and Analysis of cosmetics
Course Code: CC-05 Course Title: Physical Chemistry-II (Prac)	<i>Practical</i>	Upon successful completion students should be able to study the viscosity of unknown solution ➤ Study of viscosity of unknown liquid ➤ Determine the partition coefficient for the distribution of I_2 between water and CCl_4. ➤ Determine the K_{eq} for $KI + I_2 \rightleftharpoons KI_3$, using partition coefficient between water and CCl_4 ➤ Conductometric titration of an acid (strong, weak/ monobasic, dibasic) against strong base. ➤ Study the saponification reaction conductometrically. ➤ Verify the Ostwald's dilution law and determination of K_a of weak acid.
Course Code: CC-06 Course Title: Inorganic Chemistry-II (Prac)	<i>Iodo/Iodimetric Titrations</i>	Upon successful completion students should be able to estimate: ➤ $Cu(II)$, Vitamin C., arsenite by iodimetric method, Cu in brass and Cr and Mn in Steel
Course Code: CC-07 Course Title: Organic Chemistry-III (Prac)	<i>Qualitative Analysis of Single Solid Organic Compounds</i>	Upon successful completion students should be able to ➤ Detect special elements by Lassaigne's test ➤ check their solubility and classify them ➤ detect the different functional group, like, aromatic amine, nitro, amido, phenolic, carboxylic and carbonyl group ➤ learn to check the melting point and prepare a derivative.

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SEMESTER 4

Course Code: CC-08 Course Title: Physical Chemistry-III (Theo)	<i>Application of Thermodynamics - II</i>	After the completion of the course the students learn ➤ Colligative properties ➤ Phase rule ➤ First order phase transition and Clapeyron equation; Clausius-Clapeyron equation – derivation and use ➤ Three component systems ➤ Binary solutions
	<i>Electrical Properties of molecules</i>	On completion of the course, students will be able to: ➤ 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. ➤ Get semi-qualitative ideas about Debye-Huckel limiting law and its application and limitation. ➤ 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. ➤ Concentration cells with and without transference, liquid junction potential ➤ Learn the application of potentiometric titration as analytical techniques and solving

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	Quantum Chemistry	numerical problems related to this topic After the completion of the course the students learn about ➤ Angular momentum ➤ Qualitative treatment of hydrogen atom and hydrogen-like ions ➤ LCAO and HF-SCF
Course Code: CC-09 Course Title: Inorganic Chemistry-III (Theo)	General Principles of Metallurgy	After the completion of the course the students learn about ➤ Chief modes of occurrence of metals based on standard electrode potentials. ➤ Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agent. Electrolytic Reduction, Hydrometallurgy. ➤ Methods of purification of metals: Electrolytic Kroll process, ➤ 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 ➤ Relative stability of different oxidation states, diagonal relationship and anomalous behaviour of first member of each group. ➤ Allotropy and catenation. ➤ 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 ➤ 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 ➤ 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 ➤ Double and complex salts. ➤ Werner's theory of coordination complexes, Classification of ligands, chelates, coordination numbers, ➤ IUPAC nomenclature of coordination complexes (up to two metal centers), ➤ Isomerism in coordination compounds, constitutional and stereo isomerism, ➤ Geometrical and optical isomerism in square planar and octahedral complexes.
Course Code: CC-10 Course Title: Organic Chemistry-IV (Theo)	Nitrogen compounds	On completion of this topic the students learn about ➤ Amines ➤ Nitro compounds (aliphatic and aromatic) ➤ Alkyl nitrile and isonitrile ➤ Diazonium salts and their related compounds
	Rearrangements	On completion of this topic the students learn about ➤ Rearrangement to electron-deficient carbon, ➤ Rearrangement to electron-deficient nitrogen: ➤ Rearrangement to electron-deficient oxygen ➤ Aromatic rearrangements ➤ Migration from nitrogen to ring carbon ➤ Rearrangement reactions by green approach
	The Logic of Organic Synthesis	On completion of this topic the students learn about ➤ Retrosynthetic analysis ➤ Strategy of ring synthesis and ➤ Asymmetric synthesis
	Organic Spectroscopy	On completion of this topic the students learn about ➤ UV Spectroscopy, ➤ IR Spectroscopy, ➤ NMR Spectroscopy and ➤ Applications of IR, UV and NMR spectroscopy for identification of simple organic molecules
Course Code: SEC-2 Course Title: Pharmaceuticals Chemistry	Drugs & Pharmaceuticals	This course mainly deals with the ➤ structural determination, ➤ synthesis and uses of some drugs such as antipyretics, analgesic, sulpha-drugs penicillin etc.
	Fermentation	On completion of this course students understand ➤ Aerobic and anaerobic fermentation

