# BIDHANNAGAR COLLEGE
# COURSE OUTCOMES

## DEPT OF ANTHROPOLOGY
## Course Outcomes of
## B.Sc. Anthropology (Hons) CBCS Syllabus
## With Effect from 2018-2019

**At the completion of the programme, students will be able to:**

### 1ST SEMESTER

- **ANTACOR01T:**The students are introduced to the fundamental concepts of Biological anthropology like Human Evolution, Primatology and Skeletal Anat.

- **ANTACOR01P:** Identification of Osteology Specimens and doing Anthroposcopy.

- **ANTACOR02T:** The students are introduced to the fundamental concepts of social- cultural anthropology like society & culture,family, marriage, kinship etc.

- **ANTACOR02P:** Undertaking project Report on data collection techniques like Case Study, Genealogy and Schedule &Questionnaire related to fieldwork.

### 2ND SEMESTER

- **ANTACOR03T:**Students will have introductory ideas on Archaeological Anthropology and its methods of data collection and methods of estimation of time. They will also have ideas on the climatic background behind the origin and evolution of man. Students will also have preliminary ideas about origin and evolution of human society and culture throughout the world.

- **ANTACOR03P:**Preliminary ideas on identification and interpretation of the Prehistoric artifacts will be introduced to the students.

- **ANTACOR04T:** Students will learn about origin of Hominoid group among the primates. They will also learn about origin, distribution and characteristics of extinct hominids and will also learn about process of hominization.

- **ANTACOR04P:**Students will learn about evolutionary changes among modern humans.

### 3RD SEMESTER

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# COURSE OUTCOMES

- **ANTACOR05T:** Introducing Indian Anthropology particularly through Tribes and Peasant Studies together with their problems in everyday life.

- **ANTACOR05P:** Introduce students to read and analyze Tribal Ethnography**.**

- **ANTACOR06T:** Students should be made aware of the significant dimension of Human ecology both from Biological and Cultural dimension.

- **ANTACOR06P:** Students are trained to take Anthropometric measurements and calculate different index like BMI etc.

- **ANTACOR07T:** Students are trained about the Biological Diversity in Human Populations particularly through subjects like Biological variability, Genetic Variation, Race, Health & Epidemiology & Demographic Anthropology.

- **ANTACOR07P:** Students are trained to take Craniometric measurements and calculate different index like Cranial Index, Nasal Index etc. Angular & Curvilinear measurements are also undertaken.

- **ANTSSEC01M:** The course includes study on Public Health and Epidemiology including topics like Principles of Epidemiology, Health and Culture and Epidemiology of disease.

## 4TH SEMESTER

- **ANTACOR08T:** Students are taught different theories of Culture and Society from 19th century Evolutionism to 20th century Interpretive Anthropology& Symbolic Anthropology**.**

- **ANTACOR08P:** Students are taught Theoretical text Review and also to conduct a Socio-Economic Research and prepare Report.

- **ANTACOR09T:** Students are taught the biological variables related to Human Growth and Development.

- **ANTACOR09P:** Students are exposed to Laboratory and Field Based measurement on Human Growth & development.

- **ANTACOR10T:** Students are introduced to the most important dimension of Research, the Research Methodology**.**

- **ANTACOR10P:** Students will be taught to write or construct Research Proposal

# BIDHANNAGAR COLLEGE
# COURSE OUTCOMES

- **ANTSSEC02M:** The students will learn about various types of tourism and the way anthropologists' looks at tourism. They will also learn about different aspects of tourism management.

## 5TH SEMESTER

- **ANTACOR11T:** Students will learn thoroughly about Fundamental of Human Genetics, Ecological Generics & Polymorphism, Population Genetics and Allele Frequency.

- **ANTACOR11P:** Student will conduct practical on Human Genetic traits in topics related to ABO Blood Group System, PTC tasting Ability etc.

- **ANTACOR12T:** This course will lay focus on Anthropology in Practice i.e. Applied Anthropology**.** Students will learn about application of Anthropology in Development, Constitutional Safeguards and Application of Anthropology in Archaeology as well.

- **ANTACOR12P:** Student will undertake project on Evaluation of Development programme and also visit local self-government to monitor their action for the development of the people.

- **ANTADSE01T:** Students will learn about Pleistocene chronology of India along with the evolution of culture. They will also learn about methods of climatic reconstruction.

- **ANTADSE01P:** In this paper students will learn about application of GIS technology in Archaeological exploration and also will have practical ideas of archaeological exploration.

- **ANTADSE02T:** The course will lay emphasis on Anthropology of Health in both of its Biological and Social- Cultural domain.
- **ANTADSE02P:** Students will undertake practical on Anthropology of Health through formulating research schedule on Anthropology of Health.

- **ANTADSE03T:** The course will lay emphasis on Tribal Development in India along with Tribal movements both historical and contemporary.

- **ANTADSE03P:** Students will prepare project report on Tribal community distribution in India and generate Ethno- file on the studied tribes. Students will also lay emphasis on PVTG communities.

## 6TH SEMESTER

# BIDHANNAGAR COLLEGE
# COURSE OUTCOMES

- **ANTACOR13T:** This course will impart knowledge on Forensic Anthropology and its multiple application and anatomical identification**.**

- **ANTACOR13P:** The practical course will impart knowledge on Forensic Anthropology through dermatoglyphics and physical estimation from anatomical variables like bones, sex differentiation etc

- **ANTACOR14T:** The Course imparts knowledge on Anthropology of India with special emphasis on scholars, selected institutes and village studies.

- **ANTACOR14P:** The course will introduce Book review technique to the students and project work on renowned Anthropologists.

- **ANTADSE04T:** The course lay emphasis on physiological Anthropology particularly work physiology, Impact of lifestyle disorder in human physiology and factor affecting physical capacity.

- **ANTADSE04P:** This course covers Physiological Anthropology practical like Cardiovascular function, somatotyping and Measurement of Human Body Composition.

- **ANTADSE05T:** The Course studies both the settings of Rural and Urban Anthropology**,** its different sub areas and culture traits as well as social system associated with Rural and Urban areas**.**

- **ANTADSE05P:** The Course covers practical on Rural and Urban Anthropology through field work/photography studying popular culture in the given location etc.

- **ANTADSE06P:** The course covers a mandatory Dissertation for the students who have to stay in the field amongst the community and undertake study on different aspects of social organization and material culture**.**

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**PROGRAMME SPECIFIC OUTCOME:**

- Demonstrate a fundamental or coherent understanding of Anthropology, its different learning areas and applications and its linkages with related disciplinary areas/subjects**.**
- Use holistic knowledge encompassing the Biological and Social-Cultural attributes, in understanding and identifying problems and issues substantiated by collection of relevant quantitative and/or qualitative data from wide range of resources and their application, analysis and evaluation using methodologies as appropriate for formulating evidence- based solutions and arguments.

# BIDHANNAGAR COLLEGE
# COURSE OUTCOMES

- The critical thinking skills thus generate enables students to communicate the results of studies undertaken in an academic field accurately in a range of different contexts using the main concepts.
- Apply one's disciplinary knowledge and skills to new/unfamiliar contexts rather than replicate curriculum content knowledge to identify and analyze problems and issues and solve complex problems with well-defined solutions.
- Demonstrate subject related skills that are relevant to some of the job trades, entrepreneurship band employment opportunities.

## DEPT OF ANTHROPOLOGY
## Course Outcomes of
## M.Sc. Anthropology CBCS Syllabus
## With Effect from 2018-2019

**At the completion of the programme, students will be able to learn:**

### 1ST SEMESTER

- **ANTPCOR01T:** The students will learn about various theories and processes of evolution; primate skeletal and morphological characters and their behaviour in respect of evolution; biological evolution of hominids; human variation in respect of morphological and genetic traits of human; how human body adaptations to various ecological conditions.

- **ANTPCOR02T:**
Thiscoursedealswiththebasicidentityoftheareaofhominizationalongwithitsrelevant issues. It also logically interprets the bio-cultural postulates of human evolution.

- **ANTPCOR03T:**
Thecoursesharesaninterestinsubjectmatter,distinguishingfuturesanddevelopmentofthe major sub field. It throws light on variouscomponents attributes, concepts of the coreareaof culture. Thestudentsalsohavetoacquireasoundknowledgeonethnographicapproachasthemainstay of the subfield

- **ANTPCOR04P:**This course will give ideas of some anthropometric measurements and students will learn how to use certain anthropometric instruments. Students will have basic ideas about primate ethology and about typo-technological aspects of stone tools.

# BIDHANNAGAR COLLEGE
# COURSE OUTCOMES

- **ANTPCOR05P:** In this practical course students can understand the patterns ofbehaviour incultural contexts of rural and urban society.This course also deals withthe data from differentlevels of culture and its analyses in the field.

- **ANTPAECCIM:** Thelearningoutcomes of this paper are that thestudentswilllearnabouttheimportanceoffieldworkinsocialsciencesingeneraland anthropologyin particular. Theywill learn about the steps to be taken before finalisingthe site of fieldwork.Theywillalsolearnaboutparticipantobservationandhowtoelicitthenative'spointof view. Theywill learn how touse computer and internet.

## 2ND SEMESTER

- **ANTPCOR06T:** Thestudents will learn about different methods of human genetics.Theywill learn abouthow offspringinheritgenetic traits from their parents. Theywillalsolearnaboutconceptofhumangeneticvariationwithspecialemphasison abovesaidgenetic markers. Theywill also learn basics ofhumangrowth and development.

- **ANTPCOR07T:**This course deals with the cultural sequences of prehistoric context from Palaeolithic to Chalcolithic phase. It also let the student know about the details of those cultural sequences along with their representative evidences.

- **ANTPCOR08T:** Inthiscoursetheconceptsofculturebecomemorevariegatedintheformof economy,politics,religion,languageandruralsocietyetc.Alongwithsome theoretical models of thesubfield.The courseisalso introduced mayareas of culture forthefuture research. It alsocovers interdisciplinary collaboration as a hallmark of this subfield.

- **ANTPCOR09P:**
  Fromthepracticalcomponenttheywilllearnhowtohandleanthropometricandother instruments.Theywillalsolearntoassessnutritionalstatus,inheritancepattern,ABOandRhblood type, dermatoglyphics and Colour-blind test Theywill learn to draw genealogical chart andwillidentifyits importance. Theywill also learn to review thebook alongwith its objectives andsubjectmatters.

- **ANTPCOR10P:**Students will learn about fieldwork methods and techniques of data collection, how to interpret the data and draw appropriate generalizations from the same.

- **ANTPSEC01M:** Thestudents will learn about the concepts and approaches in SIA. Thestudents will learn how to conduct an SIA and writeareport on thesame. Thecoursewillhelpstudentsregardingemployabilityingovernmentandnon-government sectors.

## 3RD SEMESTER

# BIDHANNAGAR COLLEGE
# COURSE OUTCOMES

- **ANTPCOR11T:** Students will learn about historyand developmentofIndian Anthroplogy. Theywill learn tribal situation inIndia.Theywill also learn traditional social systems ofIndia.Theywill also learn about biological diversityof Indian population

- **ANTPCOR12T:** Thestudents will learn aboutfieldwork and its relationship with anthropology.Prepaefor fieldwork and selection of fieldsite.Various methods and techniques ofdata collection.Use statistics in anthropological researchand draw inferences

- **ANTPCOR13T:** Thestudents will learn about Appliedanthropologyandthevariousfieldsinwhichanthropologicalknowledgecan be applied.Applicationof anthropologicalknowledgeinthefieldofdevelopment,modernisation, industrialisation, urbanisation, human genetics, nutrition, sports,forensic, gender etc.Applicationofanthropologicalknowledgeforthewelfareanddevelopmentofvulnerable groups.Application of archaeological anthropological knowledge in heritage management.