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Course Code: CC-08 Course Title: Physical Chemistry-III (Prac)	PRACTICAL	Upon successful completion students should be able to ➤ Determine the solubility of sparingly soluble salt in water, in electrolyte with common ions and in neutral electrolyte (using common indicator) ➤ Perform the Potentiometric titration of Mohr's salt solution against standard $K_2Cr_2O_7$ solution. ➤ Determine the K_{sp} for $AgCl$ by potentiometric titration of $AgNO_3$ solution against standard KCl solution. ➤ Study the Effect of ionic strength on the rate of Persulphate – Iodide reaction. ➤ Study the phenol-water phase diagram.
Course Code: CC-09 Course Title: Inorganic Chemistry-III (Prac)	Complexometric titration	Upon successful completion students should be able to perform the quatitative titration of ➤ $Zn(II)$, $Zn(II)$ in a $Zn(II)$ and $Cu(II)$ mixture, $Ca(II)$ and $Mg(II)$ in a mixture ➤ Find the Hardness of water
	Inorganic preparations	At the end of the course students should learn about the preparation of ➤ $[Cu(CH_3CN)_4]PF_6/ClO_4$ ➤ Potassium dioxalatodiaquachromate(III) ➤ Tetraamminecarbonatocobalt (III) ion ➤ Potassium tris(oxalate)ferrate(III) ➤ Tris-(ethylenediamine) nickel(II) chloride. ➤ $[Mn(acac)_3]$ and $Fe(acac)_3]$
Course Code: CC-10 Course Title: Organic Chemistry-IV (Prac)	Estimation of different organic compounds	At the end of the course students learn to estimate ➤ glucose by titration using Fehling's solution ➤ vitamin-C (reduced) ➤ aromatic amine (aniline) by bromination (Bromate-Bromide) method ➤ phenol by bromination (Bromate-Bromide) method ➤ formaldehyde (Formalin) ➤ acetic acid in commercial vinegar ➤ urea (hypobromite method) ➤ saponification value of oil/fat/ester.

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SEMESTER 5

Course Code: CC-11 Course Title: Inorganic Chemistry-IV (Theo)	Coordination Chemistry-II	On completion of this topic the students learn about ➤ VB description and its limitations. ➤ Elementary Crystal Field Theory Magnetism and Colour, quenching of magnetic Moment ➤ Racah parameter. ➤ 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 ➤ Transition Elements ➤ 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: ➤ Know about different heterocyclic compounds of different sizes especially 5 and 6-membered heterocycles. ➤ Know the synthesis and reactions of different heterocycles. ➤ Understand many biological roles of some heterocycles.
	Cyclic Stereochemistry	On completion of the course, students will be able to: ➤ Alicyclic compounds: concept of I-strain; conformational analysis: cyclohexane, mono and disubstituted cyclohexane; ➤ symmetry properties and optical activity; ring-size and ease of cyclisation; conformation & reactivity in cyclohexane system: consideration of steric and stereoelectronic requirements; ➤ 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 ➤ 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 ➤ different reactions and conformations of Monosaccharides
	Biomolecules	On completion of the course, students will be able to understand about ➤ Amino acids, Peptides and Nucleic acids

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	<i>Alkaloids and Terpenoids</i>	At the end of this course students can get a idea on ➤ terpenoids and alkaloids; ➤ determination of structure of α-Terpenol and ephedrine.
Course Code: DSE-1 Course Title: Advanced Physical Chemistry (Theo)	<i>Crystal Structure</i>	On completion of the course, students will be able to: ➤ Get an idea about the specific heat of solids, Einstein and Debye theory related to it; ➤ Laws of Crystallography; x-ray diffraction as a technique to explore the atomic/molecular-level structure of a crystalline solid. ➤ Learn Bragg's law and crystal planes; Miller indices; Idea about Bravais lattices and detailed discussion about cubic crystal system.
	<i>Statistical Thermodynamics</i>	On completion of the course, students will be able to: ➤ 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. ➤ 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. ➤ Get idea about classical statistical thermodynamics and Quantum statistics on an elementary level. ➤ Understand the relation between entropy and arrangement of different particles in various energy levels at the atomic level. ➤ Learn the mathematical derivation of Maxwell-Boltzmann distribution law and should be able to solve numerical problems related with this topic.
	<i>Special selected topics</i>	On completion of the course, students will be able to: ➤ Specific heat of solid ➤ 3rd law ➤ Polymers ➤ Dipole moment and polarizability
Course Code: DSE-2 Course Title: Analytical methods in chemistry (Theo)	<i>Qualitative and quantitative aspects of analysis</i>	On completion of the course, students will learn: ➤ Sampling, evaluation of analytical data, errors, accuracy and precision, methods of their expression, 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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	<i>Optical methods of analysis</i>	On completion of the course, students will learn: ➤ Origin of spectra, ➤ UV-Visible Spectrophotometry, ➤ Basic principles of quantitative analysis, ➤ Basic principles of quantitative analysis and ➤ Flame Atomic Absorption and Emission Spectroscopy
	<i>Thermal methods of analysis</i>	On completion of the course, students will be able to understand ➤ Theory of thermogravimetry (TG), ➤ basic principle of instrumentation. ➤ Techniques for quantitative estimation of Ca and Mg from their mixture.
	<i>Electroanalytical methods</i>	On completion of the course, students will be able to understand ➤ Classification of electroanalytical methods, basic principle of pH metric, ➤ potentiometric and conductometric titrations and learn techniques used for the determination of equivalence points and techniques used for the determination of pK_a values.
	<i>Separation techniques</i>	On completion of the course, students will be able to understand ➤ Solvent extraction, ➤ Technique of extraction, ➤ Qualitative and quantitative aspects of solvent extraction, ➤ Chromatography, ➤ Development of chromatograms, ➤ Qualitative and quantitative aspects of chromatographic methods of analysis, ➤ Stereoisomeric separation and analysis and ➤ Role of computers in instrumental methods of analysis
Course Code: CC-11 Course Title: Inorganic Chemistry-IV (Prac)	<i>Chromatography of metal ions</i>	On completion of the course, students will be able to understand the principles involved ➤ 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 ➡ Estimation of nickel (II) using Dimethylglyoxime (DMG). ➡ Estimation of copper as CuSCN ➡ Estimation of Al (III) by precipitating with oxine and weighing as Al(oxine)₃ (aluminium oxinate) ➡ Estimation of chloride
	Spectrophotometry	On completion of the course, students will be able to learn ➡ spectrophotometric measurement of 10Dq of 3d metal complexes and ➡ Determination of λ_{max} 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 ➡ TLC, ➡ Column Chromatography ➡ Paper Chromatography separation.
	Spectroscopic Analysis of Organic Compounds	On completion of the course, students will be able to learn ➡ how to assign labelled peaks in the ¹H NMR spectra and IR spectra and ➡ 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 ➡ Roots of equations, ➡ Numerical differentiation, ➡ Numerical integration and ➡ Matrix operations

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

SEMESTER 6

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

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		organometallic complexes
	<i>Catalysis by Organometallic Compounds</i>	➤ 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
	<i>Reaction Kinetics and Mechanism</i>	At the end of the course, the students will be able to understand the ➤ Inorganic reaction mechanism.
Course Code: CC-14 Course Title: Physical Chemistry-IV (Theo)	<i>Molecular Spectroscopy</i>	At the end of the course, the students will be able to understand ➤ Interaction of electromagnetic radiation with molecules and various types of spectra and Born-Oppenheimer approximation ➤ Rotation spectroscopy ➤ Vibrational spectroscopy ➤ Raman spectroscopy ➤ Nuclear Magnetic Resonance (NMR) spectroscopy
	<i>Photochemistry</i>	On completion of the course, students will be able to: ➤ Get elementary ideas about the fundamental laws governing the chemical reaction induced by light ➤ Know the representation of various photo-physical processes by Jablonsky diagram. ➤ Be accustomed with the different scientific nomenclature frequently used for further extensive studies of the subject.
	<i>Surface phenomenon</i>	On completion of the course, students will be get to learn about ➤ Surface tension and energy ➤ Adsorption - Know about basic laws governing the adsorption; acquire an elementary idea about physisorption and chemisorptions. ➤ Have an idea about different adsorption isotherms and their theoretical derivation, thermodynamic aspects of sorption processes, role and function of heterogeneous catalysts. ➤ Colloids and Micelle formation
Course Code: DSE-3 Course Title: Green Chemistry (Theo)	<i>Green Chemistry: Principles and applications</i>	On completion of the course, students will be able to: ➤ Understand the source of environmental pollutions and their role in making a green world. ➤ Know the use of alternative energy sources, renewable feedstock and innocuous solvents. ➤ 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. ➤ Examples of Green Synthesis/ Reactions and some real world cases
Course Code: DSE-4 Course Title: Dissertation followed by power point presentation		On learning the course, the students will be able to ➤ Analyze the existing problems for which research can provide solutions and select the problem for research ➤ Know the various chemical publishers, journals and perform literature survey ➤ Synthesize new chemical compounds through various methods ➤ Characterize the compounds using various analytical and spectroscopical studies ➤ Learn to write their findings in a paper form ➤ Learn to present their dissertation in a power point
Course Code: CC-13 Course Title: Inorganic Chemistry-V (Prac)	<i>Qualitative semimicro analysis</i>	On completion of the course students will be able to perform ➤ Qualitative semimicro analysis of mixtures containing four radicals
Course Code: CC-14 Course Title: Physical Chemistry-IV (Prac)	<i>PRACTICAL</i>	On completion of the course students will be able to ➤ Determine the surface tension of a liquid using Stalagmometer. ➤ Determine the CMC from surface tension measurements. ➤ Verify Beer and Lambert's Law for KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ solution. ➤ Determine the pH of unknown buffer, spectrophotometrically.
Course Code: DSE-3 Course Title: Green Chemistry (Prac)	<i>PRACTICAL</i>	On completion of the course students will be able to learn about ➤ Preparation of propene, ➤ Benzoin condensation and ➤ Photo reduction of benzophenone to benzopinacol in the presence of sunlight.


 Principal
 Baloy Narayan Mahavidyalaya
 P.O. - Itachna, Dt. - Hooghly.

Shalmali Chakrabarty

01-08-2022
Head

Chemistry Department
 B. N. M. Mahavidyalaya
 Itachna - Hooghly



BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)

NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in ★ e.mail ID : bnmv2012@yahoo.in

Ref. No.

Date. 01.08.2022

B.Sc Honours in Botany (CBCS) under The University of Burdwan

Programme Outcomes (PO)

From the Academic Session 217-18, new CBCS syllabus was introduced by the University of Burdwan, which is our affiliating University at present. The Bachelor of Science (B.Sc.) programme in Botany is an undergraduate degree that focuses on the study of plants, their structure, function, categorization, and interactions with the environment. This comprehensive programme gives students a solid foundation in plant biology and prepares them for a variety of careers in industries such as research, education, conservation, agriculture, and pharmaceuticals.

PO-1: Plant Biology Knowledge and grasp: One of the key aims of the B.Sc. Botany programme is to provide students with a strong grasp and knowledge of plant biology. Plant morphology, anatomy, physiology, biochemistry genetics, molecular biology and reproduction are taught to students, as well as their evolutionary history and diversity. They obtain a thorough awareness of how plants work and adapt to their surroundings, as well as their connections with other creatures.