- **ANTPDSE01T(A):** Thestudents will learn about human evolution with special reference toevolutionarygenetics. Theory and evidences of human evolution.Selection process palaeogeographyof earlypopulation

- **ANTPDSE01T (B):** Thiscourseisconsistedoftwopartsdealwiththetheoreticalissuesofthesubfield from mid-20$^{th}$Centuryalongwith their proponents and empirical contexts. Thestudentswillbebenefitedbyknowingthedebatesaswellascriticismsofthe sameandalsotheheartofthebasicpostulateoftheoreticalunderstandinginatrans-disciplinarydimension.

- **ANTPDSE01T(C)**This course will give basic ideas about, Pleistocene environmental condition in India and the world. It will also emphasis on the Pleistocene and early Holocene cultural evolution of in India and around the world.

- **ANTPDSE02P (A):** Thestudentswilllearnaboutlinearandangularmeasurementofskullaswellas measurement oflongbones through diaptograph tracing.Theywill also learn skinfold measurements and Somatotyping.Theywill also learn computer applications fordata entryandanalysis

- **ANTPDSE02P (B):** Students can understandthe concept of traditional rural technology along with their structural functional issuesThey canalso conceive the changingpatterns of traditional technologywith their factors.

- **ANTPDSE02P (C):** Students will learn about morphometric analysis of prehistoric tools, method of drawing of potsherds. They will also learn about hardness attributes of various lithic raw materials and will also learn about basic identifying features of Pleistocene mammal fossils

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## 4TH SEMESTER

- **ANTPCOR14T:** The students will learn about basicconceptsabout health, sickness and diseasefrom Anthropological perspectives. Theywill learn about various ethnomedical practices inIndia. Theywill also learn about medical pluralism inIndia. Theywill learn differentdemographic rates andratios and its interpretations. They will learn about Environmental and ecological aspects of archaeological anthropology.

- **ANTPCOR15P:** This practical coursehelps to studydifferent aspects of biological, archaeologicaland social cultural issues for futureresearch. Thestudents also can have askill undertakingdifferent issues as their area of research individually.

- **ANTPDSE03T (A):** Thestudentswilllearnaboutgeneticpolymorphismandhowitisexplainedbyvarious theories.Theywill also learn about genetic abnormalitiesin populations and the reasons thereof. Theywill also learn about calculation of allelefrequencies.

- **ANTPDSE03T (B):** Thiscoursecontainssomerelevantsocioculturalissuesofthedaytodaylifelike Ecology,Gender, Ethnicityand Aging. Thestudyofinterrelationshipsamonghumanbeings,cultureintheecological settings, is the vital as wellas thrust areaof this course.Thecoursealsoviewstheconceptofcrossculturalvariationingenderrolesandother spheres ofculture.Finally,thiscoursewillenrichthestudentsaboutthelocalandnationalissuesrelating to gender, ethnicityand aging

- **ANTPDSE03T (C):**Students will learn about various theories of evolution and biological evolution of hominoids and hominids throughout the world; various hypotheses regarding origin of genus homo and modern human, hominization process and evolution of technology.

- **ANTPDSE04T (A):** Thestudents will learn about the concepts ofgrowth, maturation and development. Theywill learn about factors responsibleforgrowth. Theywill also learn about various methods of somatotyping. Theywill learn abouthuman reproductivesystems and reproduction. Theywill learn nutrition and its assessments.

- **ANTPDSE04T (B):** Thiscoursedealswiththeunderstandingofbusinessandorganizationaswellasrule governed behaviour under the purviewof business/organizational anthropology.In the present-daydynamicworldstudentscanunderstandthesocioculturaldimensionof globalbusinessnetworkthroughdiscoursealongwithbusinessissues,businessgroup, organizational structure,changediversityandglobalization. Thiscoursealso throws lights on the important areaof tourism and its sustainability. Theotherpartofthecourseconsistsofthemostrelevantissueofsocietyi.e.Human rightsstudentscanconceptualisedthestateasthefundamentaltasktocreateand effort adequate protection of people alongwith the realization of human rights. Theothertwounitsalsothrowtootherpertinentissueslikecommunicationand globalization

# BIDHANNAGAR COLLEGE
# COURSE OUTCOMES

- **ANTPDSE04T (C):** Students will learn about the importance of experimental approach in archaeological research; Some advanced approaches and methods in stone tool analysis and the importance of debitage or waste flakes in lithic analysis. They will also learn about some methods of debitage analysis.

- **ANTPDSE05P (A):** Thestudentswilllearnaboutidentificationonthebasisofvariousbiologicalmaterialslike finger prints, blood stainsetc. Theywill learn about sexchromatin identification and karyotyping. Theywill also learn preparation and identification of PTC threshold values. 4. Theywill learn how tomeasure and interpret blood pressure.

- **ANTPDSE05P (B):** Thestudentswilllearnabouthowtoprepareaprojectfordevelopmentandhowtoreviewa development project.

- **ANTPDSE05P (C)):** Students will have practical knowledge about basic petrographic attributes of various lithic raw materials. They will also have ideas about identification of macroscopic use breakages in lithic artifacts and will learn to classify artifacts on the basis of use breakages.

**PROGRAMME SPECIFIC OUTCOME:**

1. **Each subfield of Anthropology uses distinctive methods for examining humanity as depicted in the course.**
2. **For students, anthropology will create a holistic and global awareness and a deep appreciation of human biology and culture both past and present.**
3. **By evaluating Anthropological issues and data, students will develop critical thinking skills.**
4. **The process of Anthropological inquiry exploring other cultures and biology; and comparing their to one's own shades light on one's personal situation as a human being in a particular time and space.**

# DEPT OF BENGALI
# Course Outcomes of
# B.A. Bengali (Hons) CBCS Syllabus
# With Effect from 2018-2019

At the completion of this program, students will be able to:

- PSO1 : Students completing B.A. (Hons) Programme will be able to learn the basic concepts of Bengali Language, the history of the language and they will gain love and respect towards Bengali language, which for most students is their Mother Tongue.
- PSO2 : After the completion of the course, the students will gain knowledge about Bengali Literature, it's vast landscape and multicultural, multi religious aspects.
- PSO3 : After reading the history of Bengali literature, poems, essays and novels, carefully curated in the syllabus, the students will have a better understanding of Humanity and Tolerance.
- PSO4 : Students will get the knowledge about the technical aspects of Literature, i.e. Poetics, Figure of Speech, Idioms, Poesy etc.
- PSO5 : Students completing the B.A. (Honours) course in Bengali, will be able to apply to universities for P.G. Programme in the specific subject they have got their Honours degree in and as well as in other related subjects like Linguistics, Comparative Literature etc.
- PSO6 : After getting the B.A. (Hons.) degree in Bengali, students can appear for UPSC, WBPSC, WBSSC and other professional examinations.
- In the field of literature, students may be able to critically analyse texts of various genres in literature and thus can work successfully as story writer, script writer of Television and other Medias.

Course Outcome or Learning Outcome
Three year B.A. (Honours) Degree Course
Under CBCS semester system
HONOURS COURSE IN BENGALI

**Course Name: Core Course-1**
**Course Code: BNGACOR01T**
**Course Title: Pre-Modern History of Bengali Literature**

Course Outcome (CO) :At the end of this course a student learns the different periods of Premodern Bengali Literature and the outlines of various texts, like Mangalkavyas, ChaitanyaJivanis etc. A student may also learn about the poets of this era and their philosophical point of views.

**Course Name: Core Course-2**
**Course Code: BNGACOR02T**
**Course Title: Pre-Modern Bengali Literature**

CO – In this course a student can learn about Vaishnava and Sakta philosophy-based texts and their rich heritage of lyric poetry. Also the students are able to take a first-hand experience of reading and analysing a MangalKavya and a ChaitanyaJivani (Chandimangal of Mukunda and ChaitanyaBhagabat of Brindavanadas), a history of which the student learns in the previous course (CC1).

**Course Name: Core Course- 3**
**Course Code: BNGACOR03T**
**Course Title: Linguistics**

CO - Students will gain a strong idea about the origin and development of Bengali language. They can learn different Dialects of Bengali language, Philological and Phonological elements of Bengali language after the completion of this course.

**Course Name: Core Course- 4**
**Course Code: BNGACOR04T**
**Course Title: History of Modern Bengali Literature**

CO – Starting from the Early Bengali Prose form, a student can learn the evolution of Bengali

Prose, Poetry, Novel and Drama with the biographical elements of the eminent Poets,

Essayist and Novelists. This course prepares the students for detailed study of Bengali Literature in the various courses by teaching them the outlines of the modern Bengali Literature with different periods of Modern Literature.

**Course Name: AECC2**
**Course Code: BNGSAECO1M**
**Course Title:Pronunciation and Spelling of Bengali Language**

CO – In this course a student can learn the spoken Bengali language by the study of Sahaja Pathh by Tagore and by studying Sandhhi, Samaasa, etc. of Bengali grammar. In this way a student will be able to use the language in a proper way in spoken and written manner.

**Course Name: Core Course- 5**

**Course Code: BNGACOR05T**
**Course Title: Bengali Chhando & Alamkara**

CO – In this course Bengali Chhando and Alamkaras are taught to enhance the technological knowledge of a student in Bengali Poetry and Prose. The three types of Bangla Chhando is the main pillar of Bengali poetry. So, after the completion of this course, a student would be able to analyse poetry in the formal manner and would be able to improve their creative writing skill as well.

**Course Name: Core Course- 6**
**Course Code: BNGACOR06T**
**Course Title: History of Bengali Theatre**

CO – After the completion of this course, a student can learn the different periods and the history of Bengali Theatre and stage. They can learn about the European influence to Bengali Stage and theatre, with a special focus on the history and development of Bengali Proscenium Stage.

**Course Name: Core Course- 7**
**Course Code: BNGACOR07T**
**Course Title: Bengali Prose and Essay**

CO –This course is designed to help students develop in-depth knowledge of Bengali Prose, which started its journey in early $19^{th}$ century, but evolved in the later part of the century. After the completion, the student can grow knowledge about the development of prose and essays from Bankimchandra (B. 1838) to Abanindranath Tagore (D. 1951) by studying the selected texts of these writers.

**Course Name: Generic Elective - 3**
**Course Code: BNGHGEC03T**
**Course Title: Biography**

CO – After the completion of this course, a student can learn about the definition and development of Biography as Literature. They will study different biographies from different stratus of Bengali society, written in different time frames.

**Course Name: SEC - 1**
**Course Code: BNGGSECO1M**
**Course Title: Cinema And Literature**

CO – This course will teach the relationship between Cinema and Literature, with a special focus on the thoughts of Late Satyajit Ray. Students will be benefitted by learning the basics

of Cinema and the use of literature in it. By the very design of this course, students will be able to use the acquired knowledge to their job, which may be in media, involving script writing.