PO-2: Practical Plant Science Skills: The programme emphasises the development of practical plant science skills. Microscopy, DNA analysis, plant tissue culture, and plant breeding are among the laboratory skills taught to students. In addition, they learn practical skills such as plant identification, data gathering, and ecological survey procedures. These practical skills enable students to perform independent research and contribute to botanical developments.

PO-3: Critical Thinking and Problem-Solving Skills: The B.Sc. Botany programme promotes critical thinking and problem-solving skills. Students gain an understanding of complicated biological processes and ecological relationships. They learn how to analyse data, organise experiments, and conduct statistical analyses. These abilities enable them to analyse scientific material, create research questions, and offer novel solutions to plant biology and environmental conservation concerns.

PO-4: Understanding of Plant-Environment Interactions: A key goal of the B.Sc. Botany programme is to help students have a better understanding of plant-environment

[Signature]
Principal
Bejoy Narayan Mahavidyalaya
P.O. Itachuna, Dist. Hooghly.

Arindam Mandal
Head, Deptt. of Botany
Bejoy Narayan Mahavidyalaya
P.O. Itachuna, Dist. Hooghly. 01/08/22



BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)

NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in e.mail ID : bnmv2012@yahoo.in

Ref. No.

Date.

interactions. They investigate the effects of abiotic variables on plant growth and development, such as light, temperature, water, and nutrients. They also investigate the impact of biotic variables on plant health, such as infections, pests, and symbiotic interactions. This information is critical for dealing with concerns like climate change, biodiversity loss, and sustainable agriculture.

PO-5: Plant Diversity and Conservation: The programme aims to foster an appreciation for plant diversity as well as the importance of conservation. Students study plant categorization and distribution, especially endangered and endemic species. They investigate the function of botanical gardens, national parks, and conservation organisations in the protection of plant biodiversity. Students gain a sense of care for plants and their ecosystems via hands-on experiences and field visits.

PO-6: Effective Communication and teamwork: The B.Sc. Botany programme emphasises the development of effective communication and teamwork abilities. Students learn to deliver scientific information in written reports and oral presentations in a clear and simple manner. They also do group projects and teamwork to simulate real-world scientific interactions. These abilities are required for effectively conveying research findings, working with colleagues, and engaging with the larger scientific community.

PO-7: Ethical and Professional Responsibility: The programme instills in pupils a feeling of ethical and professional responsibility. They learn about the ethical considerations and guidelines for performing plant-based scientific research. Students are encouraged to work with integrity, truthfulness, and transparency. They also become more aware of the social, economic, and environmental repercussions of their study, encouraging responsible and sustainable botanical practises.

Finally, the B.Sc. in Botany programme provides students with a solid basis in plant biology, practical skills in plant science, critical thinking capabilities, and an awareness of plant-environment interactions. It promotes an appreciation for plant diversity, conservation, and ethical scientific research behaviour. This graduate's programmes are well-prepared for a variety of careers in research, education, and conservation.

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Course Outcomes (CO)

Semester	Core Course	Teachers Thought	Course Outcome
I	CC-I: Microbiology and Phycology	Dr. Malay Ghosh Dr. Goutam Ghosh	The study of Microbiology and Phycology offers students a deep understanding of microorganisms including algae, their structures, functions, interactions, and applications. The course outcomes of Microbiology and Phycology are : CO 1: Knowledge of Microorganisms. CO 2: Laboratory Skills. CO 3: Understanding of Microbial Physiology and Genetics. CO 4: Environmental Microbiology. CO 5: Algal Biology and Applications The study of Microbiology and Phycology equips students with a solid foundation in the knowledge and skills necessary to understand microorganisms, algae, their applications, and their impacts on the environment and human health.
I	CC-II: Archegoniatae	Prof Hemanta Ghosh Dr. Arindam Mandal Dr. Parasuram Kamilya	In the field of Botany, the study of archegoniates, also known as embryophytes, focuses on the diverse group of plants that includes mosses, liverworts, hornworts, and vascular plants (ferns, gymnosperms, and angiosperms). Here are the course outcomes of the B.Sc. Botany program with a focus on archegoniates: CO 1: Knowledge of Plant Diversity. CO 2: Reproduction and Life Cycles. CO 3: Evolution and Phylogeny. CO 4: Ecological Significance. CO 5: Conservation and Restoration. Graduates of this program are well-prepared for careers in plant ecology, conservation biology, research, and education.
II	CC-III: Mycology and Phytopathology.	Dr. Malay Ghosh Prof Hemanta Ghosh	The study of Mycology and Phytopathology within the B.Sc. Botany program focuses on the field of plant pathology, which involves the study of fungal diseases and their impact on plants. Here are the course outcomes of Mycology and Phytopathology in the B.Sc. Botany program: CO 1: Knowledge of Fungal Diversity. CO 2: Understanding of Plant-Fungal Interactions. CO 3: Disease Diagnosis and Identification. CO 4: Disease Management Strategies. CO 5: Ecological and Environmental Impacts. CO 6: Ethical and Sustainable Practices.

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			These course outcomes aim to equip students with a solid foundation in mycology and phytopathology, preparing them for careers in research, agriculture, plant pathology, environmental science, or further studies in related fields.
II	CC-IV: Morphology & Anatomy of Angiosperms	Prof Hemanta Ghosh Dr.Arindam Mandal Dr.Parasuram Kamilya	The course "Morphology & Anatomy of Angiosperms" in a B.Sc. program focuses on the study of the form, structure, and anatomical features of flowering plants. Here are some common course outcomes or learning objectives that you can expect from this course: CO 1: Understand the diversity of angiosperms. CO 2: Study plant organs and their functions. CO 3: Explore floral morphology. CO 4: Understand plant anatomy. CO 5: Appreciate the ecological significance. Overall, the course aims to provide a comprehensive understanding of the morphology and anatomy of angiosperms, enabling you to identify and appreciate the diverse forms and structures of flowering plants and their ecological significance.
III	CC-V: Plant Ecology and Phytogeography	Dr.Goutam Ghosh	The course "Plant Ecology and Phytogeography" in a B.Sc. (Bachelor of Science) program typically focuses on the study of plant communities, their distribution patterns, and the ecological processes that influence their development and dynamics. The outcomes of Plant Ecology and Phytogeography course are given below: CO 1: Knowledge of Plant Ecology. CO 2: Understanding Plant Community Dynamics. CO 3: Plant Distribution Patterns. CO 4: Fieldwork and Data Analysis. CO 5: Conservation and Management. In the course aims to provideequips students with the knowledge and skills necessary for careers in environmental science, ecology, conservation, land management, or further studies in related fields
III	CC-VI: Plant Systematics	Dr.Parasuram Kamilya	The course outcome for Plant Systematics in a B.Sc. (Bachelor of Science) program typically focuses on developing a comprehensive understanding of the taxonomy, classification, identification, and evolutionary relationships of plants. Here are some common course outcomes for Plant Systematics at the undergraduate level: CO 1: Knowledge of Plant Diversity.

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			CO 2: Taxonomy and Nomenclature. CO 3: Plant Classification and Identification Skills. CO 4: Fieldwork and Collection Methods. CO 5: Evolutionary Trends and Plant Adaptations. CO 6: Ethical Considerations. The course aims to prepares students for further studies or careers in fields such as plant taxonomy, botany, ecology, conservation, or plant-based research.
III	CC-VII: Economic Botany	Prof Hemanta Ghosh Dr.Arindam Mandal	The course outcome for "Economic Botany" in a B.Sc. program typically focuses on providing students with a comprehensive understanding of the economic importance of plants and their various applications. Here are some common course outcomes for Economic Botany: CO 1: Economic Importance of Plants. CO 2: Plant Utilization. CO 3: Plant Products and Trade. CO 4: Medicinal and Aromatic Plants. CO 5: Ethnobotany and Traditional Knowledge. CO 6: Conservation and Sustainable Use.
III	SEC-1: Mushroom Culture Technology	Dr. Malay Ghosh	The course outcome for "Mushroom Culture Technology" in the field of Botany in a B.Sc. program are given below: CO 1: Understanding of Fungal Biology. CO 2: Cultivation Techniques. CO 3: Mushroom Species Identification. CO 4: Nutritional and Medicinal Value. CO 5: Commercial Production and Research Skills. CO 6: Safety and Quality Assurance. Overall, the course aims to provide students with a comprehensive understanding of mushroom culture technology, enabling them to pursue careers in mushroom cultivation, research, entrepreneurship, or related fields in the agricultural and biotechnology sectors.
IV	CC-VIII:Paleobotany& Palynology	Dr.Parasuram Kamilya Lily Bhattacharya	The course outcomes for Paleobotany and Palynology in a B.Sc. Botany program typically aim to provide students with a comprehensive understanding of the principles, methods, and applications of these specialized fields within botany. The course outcomes for Paleobotany and Palynology are given below:

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			CO 1: Knowledge of Paleobotany. CO 2: Understanding of Palynology. CO 3: Identification Skills. CO 4: Fieldwork and Laboratory Techniques. CO 5: Environmental and Conservation Perspectives.
IV	CC-IX: Biomolecule & Cell Biology	Dr.Arindam Mandal Dr.Goutam Ghosh	The course "Biomolecules & Cell Biology Botany" in a B.Sc. program typically focuses on the study of biomolecules, cellular structures, and functions, with a specific emphasis on botany-related topics. The course outcomes for Biomolecules & Cell Biology Botany are given below: CO 1: Knowledge of Biomolecules. CO 2: Cell Biology. CO 3: Plant Anatomy and Morphology. CO 4: Photosynthesis and Respiration. CO 5: Plant Genetics. CO 6: Plant Physiology. Overall, the course aims to equip students with a solid foundation in biomolecular and cellular aspects of botany.
IV	CC-X: Molecular Biology	Dr. Malay Ghosh Prof Hemanta Ghosh	The course outcomes for a B.Sc. program in Molecular Biology and Botany typically include the following: CO 1: Understanding of Basic Concepts of Molecular Techniques. CO 2: Understanding of Plant Physiology. CO 3: Knowledge of Plant Genetics. CO 4: Understanding of Plant-Microbe Interactions. CO 5: Familiarity with Biotechnology Applications. CO 6: Environmental Awareness, Critical Thinking and Problem-Solving. These course outcomes aim to provide students with a comprehensive understanding of molecular biology principles as they relate to the study of plants, preparing them for various career paths in research, academia, biotechnology, conservation, and more.
IV	SEC-2: Biodiversity and Human Welfare	Prof Hemanta Ghosh	This course aims to provide students with a comprehensive understanding of the relationship between biodiversity and human well-being. The outcome of this course are given below: CO 1: Understanding Biodiversity.