**Course Name: Core Course- 8**
**Course Code: BNGACOR08T**
**Course Title: Bengali Poetry and Poems**

CO – From Literary Epics to Lyrical Poetries, Bengali poetry has travelled a long path in its course. After the completion of this course, a student can learn the essence of Bengali poetry and its development. From Madhusudan Dutta to Joy Goswami (end 20$^{th}$ CE), the development is essential part of the knowledge base, a student of Bengali Literature should have.

**Course Name: Core Course- 9**
**Course Code: BNGACOR09T**
**Course Title: Tagore Literature**

CO – In this course, a student learn the analysis of the works of Rabindranath Tagore's Prose and letters.

**Course Name: Core Course- 10**
**Course Code: BNGACOR010T**
**Course Title: Types of Literature and Indian Poetics**

CO – This course is designed to develop deep knowledge in a student on Literary Types. By the study of different Genre, a student can learn the technique of different forms. By learning this, a student will be able to analyse the content more effectively with the help of the knowledge of Literary Forms.

**Course Name: Generic Elective - 4**
**Course Code: BNGHGEC04T**
**Course Title: Bengali Children's Literature**

CO – After the completion of this course, a student will be familiar with Bengali Children's Literature. This Genre and reading different Texts will make a student more effective analyst of Bengali Literature. The introduction of Bengali Children's Literature can open the scope of a script writer for children in a student's mind.

**Course Name: SEC - 2**
**Course Code: BNGSAECO1M**

**Course Title: Printing and Publication**

CO – This course is designed to help a student in the works of printing and publication. In a fast-changing world, the techniques of printing and publishing are always changing for betterment. After the completion of this course, a student will be able to handle the works in a publishing house, and thus this course will enhance the chances of creating a good job profile in a student.

**Course Name: Core Course - 11**
**Course Code: BNGACOR011T**
**Course Title: Bengali Novel**

CO – This course will improve the literary analysing power of a student by the study of Bengali Novels. From the Historical novel of Bankin Chandra Chattopadhyay to the New Novel type of Manik Bandopadhyay, a student's journey in this course will make him or her a good critic of literature. By this, the student can opt for script writing career in TV and other medias.

**Course Name: Core Course- 12**
**Course Code: BNGACOR012T**
**Course Title: Bengali Short Story**

CO – After the completion of this course, a student can analyse short story techniques. Through reading of short stories by various short story writers in the contemporary language, students will be able to gain an accurate idea about social life and philosophy of life.

**Course Name: DSE – 2**
**Course Code: BNGADSE02T**
**Course Title: Biographical Literature and Essays**

CO – In this course, a student will learn the philosophies and life of some great Bengali personalities and their style and craft of essays.

**Course Name: DES - 3**
**Course Code: BNGADSE03T**
**Course Title: Bengali Poetry and Poetics after Tagore**

CO – Bengali poetry created different forms and content after the era of Tagore. In this course, a student can learn the philosophies of newer Bengali poets and their works.

**Course Name: Core Course- 13**
**Course Code: BNGACOR013T**
**Course Title: History of Literature of Sanskrit, English, Hindi and Assameese**

CO – Indian Literature is deeply connected through the different provincial literature by content and forms. In this course, a student can understand the connectivity of different literature of different parts of India. After the completion of this course, a student will gain more power to analyse Indian texts and also the core essence of Unity in Diversity in Indian society.

**Course Name: Core Course- 14**
**Course Code: BNGACOR014T**
**Course Title: Travel Literature**

CO – As the course name suggests, a student can learn a different Genre, Travel Literature through selected Bengali Travel Literature texts. Study of Travel literature can make a student more tolerant through experiencing different culture and habits via texts.

**Course Name: DSE – 4**
**Course Code: BNGADSE04T**
**Course Title: Bengali Drama and Dramaturgy**

CO – After the completion of this course, a student can learn the basics of Bengali drama form and different thoughts about drama of great dramatists.

**Course Name: DSE – 6**
**Course Code: BNGADSE06T**
**Course Title: Life, Works of Rabindranath Tagore and Related Texts**

CO – In this course a student can find the way of Life and achievements through social works of Tagore. After the completion of this course, the student can analyse the importance of the Life of Tagore in Indian society. Thus, a student will be able to relate Literary and Social works of a Poet trough the related texts of Tagore.

## DEPT. OF Botany
## Course Outcomes of

# B.Sc. Botany (Hons) CBCS Syllabus
# With Effect from 2018-2019

At the completion of the programme the students will be able to -

| **Course Name:** | **Core Course- I** |
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| **Course Code:** | **BOTACOR01T, BOTACOR01P** |
| **Topic Name:** | **Phycology and Microbiology** |
| **Course Outcome:** | After successful completion of both theory and practical modules of this course student learns: -<br>1) Properties of virus, structure, reproduction and uses of virus as vaccine. 2) The cell structure of bacteria, its distribution in nature and systematic position, reproduction, importance in agriculture and industry.<br>Distribution of algae in land, water and sea, cell's structure, morphology reserve food materials and uses of algae.<br>Sterile environment, instrument uses to sterile glass goods and chemical sterilant, process of aseptically transfer of organisms. 5) Observe bacteria under microscope after proper staining.<br>6) Drawings and measurement of microscopic organisms like algae, and observe cell structure of algae under microscope. |

| **Course Name:** | **Core Course- II** |
|---|---|
| **Course Code:** | **BOTACOR02T, BOTACOR02P** |
| **Topic Name:** | **Biomolecules and Cell Biology** |
| **Course Outcome:** | The significance and structure of different types of chemical bonds. The Uniqueness of the structure and properties of water along with the importance of pH and buffers in biological systems. The structure and function of Biomolecules, Carbohydrates, Lipids, Proteins and Nucleic acids, the most critical organic molecules present in a living cell that regulate the overall metabolic processes of living organisms.<br>The Laws of thermodynamics, the concept of free energy and energy coupled reactions in cell metabolism. The structure and role of ATP as an energy currency of the cell. The importance, structure and function and classification of enzymes- the biological catalyst. The mechanism of enzymes function. Michaelis – Menten equation and Lineweaver-Burk Plot, enzyme inhibition and factors affecting the activity.<br>The structure and function of the cell- Characteristics of prokaryotic and eukaryotic cells, how the eukaryotic cell originated (Endosymbiotic theory). Chemical composition, structure, functions of plant cell wall and plasma membrane- fluid mosaic model. Different types of membrane transport processes.<br>The Structure of nucleus -nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. The structure and function of cell cytoskeleton, structural organization of chloroplast, mitochondria and peroxisomes; semiautonomous nature of mitochondria and chloroplast. The Structure, targeting and insertion of proteins in the ER, protein folding, processing; smooth ER and lipid synthesis, export of |

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| | proteins and lipids; Golgi apparatus – organization, protein glycosylation, protein sorting and export from golgi apparatus; lysosomes. The various stages of mitotic and meiotic cell |
| | division;, phases and regulation of cell cycle. Check point and role of protein kinases in cell cycle.<br>5. In the laboratory through practical assignments, an acquaintance with the qualitative test of carbohydrates, different types of sugars, lipids, proteins and cell measurement by micrometry. Cell count by hemocytometer, effects of solvents and temperature on membrane permeability. Process of staining DNA by Feulgen stain and the different stages of mitotic and meiotic cell division. |

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| **Course Name:** | **Core Course- III** |
| **Course Code:** | **BOTACOR03T, BOTACOR03P** |
| **Topic Name:** | **Mycology and Phytopathology** |
| **Course Outcome:** | At the end of this course (both theoretical and practical) a student learns<br>1. Basic concepts of Fungi, their unique features, mode of reproduction and classification.<br>2. General characteristic features, ecology, thallus organization, life cycle pattern of Chytridiomycota, Zygomycota, Ascomycota, Basidiomycota, Oomycota and Allied Fungi.<br>3. Brief idea of symbiotic associations of Lichen and Mycorrhiza.<br>4. Role of Fungi in Biotechnology and their applications.<br>5. Concepts of Phytopathology, host-parasitic interaction and disease cycle. |

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| **Course Name:** | **Core Course- IV** |
| **Course Code:** | **BOTACOR04T, BOTACOR04P** |
| **Topic Name:** | **Archegoniate** |
| **Course Outcome:** | At the end of this course (both theoretical and practical) a student learns<br>1. Evolution of early land plants; their adaptations,<br>2. Evolution of vascular cryptogams and early seed plants,<br>3. Systematic positions and life history of some selected species,<br>4.Structural details of reproductive and vegetative parts,<br>5.Economic and ecological implications of the group. |

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| **Course Name:** | **Core Course- V** |
| **Course Code:** | **BOTACOR05T, BOTACOR05P** |
| **Topic Name:** | **Morphology and Anatomy** |
| **Course Outcome:** | After successful completion of both theory and practical modules of this course the students will learn:<br>Concepts of different types of inflorescences and their evolution.<br>Flowers with its different parts along with cohesion and adhesion of stamens and primitive and advanced types of carpel.<br>Internal organisation of plant body – tissue system types, cytodifferentiation.<br>Vascular cambium, secondary growth of plants, epidermal tissue system and adaptive features of plant. |

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| **Course Name:** | **Core Course- VI** |
| **Course Code:** | **BOTACOR06T, BOTACOR06P** |
| **Topic Name:** | **Economic Botany** |

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| **Course Outcome:** | After completing the above course successfully, students will be able to have clear ideas on:<br>Origin of cultivated crop with special reference to Vavilov's theory.<br>Origin, morphology, cultivation and uses of different cultivated crops such as cereals, oil yielding crops, rubber, beverages, fibre and medicinal plants.<br>Different micro chemical tests - Millon test- Soyabean, Sudan IV test- Groundnut,<br>Molisch test- Sugarcaane. |

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| **Course Name:** | **Core Course- VII** |
| **Course Code:** | **BOTACOR07T, BOTACOR07P** |
| **Topic Name:** | **Genetics** |
| **Course Outcome:** | 1. The students will gain a basic understanding onthe principles of Mendelian concepts, deviation from Mendelian inheritance with examples, concepts of multiple alleles and mechanism of sex determination in different organisms.<br>2. The students will also learn the concepts of chromosome and the prokaryotic and eukaryotic organisation of chromosomes. They will understand extrachromosomal inheritance pattern and different chromosomal anomalies with<br>respect humans' plants and animals.<br>3. Upon successful completion of this course student should be able to study linkage, crossing over and mutation of the genetic material at molecular level and have an advanced understanding of the modern concept of gene. In addition, they will have an understanding of quantitative genetics and population genetics.<br>4. From practical courses, they will be able to learn mitotic and meiotic slide preparations using plant specimens. They will also learn various genetic diseases and will have a concept of karyotype for finding various genetic disorders. |

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| **Course Name:** | **Core Course- VII** |
| **Course Code:** | **BOTACOR08T, BOTACOR08P** |
| **Topic Name:** | **Molecular Biology** |
| **Course Outcome:** | 1. Upon successful completion of this course student should be able to learn and understand the concepts of central dogma of molecular biology, concept of DNA and RNA as genetic material through experimental techniques, Study the structure of DNA and RNA, and its types.<br>2. They will be able to learn the mechanism of DNA replication in prokaryotes and eukaryotes, mechanism of transcription as well as mRNA processing before protein synthesis.<br>3. They will have a concept of ribozyme, protein synthesis machinery in prokaryotes and eukaryotes along with the regulatory mechanism of genes in both eukaryotes and prokaryotes. |