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			CO 2: Biodiversity Conservation and Ecosystem Services. CO 3: Human Dependence on Biodiversity. CO 4: Sustainable Use of Biodiversity. The students should be able to demonstrate a comprehensive understanding of the importance of biodiversity for human welfare, the threats facing biodiversity, and the conservation and sustainable use practices necessary to ensure the long-term well-being of both humans and ecosystems.
V	CC-XI: Plant Physiology	Dr. Malay Ghosh Prof Hemanta Ghosh	The course on Plant Physiology in the field of Botany aims to provide students with a comprehensive understanding of the physiological processes and mechanisms that occur in plants. By the end of the course, students are expected to achieve the following outcomes: CO 1: Knowledge of Plant Structure and Function. CO 2: Understanding of Plant Metabolism. CO 3: Comprehension of Plant Growth and Development. CO 4: Application of Plant Physiology in Agriculture and Biotechnology. CO 5: Development of Practical Skills. The course on Plant Physiology in B.Sc. Botany aims to provide students with a solid foundation in understanding the physiological processes that occur in plants.
V	CC-XII: Plant Metabolism	Dr. Arindam Mandal Dr. Malay Ghosh	Course Outcome for Plant Metabolism in Botany (B.Sc.) are given below: CO 1: Understanding of Plant Biochemistry. CO 2: Knowledge of Enzymes and Metabolic Regulation. CO 3: Familiarity with Primary and Secondary Metabolism. CO 4: Understanding of Photosynthesis. CO 5: Knowledge of Respiration and Energy Metabolism. CO 6: Application of Metabolic Knowledge Overall, the course outcome for this course aims to provide students with a comprehensive understanding of the biochemical processes and metabolic pathways in plants, and equip them with the necessary knowledge and skills to explore the diverse aspects of plant metabolism and its applications.
V	DSE-1: Reproductive Biology of Angiosperm	Dr. Arindam Mandal Prof Hemanta Ghosh	The course "Reproductive Biology of Angiosperms" typically covers the study of the reproductive processes and mechanisms in flowering plants, known as angiosperms. The main goal of the course is to provide students with a comprehensive understanding of the various aspects of plant reproduction, including both sexual

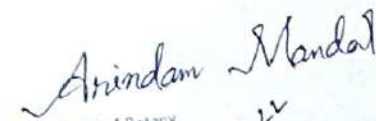
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			and asexual modes. Some of the Course Outcome are : CO 1: Knowledge of Floral Morphology. CO 2: Pollination Mechanisms. CO 3: Plant Reproductive Strategies, Fertilization and Seed Development. CO 4: Plant Reproduction and Human Agriculture Reproductive Disorders. It may prepare students for further studies or careers in plant biology, plant breeding, agriculture, or related fields.
V	DSE-2: Natural Resource Management	Dr. Goutam Ghosh	The course outcome for Natural Resource Management (Botany) in a B.Sc. program typically focuses on providing students with a comprehensive understanding of the principles and practices related to managing natural resources, particularly in the context of land, water, energy and biological resources. The outcome are given below: CO 1: Conservation and Sustainability and Ecosystem Management. CO 2: Fieldwork and Practical Skills. CO 3: Energy resources and contemporary practices. CO 4: National and International efforts in resource Management
VI	CC-XIII: Genetics & Plant Biotechnology	Dr. Goutam Ghosh Dr. Arindam Mandal	The course outcomes for a Genetics & Plant Biotechnology course in Botany for a B.Sc. program are given below: CO 1: Understanding of Genetics. CO 2: Familiarity with Plant Biotechnology. CO 3: Biotechnological Applications. CO 4: Environmental and Ethical Considerations. It may prepare students for further studies or careers in plant biology, Genetics & Plant Biotechnology, agriculture, or related fields.
VI	CC-XIV: Plant Biotechnology	Dr. Malay Ghosh Prof Hemanta Ghosh	The outcomes for Plant Biotechnology in Botany are designed to provide students with a solid foundation in plant biotechnology and its application in the field of botany. The course outcomes are given below: CO 1: Understanding Plant Biotechnology. CO 2: Application of Biotechnological Tools. CO 3: Plant Genetic Engineering. CO 4: Tissue Culture Techniques. CO 5: Plant Biotechnology Applications. The course on Plant Biotechnology in B.Sc. Botany aims to provide students with a

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VI	DSE-3: Plant Evolution and Biodiversity	Dr.Parasuram Kamilya	solid foundation in understanding the Plant Biotechnological processes. Course Outcome of "Plant Evolution and Biodiversity" are given below: CO 1: Understanding Plant Evolution. CO 2: Plant Diversity and its Taxonomy and Classification. CO 3: Plant Adaptations, Plant Reproduction and Life Cycles. CO 4: Plant Evolutionary History, Conservation and Threats to Plant Biodiversity. CO 5: Research and Data Analysis. By the end of the course, students should have a strong foundation in plant evolution and biodiversity, enabling them to pursue further studies or careers in fields such as botany, ecology, conservation biology, and plant biotechnology. They will have gained a deep appreciation for the diversity and importance of plants in ecosystems and society.
VI	DSE-4: Horticultural Practices and Post-Harvest Technology	Dr.Goutam Ghosh Dr.Arindam Mandal	Horticultural Practices and Post-Harvest Technology is a course that provides students with a comprehensive understanding of the principles and techniques involved in the cultivation and management of horticultural crops, as well as the post-harvest handling and preservation of these crops. The course aims to equip students with the necessary knowledge and skills to effectively grow and handle horticultural crops, ensuring maximum yield and quality. Upon completion of the course, students can expect to achieve the following learning outcomes: CO 1: Understanding of Horticultural Crop Production. CO 2: Knowledge of Pest and Disease Management. CO 3: Proficiency in Post-Harvest Handling Techniques. CO 4: Familiarity with Value Addition and Marketing. CO 5: Awareness of Sustainable Practices. Overall, the course in Horticultural Practices and Post-Harvest Technology equips students with the necessary knowledge and skills to excel in the field of horticulture. Graduates will be prepared to contribute to the sustainable production, handling, and marketing of horticultural crops, meeting the demands of the industry while ensuring environmental stewardship and food security.


Principal
Belay Narayan Mahavidyalaya
P.O. - Itachuna, Dt.- Hooghly.


Head, Deptt. of Botany
Belay Narayan Mahavidyalaya
P.O.-Itachuna, Dist.-Hooghly. 08-22



BEJOY NARAYAN MAHAVIDYALAYA

(GOVT. SPONSORED)
NAAC ACCREDITED

P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in e.mail ID : bnmv2012@yahoo.in

Ref. No.

Date, 01.08.2022

B.Sc. Honours in Zoology (under CBCS)

PROGRAMME OUTCOMES (PO)

Our college is affiliated under The University of Burdwan, The Choice Based Credit System (CBCS) was introduced in the academic session 2017-2018. The expected programme outcomes of the Department of Zoology are 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

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Head
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Bejoy Narayan Mahavidyalaya

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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.

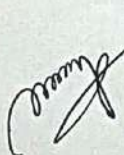
COURSE OUTCOME (CO)

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.


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C03: 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.

C04: 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.

C05: 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.

C06: 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 studying enzyme actions.

C07: 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.

C08: Genetics

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


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- 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.

C09: 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 Electrophoresis.
- e) Gain experience on preparing liquid, solid media for bacteria culture and determining antibiotic sensitivity and resistance zones of bacteria.

C010: 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.

C011: 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

C012: 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.

C013: 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, circadian 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 homeostasis.
- 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.

C020: 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.

C021: 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.

C022: 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.

C023: 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.

C024: 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.

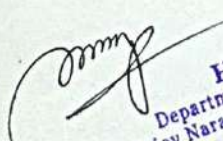
C025: Aquatic biology

- 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.

C026: 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.

C027: Comparative anatomy and developmental biology of vertebrates


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- 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.

C028: 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

C029: 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.

 01-08-2022
Head
 Department of Zoology
 Bejoy Narayan Mahavidyalaya


Principal
 Bejoy Narayan Mahavidyalaya
 P.O. - Itachuna, Dt.- Hooghly.



Phone : (03213) 272 275

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P.O. ITACHUNA, DIST. HOOGHLY, PIN - 712147

website : www.bnmv.ac.in e.mail ID : bnmv2012@yahoo.in

Ref. No.

PROGRAMME TITLE: B.SC. IN NUTRITION (HONOURS) (CBCS) Date: 01-08-2022

Programme Outcomes (PO)

- **PO-1:** The course is an interdisciplinary programme with knowledge of human physiology, microbiology, biochemistry and their role in relation to food and health. It also provides a keen knowledge about foods and their proper uses in human health.
- **PO-2:** The programme provides in-depth understanding of the role of food under specific diseased conditions.
- **PO-3:** Students would have had multiple opportunities to learn the skills necessary for applying theoretical knowledge into practical life and enhance their soft skills and employability quotient.
- **PO-4:** The students get the opportunity to be interactive environmentally as well as socially.
- **PO-5:** The course helps to acquire the skills needed to establish the students economically.

Principal
Bejoy Narayan Mahavidyalaya
P.O.- Itachuna, Dt.- Hooghly.

Shalmali Chakraborty
01/08/2022

Head
Department of Nutrition
B.N. Mahavidyalaya,
P.O.- Itachuna, Hooghly

PROGRAMME SPECIFIC OUTCOMES (PSO)

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.

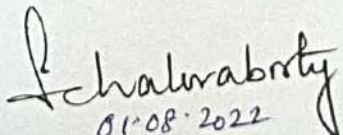
PSO-4: The course helps to understand the microbiology of food and how it affects the storage of food items.

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

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Course outcomes

Sl no	Name of the course	Course code	Course outcome
1	Nutritional physiology I	CC1	CO-1: Learn the anatomical structures and physiology of different systems of human body. 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	CC2	CO-1: Gain knowledge on different nutrients in food CO-2: Understand the basic concepts behind food science and food preparation. CO-3: Gain an in-depth understanding on cooking
	Practical		CO-1: Apply scientific knowledge in assessing food products. CO-2: Have an in-depth knowledge on application of food science.
3	Nutritional physiology II	CC3	CO-1: Learn how the human body maintain the homeostasis 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. CO-1: Learn the basic pathological experiments of human body
4	Physiological aspect of nutrition	CC4	CO-1: Understand the properties of various micro and macro food components.