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| | 4. From practical course they will be able to isolate DNA and learn various molecular mechanisms through photographs and demonstrations. |

| **Course Name:** | **Core Course- IX** |
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| **Course Code:** | **BOTACOR09T, BOTACOR09P** |
| **Topic Name:** | **Plant Ecology and Phytogeography** |
| **Course Outcome:** | Students will be apprised of –<br>1. The physical and the biotic factors and their interplay<br>2. Population ecology dynamics<br>3. Aspects of Community ecology<br>4. Ecosystem functioning – energy flow & biogeochemical cycling<br>5. Knowledge of Biome and Biosphere, phytogeographical regions<br>6. Handling weather monitoring instruments, soil-water analysis and phytosociology. |

| **Course Name:** | **Core Course- X** |
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| **Course Code:** | **BOTACOR10T, BOTACOR10P** |
| **Topic Name:** | **Plant Systematics** |
| **Course Outcome:** | After completing the above course successfully, students will be able to have clear ideas on:<br>1. Systematics- identification, nomenclature and classification.<br>2.Data sources analysis for plant systematics evidences from palynology, cytology, phytochemistry and molecular data.<br>3. Principles of ICN, typification, author citation, priority, valid publication.<br>4. Brief idea of classification of Bentham Hooker, Englar Prantle and Angiosperm Phylogeny Group.<br>5. Numerical Taxonomy and Phylogeny of Angiosperms. |

| **Course Name:** | **Core Course- XI** |
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| **Course Code:** | **BOTACOR11T, BOTACOR11P** |
| **Topic Name:** | **Reproductive Biology of Angiosperms** |

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| **Course Outcome:** | After completing the above course successfully, students will be able to have clear ideas on:<br>1. Flower development – both genetic and molecular aspects<br>2.Microsporogenesis and microgametogenesis, pollen germination and viability<br>3.Megasporogenesis and gametogenesis, organisation of mature ovule<br>4. Self-incompatibility and in-vitro fertilisation<br>5. Structure and development of embryo, endosperm and seed. |

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| **Course Name:** | **Core Course- XII** |
| **Course Code:** | **BOTACOR12T, BOTACOR12P** |
| **Topic Name:** | **Plant Physiology** |
| **Course Outcome:** | After successful completion of both the theoretical and practical modules the students would get in-depth knowledge about the<br>1. Water absorption by roots, water movement and transpiration.<br>2. Use of macro and micronutrients, mineral deficiency symptoms and roles of essential elements.<br>3. Transport of ions across cell membrane, role of ATP, proton ATPase pump, ion flux and movement of solute with the help of proteins. |
| | 4.Translocation in the phloem, source- sink relationship, phloem loading and unloading<br>5. Bioassays and physiological roles of different phytohormones.<br>6. Physiology of flowering, vernalization and seed dormancy.<br>7. Mode of actions of phytochromes, crytochromes and phototropins.<br>8. In practical classes students get acquainted with methods of determination of osmotic potential of plant cell and plant tissue (potato tuber), effect of different environmental factors on the rate of transpiration They also get ideas about stomatal index, stomatal frequency and the proportion of area covered by stomatal pore with respect to the total leaf area in different plants. |

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| **Course Name:** | **Core Course- XIII** |
| **Course Code:** | **BOTACOR13T, BOTACOR13P** |
| **Topic Name:** | **Plant Metabolism** |
| **Course Outcome:** | After studying the course, the following outcome is expected:<br>1) An in-depth knowledge on the photosynthetic carbon assimilation and respiratory carbon oxidation.<br>2) A detailed concept on the carbohydrate, lipid and nitrogen metabolism. 3) A clear understanding of the mechanism of ATP synthesis and signal transduction.<br>4) In Practical course, the students get acquainted with the separation and spectro-photometric analysis of photosynthetic pigment. Students learn about the interacting factors responsible for photosynthesis and |

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| | respiration as well as the different enzyme activity during seed germination. |

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| **Course Name:** | **Core Course- XIV** |
| **Course Code:** | **BOTACOR14T, BOTACOR14P** |
| **Topic Name:** | **Plant Biotechnology** |
| **Course Outcome:** | 1. Familiarise the students with basic concepts of genetic engineering and describe the versatile tools and techniques employed in genetic engineering.<br>2. The course includes structures and methods of various cloning vectors: prokaryotic (pBR322, Ti plasmid, BAC); lambda phage, cosmid; eukaryotic vectors (YAC).<br>3.Students will be acquaintedwith the *Agrobacterium* mediated gene transfer mechanisms will be able to gain knowledge on the various applications of genetically modified organisms (GMO'S)<br>4. They will also understand the applications of recombinant DNA technology from academic and industrial perspective.<br>5. From practical course they will be able to isolate DNA and learn the DNA estimation process. Students will study the structure of vector molecules through charts and photographs and learn the experiments of restriction enzyme digestion, ligation of DNA fragments. |

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| **Course Name:** | **Discipline Specific Electives (DSE)** |
| **Course Code:** | **BOTADSE01T, BOTADSE01P** |
| **Topic Name:** | **Natural Resource Management** |
| **Course Outcome:** | After successful completion of both the theoretical and practical module |

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| | students will get an idea about:<br>1. Types of Natural Resources – Land, Water, Forest Energy<br>2. Utilization and management of the same<br>3. Concept of sustainable development<br>4. Idea about EIA, GIS, Ecological footprint<br>5. Domestic waste management, plant cover and dominance. |

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| **Course Name:** | **Discipline Specific Electives (DSE)** |
| **Course Code:** | **BOTADSE03T, BOTADSE03P** |
| **Topic Name:** | **Industrial and Environmental Microbiology** |
| **Course Outcome:** | After studying of the course both theory and practical and visiting to an industry the following outcome is expect: -<br>1) Uses of microbes in industry and environment, and uses of low-price raw materials for industry or by-products of other industry.<br>2) Structure and uses of different types of fermenter/Bioreactors.<br>3) Production and uses of citric acid. alcohol, antibiotics like penicillin, glutamic acid. Method, advantages and application of immobilization enzymes,uses of lipase and amylase in different industry.<br>4) Also know the role of microbes as biofertilizers, remediation of pollutant contaminated soil.<br>5) Water borne diseases and sewage treatment, water purification procedures before municipality supply, detection of coliform bacteria in water. 6) Use to handle different instruments in microbiology laboratory and preparation of media. |

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| **Course Name:** | **Discipline Specific Electives (DSE)** |
| **Course Code:** | **BOTADSE04T, BOTADSE04P** |
| **Topic Name:** | **Analytical Techniques in Plant Sciences** |

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| **Course Outcome:** | 1.The concepts of Imaging related techniques such as Light microscopy, Fluorescence microscopy, Confocal microscopy, Flow cytometry (FACS) Chromosome banding, FISH, chromosome painting. Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching. These techniques are important for plant science research. Techniques related to different types of centrifugation.<br><br>2. Use of radioisotopes and spectrophotometry frequently used in plant science research. They also learn about the chromatography techniques such as Paper chromatography Column chromatography, TLC, GLC, HPLC, Ion-exchange chromatography, molecular sieve chromatography, affinity chromatography.<br>3. The different types of techniques used in characterization of proteins and nucleic acids- mass spectrometry, X-ray diffraction, X-ray crystallography, electrophoresis, AGE, Native-PAGE, SDS-PAGE and different blotting techniques.<br>4. Representation of research data through statistical methods using arithmetic mean, mode, median; measures of dispersion: Range, mean deviation, variation, standard deviation and Chi-square test for goodness of fit. |
| | 5. In the laboratory through practical assignments, hands-on training on protein estimation, paper chromatography, TLC, PAGE, AGE. Students also learn the differential staining methods of plant tissues. |

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| **Course Name:** | **Discipline Specific Electives (DSE)** |
| **Course Code:** | **BOTADSE06T, BOTADSE06P** |
| **Topic Name:** | **Biostatistics** |
| **Course Outcome:** | After successful completion of both the theoretical and practical module students will get an idea about:<br>1.Types and methods of data collection procedures and data presentation 2. Statistical calculation of mean, median, mode, standard deviation, mean deviation, quartile deviation and Co-efficient of variations<br>3. Understanding and learning about the calculation procedures of correlation, regression, simple regression equation and fitting prediction,<br>4. Identification of appropriate tests to perform hypothesis testing-simple hypothesis, student 't' test and chi square test. |

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| **Course Name:** | **Generic Electives (GE)** |
| **Course Code:** | **BOTHGEC01T, BOTHGEC01P** |
| **Topic Name:** | **Biodiversity (Microbes, Algae, Fungi and Archegoniate)** |
| **Course Outcome:** | After the completion of the course students will learn the followings: -<br>1) Single genetic material like DNA or RNA virus, their discovery and reproduction and their importance.<br>2) Habit& Habitat of Biodiversity and transition to land habit.<br>3) Morphology, cell structure, stem anatomy, life cycle and economic importance of Bacteria, Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.<br>4) Primitive and advance type of plants.<br>5) Symbiotic association-Lichen, Mycorrhiza. |

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| **Course Name:** | **Generic Electives (GE)** |
| **Course Code:** | **BOTHGEC02T, BOTHGEC02P** |
| **Topic Name:** | **Plant Ecology and Taxonomy** |
| **Course Outcome:** | After completing the above course successfully, students will be able to have clear ideas on:<br>1. Ecological factors, Shelfordlaw of tolerance. Adaptation of hydrophytes and xerophytes.<br>2.Plant community, succession, food chain, food web, ecological pyramid<br>3.Biogeograpgical zone and endemism<br>4. Identification, Classification, Nomenclature of Plant Taxonomy |
| | 5. Principles and rules (ICN),ranks and names, binominal system, typification, author citation, valid publication, Bentham& Hooker Classification, Cronquist's classification, Numerical Taxonomy and Cladistics. |

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| **Course Name:** | **Generic Electives (GE)** |
| **Course Code:** | **BOTHGEC03T, BOTHGEC03P** |
| **Topic Name:** | **Plant Anatomy and Embryology** |
| **Course Outcome:** | After successful completion of the above course, students will be able to understand clearly:<br>1. Structural features of different meristematic and permanent tissues, dicot and monocot root, stem and leaf<br>2. A detailed study on the plant secondary growth, adaptive and protective systems.<br>3. Structural organization of flowers, embryo and endosperms<br>4. A concept on the pollination and fertilization, apomixis and polyembryony 5. In the Laboratory, study of meristems, simple and complex tissues, stem, root and leaf anatomy, structure of anther and ovules through permanent slides. |

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| **Course Name:** | **Generic Electives (GE)** |
| **Course Code:** | **BOTHGEC04T, BOTHGEC04P** |
| **Topic Name:** | **Plant Physiology and Metabolism** |
| **Course Outcome:** | At the end of both the theoretical and practical courses the students will get clear ideas on:<br>1. Water potential and its components, transpiration and root pressure.<br>2. Mineral nutrition, active and passive transport, phloem loading and unloading 3. Different types of photosynthetic pigments, Photosystems, Electron transport, mechanism of ATP synthesis, C3, C4, CAM pathways, mechanism of respiration and photorespiration.<br>4. Structure, properties and mechanism of enzyme catalysis and inhibition.<br>5. Biological nitrogen fixation, nitrate and ammonia assimilation.<br>6. Physiological roles of different phytohormones, physiology of flowering, vernalization and seed dormancy.<br>7. Photoperiodism, phytochrome and vernalization.<br>8. In practical classes students get acquainted with some methods of determination of osmotic potential of plant cell, effect of different environmental factors on the rate of transpiration, calculation of stomatal index and stomatal frequency, effect of bicarbonate concentration on oxygen evolution in photosynthesis and comparison of the rate of respiration in different parts of a plant. They will also get experience |

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| | about the effect of auxins on rooting, suction due to transpiration and R.Q. |

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| **Course Name:** | **Skill Enhancement Courses Elective (SEC)** |
| **Course Code:** | **BOTSSEC01M** |
| **Topic Name:** | **Plant Diversity and Human Welfare** |
| **Course Outcome:** | The students will be apprised of-<br>1. Plant diversity- types, importance, loss and management practices 2. Methods of conservation |
| | 3. Role of National and International NGOs 4. Utility plants. |

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| **Course Name:** | **Skill Enhancement Courses Elective (SEC)** |
| **Course Code:** | **BOTSSEC02M** |
| **Topic Name:** | **Ethnobotany** |

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| **Course Outcome:** | At the end of this course a student learns<br>1) Concept, scope and objectives of ethnobotany and importance of ethnobotany in modern day.<br>2) Uses of plants by minor and major ethnic groups or Tribals of India as food plants, intoxicants and beverages, resin and oils etc.<br>3) Methodology of Ethnobotanical studies, conservation of plant genetic resources, preserved endangered plants around temples and sacred places.<br>4) Role of ethnobotany in modern medicine.<br>5) To protect the interest of ethnic groups and sharing of our ethnic wealth concepts in legal way. |

**DEPARTMENT OF BOTANY**
**PROGRAMME SPECIFIC OUTCOME**
**M.Sc. Botany CBCS Syllabus**
**w.e.f. 2019 onwards**

At the completion of the programme the students will be able to -

# Program Specific Outcome

1. Botany as a discipline through the past decades has been transforming itself rapidly through interdisciplinary and technological inputs which have brought about a paradigm shift in our knowledge and understanding the diversity of plant and microbe life as well as their interaction.

2. New niche areas in plant developmental biology, molecular ecology, statistical genetics, transcriptomics of stress interactions of plants, next gen sequencing, predictive models of decision support systems combining large data as well as artificial intelligence and population genetics studies in preventing disease losses, structural modelling and phylogeny constructions through bioinformatics have been created due to cutting edge research in these fields which are now all a part of the Plant sciences.

3. The M.Sc. program in Botany endeavors to expose the student to these changes in order to bridge the traditional boundaries of the subject and excite him/her not only to carry on further higher studies but also to prepare him for the future workplace. These concepts and skills are developed from core and elective courses, many of which include current relevant topics taught from review papers, students' projects, and in part by the research programs undertaken by the department.

4. The M.Sc. program links current research findings and developments in the field and allied areas with the subject specializations in a holistic way.

5. The students in general are familiarized with the diversity of life in natural habitats which are then identified and characterized in the laboratory, identified using both traditional and molecular methods using some of the latest techniques and where feasible partial genomes sequenced and phylogenies constructed. This allows the students to be exposed to the whole gamut of process that he/she would face in a real work environment.

6. Exposure to biochemical and molecular pathways in plants through real life problems of ecological bioremediation, etc., are emphasized.

7. The USP of the program is that the endeavor is always to prepare and expose the student to translational research as far as applicable for the various streams in Botany if not fully through the practical syllabus then at least through the theoretical syllabus.

**DEPT OF BOTANY**
**Course Outcomes of**
**M.Sc. Botany CBCS Syllabus**
**With Effect from 2019-2020**

# SEMESTER-I

## Departmental 1: INTEGRATED LIFE SCIENCES (ILS)

**Course outcome**:

1. This integrated life science course will introduce the students to basic common arenas of life sciences such as basic cell structure, function, cell signaling, cancer biology, immunology, development, molecular biological techniques, Mendelian genetics and basic biostatistics.
2. This course will greatly assist the students following other harder courses in the later part of semesters.

## Departmental 2: DIVERSITY OF PLANT LIFE-ALGAE & BRYOPHYTES

**Course outcome**:

1. Completion of the course will familiarize the student with diversity of the major life forms of algae and bryophytes.
2. The students learn the biology, genetic structure, phylogeny, interrelationships, role in environment as well as their commercial uses and industrial applications.

## Departmental 3: FUNGAL & OOMYCETE BIOLOGY

**Course outcome**:

1. This course introduces major roles of Fungi and Oomycetes in ecosystem from the degradation of organic matter and nutrient cycling to plant symbioses and as pathogens of plants, animals, and humans.
2. Fungi and oomycetes, the most destructive pathogens of plants play a central role in the development of plant pathology as a discipline.

## Departmental 4: PLANT VIRUSES & BACTERIA

**Course outcome**:

Upon successful completion of this course the student will be able to

1. Understand the general structure and functions of the prokaryote, microbial growth and different microbial growth controlling factors and about the different types of culture media, the role of microorganisms in food and pharmaceutical industry, their sources, methods of disinfection, sterilization and preservation of food and pharmaceutical formulations.
2. Understand the microbial genetics and the different diseases caused by the plant bacteria and their control.
3. Understand the architecture of viruses, their classification and the methods used in their study, general replication strategies of viruses
4. Comprehend the role of viruses in improvement of the plant resistant against the plant viruses, and ways of preventing/management of the viral infections and the plant viruses that can be used as tools to study biological processes, such as cloning vectors and for gene transfer.

## Departmental 5:-LABORATORY COURSE

**Course outcome**:

**1.** This laboratory course aims at making the student familiar with the diversity of algae, bryophytes, fungi, oomycetes, bacteria and viruses in various habitats, their identification using both morphological and modern molecular techniques including use of phylogenetic software/(s).

**2.** The students will also be acquainted with various commonly used molecular biology techniques in plant sciences.

## SEMESTER-II

### Departmental 6: ANGIOSPERM SYSTEMATICS

**Course outcome**: The course will equip the student to

1. Understand the origin and diversification of flowering plants.
2. Familiarity with the advanced aspects of the principles of taxonomy (identification, nomenclature, classification of flowering plants), evolution (speciation, reproductive biology, adaptation, convergence, biogeography), and phylogenetics (phenetics, cladistics, morphology and molecules).
3. Do systematic survey of plant families, understand the evolutionary processes and patterns in the major families and develop expertise on the representative families and local flora.

## Departmental 7: PLANT ECOLOGY & ENVIRONMENTAL BIOLOGY

**Course outcome**:

1. This course familiarizes the students about issues of plant ecology and the environments.

2. The interspecies competition, resilience study, biodiversity assessment, themes of conservation based on ecology are the major areas of study that will introduce students to the state-of-the-art knowledge about ecology and environment.

3. Students will be really benefitted by learning about this very contemporary branch of botany.

## Departmental 8: PLANT PATHOLOGY & CROP PROTECTION

**Course outcome**:

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

1. Understand the importance of diseases caused by representative pathogens
2. Understand the molecular mechanism of host –pathogen interaction and disease resistance, and its translational use for the development of disease resistant plants through genetic engineering
3. Identification of the diseases based on the symptoms and their control measures and understanding of disease control strategies with special reference to principles of plant viral disease management

## Departmental 9: DIVERSITY OF PLANT LIFE - PTERIDOPHYTES, GYMNOSPERMS, PALAEOBOTANY &PALYNOLOGY

**Course outcome**:

Completion of the course will

1. Familiarize the student with diversity of the major life forms of pteridophytes and gymnosperms as well as their fossil members, their biology, phylogeny, interrelationships, role in environment as well as their commercial uses and industrial applications.
2. Equip the student to understand the evolutionary interrelationships between these groups and angiosperms both from extant and extinct genera.

## Departmental 10: LABORATORY COURSE

**Course outcome**: The student will be equipped to

(i) Handle and analyze plant and diseased materials in the laboratory/herbarium and in the field.
(ii) Use scientific terminology accurately through effective oral and written communication and the use of dichotomous keys in a regional floristic manual
(iii) Have expertise in techniques related to plant pathology
(iv) Have exposure to the diversity of Pteridophytes, Gymnosperms, plant fossils and palynological samples and as well as their handling techniques.

## SEC-1:

## BIODIVERSITY AND CONSERVATION

**Course outcome**:

1. This course provides an understanding of the concept and principle of biodiversity science, causes as well as current crisis, and consequences of biodiversity loss.
2. The course provides a conceptual understanding of various means of conservation, restoration and sustainable utilization of biodiversity which can provide viable solutions to a range of societal challenges and provides an effective tool to bridge the knowledge gap for sustainable management of biodiversity.
3. The course also explores the linkages between biodiversity conservation, ecosystem services, climate change and sustainable livelihood.

## SEMESTER-III

## Departmental 11: MOLECULAR & CELLULAR GENETICS & PLANT BREEDING

**Course outcome:**

On successful completion of the course students will:

1. Have a solid foundation in modern molecular genetics as the focus is on understanding central principles and fundamental mechanisms for the organization, replication, expression, variation, and evolution of the genetic material at a molecular level, as well on methods for molecular genetic analyses and gene technology
2. Have an advanced understanding of the modern concept of gene, methods to study them along with their model systems, their changes in frequency and structure as well as its regulation.

3. Have an understanding of transmission genetics (including linkage analysis), quantitative genetics and population genetics and have an in depth exposure and analyses of various modern tools and instrumentation techniques used in molecular biology, cytogenetics and plant breeding.
4. Have the skills necessary for critically reviewing scientific papers and general media presentations, for retrieving and analyzing molecular information as well as skills for interpreting genetic data on issues related to molecular biology as the main theme of the course is to understand molecular genetics as an experimental discipline.

## Departmental 12: PLANT PHYSIOLOGY & BIOCHEMISTRY

**Course outcome**:

1. This course covers the general aspects of plant physiology and biochemistry. Plants maintain a very unique physiological system through photosynthesis, photorespiration, nitrogen fixation, plant specific growth hormonal control etc. and we introduce students to that specific arena through this course.
2. Students will acquire the basic physiological and biochemical knowledge of plant systems that will help them build up their further concepts and will be knowledgeable enough to choose their elective courses in the next semester depending upon their understanding about the relevant subject.

**Departmental 13: DSE1**

### a)PLANT DEVELOPMENTAL BIOLOGY AND ANATOMY

**Course outcome**:

**1.** This is an upcoming research area in the field of plant science. Though the subject is still young, we intend to expose our students to the state of the art knowledge about this specific section.
**2.** Plant developmental studies with identification of the genes associated with the developmental events are mostly carried out in model species and this area of study is mainly based upon mutant generation.
**3.** This fascinating area is highly relevant at the present scientific world and students will benefit from this study.

### b)PHYTOCHEMISTRY AND PHARMACOGNOSY

**Course outcome**: At the end of the course the student will

1. Know about plants having active constituents effective against advanced diseases.
2. Know the phytochemistry and phytopharmacology of these drugs.
3. Have knowledge about pharmaceutical adjuvants of plant origin.
4. Understand concept of Ethanopharmacognosy, Ethanomedicine

## Departmental 14: LABORATORY COURSE (Molecular & Cellular Genetics & Plant Breeding)

**Course outcome**:

1. This practical course is intended for the students to give them hands-on training to different experiments on Molecular biology, Cytogenetics and Plant breeding and develop technical capability in the selection and use of appropriate laboratory and other materials and equipment and the ability to employ them in a safe and responsible manner to achieve the desired outcome.