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			CO-2: Learn about the basic of nutrition and diet.
	Practical		CO-1: Apply the knowledge to monitor growth and development of children. CO-2: Assess the nutritional status. CO-3: Understand the deficiencies in-depth.
5	Nutritional biochemistry	CC5	CO-1: Learn about the building blocks of food. CO-2: Understand the metabolism of major food components. CO-3: Comprehend the Biochemical implications of foods components.
	Practical		CO-1: Utilize the laboratory techniques common to basic and applied food chemistry. CO-2: Analyze the principles behind the analytical technique of food products when presented with a practical problem. CO-3: Evaluate the chemical properties and reactions of various food components.
6	Nutrition: life cycle approach	CC6	CO-1: Understand the importance of nutrition in various stages of life. CO-2: Evaluate the nutritional status through the lifecycle. CO-3: Efficiently assess deficiencies.
	Practical		CO-1: Plan a balanced menu through various stages of life. CO-2: Assess the nutritional status.
7	Diet therapy I	CC7	CO-1: Understand the implication of diet under diseased conditions. CO-2: Prescribe individualized diets.

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			CO-3: In-depth knowledge on hospital diets CO-4: Understand the correlation between diet and diseases.
	Practical		CO-1: Plan a diet chart under normal conditions. CO-2: Plan a balanced menu for diseased conditions.
8	NUTRITIONAL ASSESSMENT AND NUTRITION PROGRAMME	CC8	CO-1: Evaluate the major global issues related to Food and Nutrition board. CO-2: Learn how to educate the community about nutrition and health education CO-3: Understand different nutrition programme and their implication for the development of the community 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. CO-2: In depth knowledge about the ideal body measurements and determination of disease
9	Community nutrition and epidemiology	CC9	CO-1: Understand the role of nutrition at community level. CO-2: Learn about disease in global scale CO-3: Learn about managing wastes and pollution control CO-4: Evaluation of drinking water
	Practical		CO-1: Evaluation of wholesomeness of water

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			CO-2: Assessment of the state of health of population living in different corner of the community by visiting different homes.
10	Diet therapy II	CC10	CO-1: Understand diet under hospital conditions. CO-2: Understand the correlation between diet and diseases.
	Practical		CO-1: Provide adequate nutrition for special diseased conditions.
11	FOOD MICROBIOLOGY AND FOOD BORNE DISEASE	CC11	CO-1: Understand the interaction between microorganisms and food. CO-2: Explain the significance of microorganisms in food CO-3: Describe the disease characteristics of food borne and water borne microorganisms.
	Practical		CO-1: Learn basic laboratory process of microbiology CO-2: Knowledge about the basic reactions of microorganisms CO-3: Differentiate various microorganisms.
12	MEDICAL MICROBIOLOGY AND PATHOLOGY	CC12	CO-1: Learn about pathogenic bacteria and viruses and diseases caused by them CO-2: Knowledge about natural micro flora of human body
	Practical		CO-1: Assessment of microorganisms in spoiled food and water CO-2: Evaluate the antibiotic properties of microorganisms
13	NUTRACEUTICAL AND FUNCTIONAL FOOD	CC13	CO-1: Understand the role of nutraceuticals. CO-2: Explain the significance of foods

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			to provide immunity in human body CO-3: Gain in-depth knowledge on the relationship between nutrition and food biotechnology
	Practical		CO-1: better understanding and Formation of article about the significance of foods against different disease condition
14	FOOD SAFETY AND FOOD STANDARD	CC14	CO-1: Gain in-depth knowledge on various quality control measures of food products. CO-2: Importance of food specification and food – label with reference to various food additives. CO-3: The implications of adulteration of food and the toxic effects of adulteration. 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	DSE1	CO-1: Provide adequate nutrition for special diseased conditions. CO-2: Understand about critical care for patients
	Practical		CO-1: Understanding the work process in dietary department. CO-2: Plan diets and counsel patients effectively. CO-3: Hand on training in different processes of food technology.
16	MOLECULAR BIOLOGY	DSE2	CO-1: Understanding about DNA, RNA and nucleic acids In depth knowledge about formation of

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			these important molecules in the body. CO-2: Visit to rural area for the glimpse of individualism.
	Practical		CO-1: Gain knowledge about different instruments needed in the research laboratory CO-2: Basic fundamentals of DNA and RNA
17	BIostatistics AND BIOinformatics	DSE3	CO-1: Introduction to bioinformatics and statistics in the world of nutrition CO-2: Knowledge about different storage data bases of genetic formula
	Practical		CO-1: Knowledge of data interpretation CO-2: Evaluation of bioinformatics approach for structural identification of protein and other genetic material
18	FOOD SPOILAGE AND FOOD PRESERVATION	DSE4	CO-1: Understand the importance of food preservation. CO-2: Educate public on the importance of food preservation. CO-3: In depth knowledge about food spoilage
	Practical		CO-1: Knowledge about food sanitation and hygiene by visiting food industries CO-2: In depth knowledge about food processing techniques
19	TECHNOLOGY OF FRUITS AND VEGETABLES	SEC1	CO-1: Understand the importance of fruits and vegetables CO-2: Knowledge about different processing techniques and preservation processes of raw and processed fruits and vegetables and their products
20	IMMUNOLOGY, TOXICOLOGY AND	SEC2	CO-1: Understand the basic of immune

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	PUBLIC HEALTH	system of human body CO-2: Learn about different toxic agents CO-3: In depth knowledge about toxic reacts in human body and their control
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Principal
Bijoy Narayan Mahavidyalaya
P.O.- Itachuna, Dt.- Hooghly.

Shalmali Chakraborty
01/08/2022

Head
Department of Nutrition
B.N. Mahavidyalaya
P.O.- Itachuna, Hooghly