2. This will include the ability to follow standard operating procedures.

## Departmental 15: LABORATORY COURSE (Plant Physiology & Biochemistry)

**Course outcome**:

**1.** This practical course is intended for the students to give them hands-on training to different experiments on plant physiology, biochemistry and plant developmental studies.

**2.** Students will learn to carry out experiments on major plant biochemical events like photosynthesis, compatible solute accumulation under stress conditions, enzymatic activity estimation and $K_m$ calculation etc. by themselves.

**3.** It will benefit them greatly in pursuing further research.

**SEMESTER-IV**

**Departmental 16: DSE2**

## ADVANCED PLANT PHYSIOLOGY& BIOCHEMISTRY

**Course outcome**:

1. This course will expose the students to advanced areas of plant physiology and biochemistry.
2. This will enhance the knowledge of the students who are interested to pursue further research in this arena.
3. This is an elective course and students are free to choose the course based on their admiration to the specific subject area.

## Departmental 17: DSE3 PLANT MOLECULAR BIOLOGY

**Course outcome**:

1. This is a very relevant course and teaches the students about major areas of plant biotechnology like recombinant DNA technology, gene cloning, gene sequencing, genome projects, cloning vectors, proteomics, RNA interference, gene regulation, epigenetics etc. in a very concise and simplistic manner.
2. This course is designed in such a way that it will benefit the students greatly to answer CSIR/UGC NET questions.

## Departmental 18 (P): LABORATORY COURSE

**Course outcome**:

1. This course is intended to prepare the student for research.
2. The emphasis on the practical courses which will be according to the theoretical syllabus will enable development of skills from identifying problems from the field, solving it in the lab and taking it back to the field as solutions

## Departmental 19 (P): LABORATORY COURSE (SEMINAR PRESENTATION)

**Course outcome**:

**1.** This course is intended to prepare the student for advanced topics pertaining to their DSE choices.

**2.** On completion of this course along with Departmental 20, the student skill sets will have substantially enhanced such that he/she will be able to take up a career in higher education and research.

**3.** This course will particularly focus on presentation of the research findings/review done by the student in Departmental 20.

**4.** As scientific communication is an essential and important component of scientific research, major emphasis has been given on this aspect.

## Departmental 20 (P): DISSERTATION PROJECT WORK

**Course outcome**:

On completion of the course, the student

1. Will be exposed to the research problems in the field through accessing web-based resources and physical databases (where applicable)
2. Will be able to design experiments and be aware of the various tools and technologies for it
3. Will have hands-on training on different biological techniques, statistical procedures and wet lab instrumentation facilities.

**DEPARTMENT OF CHEMISTRY**

# Programme Specific Outcomes

**B.Sc. Chemistry (Hons) CBCS Syllabus**

**With effect from2018-19**

At the completion of this program, students will be able to

- **PSO1:** Understand the basic concepts, principles and applications of chemistry, viz. Physical, organic and inorganic.
- **PSO2:** Setup physicochemical experiments, analyse the data, draw plots, calculate physical constants and interpret the results.
- **PSO3:** Estimate and analyse inorganic compounds both qualitatively and quantitatively and learn the use of analytical instruments
- **PSO4:** Prepare, purify and estimate organic compounds and interpret the NMR and IR data.
- **PSO5:** Learn the basic tenants of computer programming and use of data processing software.
- **PSO6:** Prepare and deliver a PowerPoint presentation on the topics learned during the program.
- **PSO7:** Learn the safety precautions and maintenance protocols of a chemistry laboratory and work cohesively in a group.

**Course Name:** **Core Course-1**

**Course Code:** **CEMACOR01T & CEMACOR01P**

**Topic Name:** **ORGANIC CHEMISTRY-I**

**Course Outcome:** At the end of this course a student learns

1. Basics of Organic Chemistry like Valence Bond Theory, Electronic Displacements, MO theory (qualitative idea of: σ, σ*, π, π*& n-MO. Basic idea of HOMO, LOMO, LUMO, HUMO, SOMO & FMO. Hückel's rules for aromaticity.

2. General Treatment of Reaction Mechanism like Mechanistic classification and Reactive intermediates.

3. Stereochemistry and Bonding geometries of carbon compounds and representation of molecules in Fischer, Sawhorse & Newman projection formula, Flying-wedge formula. Concept of chirality and symmetry and Optical activity of chiral compounds.

4. To identify and separate some organic compounds.

**Course Name:** **Core Course – 2**

**Course Code:** **CEMACOR02T and CEMACOR02P**

**Topic Name:** **Physical Chemistry I**

**Course Outcome:** This course will enrich the students with some basic concepts on:

1. Kinetic behavior of molecules of ideal gas, concept of pressure, Maxwell's distribution of speed and energy of the molecules, different kinds of velocities, principle of equipartition of energy.

2. Behaviour of molecules of real gases, deviation from laws of ideal gases, different real gas laws, critical states, compression factor, intermolecular interactions of molecules.

3. Laws of classical thermodynamics, understanding of different thermodynamic properties for varying systems, criteria of spontaneity and equilibrium, concept of heat capacity, thermochemistry.

4. Chemical kinetics of reactions of different orders, theory of rate processes, catalysis.

5. Experimental kinetic studies of $1^{st}$ order reactions, preparation of buffer solutions and their practical use, experimental determination of heat of neutralization and heat of solution.

**Course Name:** **Core Course-3**

**Course Code:** **CEMACOR03T&CEMACOR03P**

**Topic Name:** **Inorganic Chemistry-l**

**Course Outcome:** Post completion of the course given below, will give the students a vivid idea on

fundamental chemical reactions and their correlations.

1. Atomic structure from the context of Classical and Quantum Mechanical point of view
2. Chemical periodicity
3. Acid-base concept and indicator reactions
4. Redox and precipitation reactions
5. Volumetric estimations of various meta lions like Fe(II),Fe(III),Cu(II),Mn(II) etc.

**Course Name:** **Core Course-4**

**Course Code:** **CEMACOR04T & CEMACOR04P**

**Topic Name:** **ORGANIC CHEMISTRY-II**

**Course Outcome:** After end of the course students will be able to know about the following topic:

1. Stereochemistry like (a) Chirality arising out of stereo axis (b) Concept of prostereoisomerism (c) Prostereogenic centre and Conformation
2. General Treatment of Reaction Mechanism like (a) Reaction thermodynamics (b) Concept of organic acids and bases (c) Tautomerism (d) Reaction kinetics
3. Substitution and Elimination Reactions like (a) Free-radical substitution reaction(b) Nucleophilic substitution reactions (c)Elimination reactions
4. Synthesize some organic compounds followed by their purification.

**Course Name: Core Course-5**

**Course Code: CEMACOR05T & CEMACOR05P**

**Topic Name: Physical Chemistry II**

**Course Outcome:** This course will enrich the students with some basic concepts on:

1. Transport phenomena, viz. viscosity, conductance; ionic atmosphere, transport numbers, theories on ionics.
2. Thermodynamics of open systems, chemical equilibrium, properties of ideal pure and mixed systems, standard states.
3. Failure of classical mechanics and foundation of quantum mechanics, concepts of operators and wave functions, Schrodinger equation and its application for simple systems viz. particle in a box, simple harmonic oscillator.
4. Conductometric experiments on titrations, kinetics, verification of law, experiments on partition coefficient, studies on viscosity.

**Course Name: Core Course-6**

**Course Code: CEMACOR06T & CEMACOR06P**

**Topic Name: Inorganic Chemistry-II**

**Course Outcome:** Getting through the course given below, students will be able to understand the different types of chemical environment and subsequent molecular interactions.

1. Useful aspects of ionic and covalent bonds
2. Details of Molecular Orbital theory including metallic bond.
3. Weak chemical forces and their beautiful reflection in various chemical land biochemical systems.
4. Radiochemistry and its useful aspects in various fields like chemistry, biology, medicine, agriculture and industry including its safety measure.
5. Methods to estimate Vit.C, Cu (II), arsenite, Cu in brass and Cr & Mn in steel by Iodo/iodimetrically.

**Course Name:** **Core Course-7**

**Course Code:** **CEMACOR07T & CEMACOR07P**

**Topic Name:** **ORGANIC CHEMISTRY-III**

**Course Outcome:** After end of the course students will be able to know about the following topic:

1. Chemistry of alkenes and alkynes. Addition to C=C: mechanism, Addition to C≡C

2. Aromatic Substitution Electrophilic aromatic substitution: Ipsosubstitituion. Nucleophilic aromatic substitution: cine- substitution, benzyne mechanism.

3. Carbonyl and Related Compounds. Addition to C=O: Exploitation of acidity of α-H of C=O: Elementary ideas of Green Chemistry: Substitution at $sp^2$ carbon (C=O system): mechanism : $B_{AC}^2$, $A_{AC}^2$, $A_{AC}^1$, $A_{AL}^1$

4. Organometallic chemistry: Grignard reagent; Organolithiums; Gilman cuprates: Corey-House synthesis; abnormal behavior of Grignard reagents; Organocopper reagents; Reformatsky reaction; Blaise reaction; concept of umpolung and basenucleophile dichotomy in case of organometallic reagents.

5. Qualitative analysis of a single solid organic compound.After this course one student can grow some idea about the different types of chemical reactions, and their application in the field of boarder line organometallic chemistry and also acquire the knowledge of pollution free green chemistry. In practical chemistry: students can do the Qualitative Analysis of Single Solid Organic Compounds.

**Course Name:** **Core Course – 8**

**Course Code:** **CEMACOR08T and CEMACOR08P**

**Topic Name:** **Physical Chemistry III**

**Course Outcome:** This course will enrich the students with some basic concepts on:

1. Application of thermodynamics, colligative properties, phase rule and phase diagram for different systems viz. simple, binary and ternary systems, behavior of binary solutions.

2. Electrical properties of molecules, Ionic equilibria, electromotive force and application of emf measurement, dipole moment and polarizability.

3. Angular momentum operators and commutation relations, operators in polar co-ordinates, qualitative treatment of hydrogen like atoms, bonding: valence bond and molecular orbital theory of hydrogen molecule .

4. Potentiometric titrations: redox and precipitation, kinetic studies spectrophotometrically, pH-metric titrations, study on phase diagram of binary solution, experiment on solubility of sparingly soluble salt.

**Course Name: Core Course-9**

**Course Code: CEMACOR09T & CEMACOR09P**

**Topic Name: Inorganic Chemistry-III**

**Course Outcome:** After successful completion of both theory and practical modules of the course, the following outcome is expected:

1. Understanding of the fundamental problems of extracting and purification of metals from their ores.

2. Understanding of chemistry of s- and p-block elements and their comparative studies.

3. Learning of different chemistry of elements and inorganic polymers.

4. Understanding and learning of different complex salts formation and their isomerism

5. In-depth understanding of the procedure of preparation of several inorganic complexes and different metal ion determinations by complexometric titration through practical classes.

**Course Name: Core Course-10**

**Course Code: CEMACOR10T & CEMACOR10P**

**Topic Name: ORGANIC CHEMISTRY-IV**

**Course Outcome:**

After this course, a student can learn different types of chemical reactions involving nitrogeneous compounds anddiffrenert types of rearrangement reaction with mechanism. Students can learn the idea of retrosynthesis technique. They can be able to grow their knowledge of the structure and properties of an organic compound spectroscopically. In practical chemistry, students can also be able to estimate organic compounds quantitatively, likequantitative estimation of glucose, vitamin C, aromatic amines, phenol, formaldehyde, acetic acid, urea and saponification value of oil etc.

**Course Name:Core Course-11**

**Course Code: CEMACOR11T & CEMACOR11P**

**Topic Name: Inorganic Chemistry-IV**

**Course Outcome:** After successful completion of the course, students will get fundamental principles about

1. Coordination chemistry, magnetism, colour, spectra and calculation of CFSE
2. Chemistry of transition elements, Lanthanoids and Actinoids
3. How to estimate ions in solution gravimetrically
4. Spectrophotometric estimation
5. Paper chromatographic separation of some ions and gravimetric estimation of nickel, copper, Aluminium and chloride.

**Course Name: Core Course-12**

**Course Code: CEMACOR12T & CEMACOR12P**

**Topic Name: ORGANIC CHEMISTRY-V**

**Course Outcome:** After end of the course students will be able to know about the following theoretical topics:

1. Polynuclear hydrocarbons and their derivatives: Heterocyclic compounds (one hetero atom): Cyclic Stereochemistry
2. Pericyclic reactions: Electrocyclic reactions: Cycloaddition reactions: Sigmatropic reactions.
3. Carbohydrates: Monosaccharides: Disaccharides: Polysaccharides:
4. Biomolecules: Amino acids & Nucleic acids

In practical classes get acquainted with some methods of chromatographic techniques of purification and separation including TLC, column and paper chromatography. They also get preliminary ideas about 1H NMR and IR spectra of some compounds.

**Course Name:Core Course-13**

**Course Code: CEMACOR13T & CEMACOR13P**

**Topic Name: Inorganic Chemistry-V**

**Course Outcome:** After completing the course, students would get in depth knowledge about and ability to understand and analyse the application of compounds mentioned below. A detailed expected result is as follows.

1. Learning about the essential and beneficial elements in the biological systems

2. Understanding the importance of different biological proteins of Human body

3. Learning the different techniques of Toxification and detoxification of metals and get a clear idea about Chelation therapy

4. Gaining knowledge about different organo-metallic compounds and their industrial applications as catalysts.

5. Understanding different inorganic reaction mechanisms and kinetics

6. Learning about qualitative detection and analysis of different anions and cations in practical classes.

**Course Name: Core Course – 14**

**Course Code: CEMACOR14T and CEMACOR14P**

**Topic Name: Physical Chemistry IV**

**Course Outcome:** This course will enrich the students with some basic concepts on:

1. Molecular spectroscopy: rotational, vibrational, Raman, NMR and ESR: theoretical basis of these spectroscopies, features and analysis of the different spectrum, structure-function relation.

2. Photochemistry: Laws of photochemistry, quantum yield, photochemical processes: rates of photochemical reactions, decay of excited states by radiative and non-radiative paths, Jablonskii diagram, photostationary states.

3. Surface phenomena: Surface tension, physical and chemical adsorption, adsorption isotherm, heterogeneous catalysis, colloids: their classification, structures and functions, zeta potential and stability, micelle.

They learn the basic ideas of colloids, particularly their stability. They also learn about different electro-kinetic phenomena and preliminary concepts of association colloids.

4. In the laboratory, the students learn the following experiments: (i) surface tension determination by Stalagmometer, (ii) determination of CMC measuring surface tension by tensiometer, (iii) spectrophotometric studies on kinetics, verification of Beer and Lambert's law, (iv) determination of pH and CMC.

**Course Name: Discipline Specific Elective -1**

**Course Code: CEMADSE01T and CEMADSE01P**

**Topic Name: Advanced Physical Chemistry**

**Course Outcome:** This course will enrich the students with some basic concepts on:

1. Structures and laws of crystallography, lattice types, planes, packing fraction, voids, determination of crystal structure.

2. Statistical thermodynamics, concept of ensembles, Boltzmann distribution and thermodynamic probability, partition function and different thermodynamic properties.

3. Specific heat of solid, Einstein's and Debye's theory, third law of thermodynamics, adiabatic demagnetization.

4. Polymers: classification, nomenclature, structures; mechanism of polymerization, conducting polymers.

5. Computer programming in basic level (FORTRAN) based on numerical methods for simple systems.

**Course Name: Discipline Specific Elective -2**

**Course Code: CEMADSE02T and CEMADSE02P**

**Topic Name: Analytical Methods in Chemistry**

**Course Outcome:** 1.The students become aware about sampling methods and sampling errors. They get to know about accuracy and precision, normal law of distribution and they can apply these concepts to solve numerical problems.

2. The students are exposed to the basic optical methods of analysis viz., UV-vis, IR, flame AAS and flame AES and their principles and applications in estimation of metal ions, geometrical isomers, keto-enol tautomerism and determination of composition of metal complexes.

3. The students are made aware of thermal and electro analytical methods and their use in various estimations and Separation techniques like solvent extraction and chromatographic methods. The students also learn about stereo isomeric separation and analysis and about role of computers in instrumental method of analysis.

4. In the practical classes, the students master the skill of separation methods by paper and thin layer chromatography and solvent extraction and ion exchange techniques. The students understand the applicative importance of analytical methods as they perform soil analysis and determine BOD and COD of water.

**Course Name: Discipline Specific Elective -3**

**Course Code: CEMADSE03T and CEMADSE03P**

**Topic Name: Green Chemistry**

**Course Outcome:** After successful completion of both theory and practical modules of the course students will be able to

1. Understand the basic principles of green chemistry, its importance to minimize the use of hazardous chemicals, atom economy, and precautions taken for generation of toxic by-products during chemical reactions.

2. Understand different industrially important synthesis in less polluted way and future trends of green chemistry for sustainable development for better world.

3. Perform hands on experiments using non-toxic materials and water like green solvent. They also have the knowledge to use alternative source of energy in typical green synthesis by avoiding maximum chemical wastage.

**Course Name: Discipline Specific Elective -4**

**Course Code:CEMADSE04T and CEMADSE04P**

**Topic Name: Inorganic Material of Industrial Importance**

**Course Outcome:** After studying of the course, both theory and practical the following outcome is expected

1. Learning the procedure of preparation of cement, ceramics and glass and their uses

2. In-depth understanding of the different chemical properties of cement, ceramics and glass

3. Learning the procedure of preparation of important fertilizers and oils, paints, dyes and pigments

4. Learning the procedure of preparation of different types of batteries and alloys and their properties

5. Learning the utility of using different catalysts in different chemical reactions including chemical explosives.

**Course Name: Skill Enhancement Course-1**

**Course Code: CEMSSEC01M**

**Topic Name: Basic Analytical Chemistry**

**Course Outcome:** After successful completion of the course, students will get an idea about

1. Introduction to analytical Chemistry, precision and accuracy
2. Analysis of soil and water
3. Analysis of food products and cosmetics
4. Principles of chromatography, different types of Chromatography-paper, TLC, column and ion exchange and separation of mixtures.

**Course Name:Skill Enhancement Course-2**

**Course Code: CEMSSEC02M**

**Topic Name: Analytical Clinical Biochemistry**

**Course Outcome:** After successful completion of the above course, students will be able to understand clearly:

1. Essential features of carbohydrates and proteins
2. Utilities and useful aspects of enzymes
3. Essentials of lipids and lipoproteins
4. Diagnostic approach by blood and urine analysis.

# DEPT OF ECONOMICS
# Course Outcomes of
# B.Sc. Economics (Hons) CBCS Syllabus
# With Effect from 2018-2019

## SEMESTER 1

**Course Name: Core Course-1**
**Course Code: ECOACOR01T**
**Topic Name: INTRODUCTORY MICROECONOMICS**

Course Outcome: At the end of this course a student learns

1. The basic concepts of determination of choice to produce and consume at the micro-level
2. The economic behaviour of individuals, firms and markets.
3. A comprehensive understanding of the various aspects of consumer behaviour and demand analysis, production theory and behaviour of costs, the theory of traditional markets and equilibrium of firm
4. To understand the basic principles of General Equilibrium theory

**Course Name: Core Course-2**
**Course Code: ECOACOR02T**
**Topic Name: MATHEMATICAL METHODS FOR ECONOMICS**

Course Outcome: At the end of this course a student learns to demonstrate quantitative reasoning skills. They learn

1. Concept of series and various functions, associated characteristics and their relationship with economic variables
2. To conduct economic analysis using equations and graphs
3. Basic concepts and conditions for optimisation of functions with and without constraints
4. The ability to solve systems of linear equations

## SEMESTER 2

**Course Name: Core Course-3**
**Course Code: ECOACOR03T**
**Topic Name: INTRODUCTORY MACROECONOMICS**

Course Outcome: At the end of this course a student learns

1. The functional relationships between aggregates obtained when considering different activities of economic agents

2. The various models of income determination
3. understand the basic principles underlying the working of the financial institutions
4. understand how Central banks conduct monetary policy
5. understand the sources of inflation and its policy implications

**Course Name: Core Course-4**
**Course Code: ECOACOR04T**
**Topic Name: STATISTICAL METHODS FOR ECONOMICS-1**

Course Outcome: At the end of this course a student learns

1. The basic statistical tools used to summarize and analyse quantitative information.
2. Methods of descriptive analysis
3. compute measures of central tendency (mean, median and mode) and dispersion (standard deviation and variance).
4. to assess relationships between variables, and are introduced to the concepts of correlation and regression
5. the basics of hypothesis testing i.e. estimation and interpretation of regression coefficients and standard error
6. techniques of measuring various economic variables such as price and quantity index numbers and demographic data (birth rate, death rate, infant mortality rate etc.)

## SEMESTER 3

**Course Name: Core Course-5**
**Course Code: ECOACOR05T**
**Topic Name: INTERMEDIATE MICROECONOMICS-1**

Course Outcome: At the end of this course a student learns

1. an advanced treatment of consumer theory- his choices between saving and borrowing; income and leisure; and risk and reward
2. the revealed preference approach to understanding consumers choice between commodities
3. deeper knowledge on decision making under different market imperfections such as monopoly and monopolistic competition

**Course Name: Core Course-6**
**Course Code: ECOACOR06T**
**Topic Name: INTERMEDIATE MACROECONOMICS-1**

Course Outcome: At the end of this course a student learns

1. the basic classical model of determination of output employment and price level

2. the concepts of dichotomy of pricing principle and neutrality of money
3. the Keynesian model of involuntary unemployment
4. to derive the Aggregate Demand and Aggregate Supply curve of the economy
5. Concepts about inflation and its relation with unemployment
6. 
7. the concepts of fiscal and monetary policy and their economic impacts on equilibrium; exchange rate and balance of payments

**Course Name: Core Course-7**
**Course Code: ECOACOR07T**
**Topic Name: MATHEMATICAL METHODS FOR ECONOMICS-II**

Course Outcome: At the end of this course a student learns

1. Details of convexity and convex programming and their application in economic function derivation and economic modelling
2. Classical optimisation techniques and application to comparative statics problems
3. to approach a strategic problem mathematically by using Game theory
4. The temporal approaches of convergence to equilibrium of market and trade models applying difference and differential equations
5. Solving linear as well as non-linear system of equations and applying them input output analysis and general equilibrium theory

**Course Name: SEC -I**
**Course Code: ECOSSEC001**
**Topic Name: SURVEY METHODOLOGY**

Course Outcome: At the end of this course a student learns

1. a set of principles of survey and data science that are the basis of standard practices in these fields.
2. key terminology and concepts of collecting and analyzing data from surveys and other data sources to gain insights
3. and to test hypotheses about the nature of human and social behavior and interaction.
4. It will also present a framework that will allow the student to evaluate the influence of different error sources on the quality of data.

**SEMESTER 4**

**Course Name: Core Course-8**
**Course Code: ECOACOR08T**
**Topic Name: INTERMEDIATE MICROECONOMICS-II**

Course Outcome: At the end of this course a student learns

1. To analyze a firm's decision strategies under imperfect market conditions of oligopoly
2. To understand the decision-making process involved in obtaining input market equilibrium under various market situations
3. How labour unions and collective bargaining function to optimise decision-making
4. The reasons and implications of market failure on the economic agents and how policies have evolved to bridge the gap
5. To have an in-depth knowledge about distributional and welfare aspects of economic activities.

**Course Name: Core Course-9**
**Course Code: ECOACOR09T**
**Topic Name: INTERMEDIATE MACROECONOMICS-II**

Course Outcome: At the end of this course a student learns

1. The theories of economic growth and the rules and methods of identifying the contributory factors such as capital, labour and technological progress in economic growth
2. To have the knowledge of microeconomic foundations on macroeconomics in terms of consumption, investment, and demand for money
3. To have basic knowledge of macroeconomic thoughts with some history of economic thoughts including Mercantilism, Physiocracy

**Course Name: Core Course-10**
**Course Code: ECOACOR10T**
**Topic Name: STATISTICAL METHODS FOR ECONOMICS-II**

Course Outcome: At the end of this course a student learns

1. to use the techniques of probability theory and statistical analysis, which are commonly applied to understand and analyze economic problems
2. to understand theoretical distributions and their significance
3. To deal with simple tools and techniques, which will help in sampling theory and designs, data collection, analysis, theory of estimation and hypothesis testing
4. **Demonstrate the ability to collect, process, and interpret data, including statistical inference**

**Course Name: SEC II**
**Course Code: ECOSSEC002**
**Topic Name: INDIAN OFFICIAL STATISTICS**

Course Outcome: At the end of this course a student learns

1. About official organisations for collecting, compiling and analysing the national and state level data on different variables.
2. The concepts of different statistics related to agriculture, population , financial
3. To compare major macroeconomic variables such as national income, different indicators related to energy, environment and gender across economies

## SEMESTER 5

**Course Name: Core Course-11**
**Course Code: ECOACOR11T**
**Topic Name: INTRODUCTORY ECONOMETRICS**

Course Outcome: At the end of this course a student learns

1. to understand the basic concepts in econometrics necessary for more advanced optional courses
2. The techniques of forming simple and multiple regression models
3. To estimate linear models using OLS and make inferences about population parameters
4. Understand the detection, consequences and remedies of violation of classical assumptions
5. Concepts of dummy variables, its' interpretation, and consequences

**Course Name: Core Course-12**
**Course Code: ECOACOR12T**
**Topic Name: DEVELOPMENT ECONOMICS**

Course Outcome: At the end of this course a student learns

1. the essential tools and concepts of development economics, what makes underdevelopment persist and what helps development succeed.
2. To explore the diverse dimension and measures of development including income growth, poverty, vulnerability, inequality and human development measures
3. Understand theories in development economics and wide-ranging development policy issues.

4. Why markets are so important to economic development and why markets fail for many people even in the presence of globalization

experiments to understand the behavior of individuals under imperfect market conditions. Finally, we will see how formal and informal norms define cultures and institutions that persist and need to be studied from a long-term perspective
. 2. To impart theoretical knowledge on distribution.

**Course Name: DSE COURSE-Group A(a)**
**Course Code: ECOADSE01T**
**Topic Name: APPLIED ECONOMETRICS**

Course Outcome: At the end of this course a student learns

1. The basics of empirical research – definition, methods, types and examples
2. About the various data types- primary data collection methods and introduction to secondary data sources
3. Different types of econometric models and the techniques to form econometric models of real world problems
4. To understand estimation techniques for econometric equations involving qualitative variables
5. To become familiar with the basic tenets of computer programming and use of a data processing statistical software.

**Course Name: DSE COURSE-Group A(b)**
**Course Code: ECOADSE02T**
**Topic Name: PUBLIC ECONOMICS**

Course Outcome: At the end of this course a student learns

1. Theoretical and empirical understanding about different aspect of Governmental activities and their rationality.
2. To understand public and private sector solutions to market failure and government failure
3. An understanding of public goods, social and private cost-benefit analysis and public choice
4. To examine issues related to welfare analyses and how government debt finances spending
5. To assess tax policy and its redistributive impacts on different sectors of the economy
6. Fundamental concepts of public economics, public expenditure, public revenue, and public debt

## SEMESTER 6

**Course Name: Core Course-13**
**Course Code: ECOACOR13T**
**Topic Name: INDIAN ECONOMY**

Course Outcome: At the end of this course a student learns

1. To critically understand contemporary Issues in Indian Economy constituting the economic growth trajectory, economic policies, and institutional reforms of modern India
2. To understand trends and issues relating to major economic challenges of Indian Economy, i.e. Poverty, Inequality and Unemployment.
3. To gain basic knowledge on the role of public institutions and human resources development.
4. To have an in-depth analysis of the sectoral contributions of agriculture, industry and service sector in India
5. To examine the operation and implementation of fiscal and monetary policy in India

**Course Name: Core Course-14**
**Course Code: ECOACOR14T**
**Topic Name: INTERNATIONAL ECONOMICS**

Course Outcome: At the end of this course a student learns

1. The concepts of intranational and international trade
2. The basis of trade following the Classical trade theories
3. The methods of obtaining international equilibrium and the various measurements of gains from trade
4. To reflect on trade policy instruments and analyse their effects on nation's welfare
5. To understand open economy macroeconomics involving the determinants of exchange rate and its relation with nation's Balance of payment situation

**Course Name: DSE COURSE-Group B(a)**
**Course Code: ECOADSE4T**
**Topic Name: CONTEMPORARY DEVELOPMENT ECONOMICS**

Course Outcome: At the end of this course a student learns

1. The basic demographic concepts and measurements related to HDI, Capability, poverty and inequality and their evolution during the process of development.

2. The role of government as political institutions in influencing development; different regulatory structures and the impacts of their failure.
3. Concepts of market contracts and the particular problems of enforcement experienced in poor countries.
4. About the governance of communities and organizations and their links to questions of sustainable growth.
5. To assess the role of globalization and increased international dependence on the process of development.

**Course Name: DSE COURSE-Group B(c)**
**Course Code: ECOADSE02P**
**Topic Name: PROJECT/DISSERTATION**

Course Outcome: At the end of this course a student learns

1. To understand some basic concepts of research and its methodologies
2. To identify a research topic, define appropriate research problem and parameters to undertake a research project
3. The ability to use economic theories and methods to research projects by using appropriate quantitative techniques and software to carry statistical and numerical analyses
4. To author a detailed project report inclusive of the general contents
5. Interpret the result with a proper conclusion on the findings

## SEMESTER 3 (ECONOMICS GENERAL)

**Course Name: DSC COURSE-3**
**Course Code: ECOGCOR03T**
**Topic Name:**

Course Outcome: At the end of this course a student learns

1. The concepts of economic development and growth; their differences
6. To identify various indicators of development including the HDI indicators
7. The Balanced versus Unbalanced paths to development and the role of technology in development with reference to application in agriculture and industry
8. How different elements like population pressure, domestic capital formation, foreign investment affect economic development in LDCs
9. The role of international organisations like the IMF and World Bank in LDC development
10. The importance of Gender issues in economic development and various related concepts

**Course Name: DSC COURSE-4**
**Course Code:** ECOGCOR04T
**Topic Name: Indian Economy**

Course Outcome: At the end of this course a student learns

1. Nature and characteristics of the Indian economy
2. Study its structure of agriculture, industry and demographic features
3. About the foreign trade policies and trade relations with the world
4. To understand the sources of revenue and expenditure of Union and State government
5. Regarding the financial structure of the economy and monetary policy undertaken

# DEPT OF EDUCATION
## Course Outcomes of
## M.A. Education (Hons) CBCS Syllabus
## With Effect from 2019-2020

**PSO1:** Develop knowledge and understanding of major specialized areas in Education.

**PSO2**: Develop critical thinking pertaining to issues related to Education.

**PSO3:** Orient the students on the modern trends of Educational Technology and their application in educational system.

**PSO4:** Enhance the necessary competencies to provide better inclusive classroom environment to accommodate various categories of the students.

**PSO5:** Develop competencies to conduct research in emerging areas of Education.

**PSO7:** Develop knowledge and understanding of the process of educational research.

**BIDHANNAGAR COLLEGE**

**Department of Education**

**Course Outcome or Learning Outcome**

**Two-year M.A. degree course in Education**

**Under CBCS semester system**

**With effect from the session 2019-20**

**Course Name: DEPARTMENTAL-1**

**Course Code: EDCPCOR01T**

**Topic name: EDUCATIONAL PHILOSOPHY**

**Course outcome: At the end of this course a student will be able to**

1. recognize the importance and significance of Education, Philosophy and Educational Philosophy.
2. understand the contributions of Indian & Western Schools of Philosophy in Education.
3. appreciate the contributions of Educational Thinkers.

**Course Name: DEPARTMENTAL-2**

**Course Code: EDCPCOR02T**

## PSYCHOLOGICAL FOUNDATIONS OF EDUCATION

**Course outcome: At the end of this course a student will be able to**

1. understand the concept and significance of schools of psychology.
2. understand the various aspects of Growth and Development.
3. understand the concept, nature of intelligence and creativity.
4. understand the concept, development, measurement, importance of personality

**Course Name: DEPARTMENTAL-3**

**Course Code: EDCPCOR03T**

**Topic name: METHODOLOGY OF EDUCATIONAL RESEARCH**

**Course outcome: At the end of this course a student will be able to**

1. comprehend the nature and process of understanding research in Education
2. understand various research designs in Education
3. understand analysis of data and research report writing
4. plan and design Educational Research

**Course Name: DEPARTMENTAL-4**

**Course Code: EDCPCOR04T**

**Topic name: STATISTICS IN EDUCATION**

**Course outcome: At the end of this course a student will be able to**

1. understand the basic concept and need of statistics in educational research.
2. understand quantitative data analysis
3. acquaint with parametric and non- parametric inferential analysis.
4. understand qualitative data analysis.

**Course Name: DEPARTMENTAL-5**

**Course Code: EDCPCOR05P**

**Topic name: EVALUATION OF LISTENING & SPEAKING SKILLS**

**Course outcome: At the end of this course a student will be able to**

1. understand how to develop listening skills
2. understand how to develop speaking skills

**Course Name: DEPARTMENTAL-6**

**Course Code: EDCPCOR06T**

**SOCIOLOGICAL FOUNDATIONS OF**

**EDUCATION Course outcome: At the end of this course a**

**student will be able to**

1. understand the relationship between Education and Sociology.
2. understand culture, socialization and social process.
3. recognize social change properly.
4. analyze the causes and remedial measures of social problems.

**Course Name: DEPARTMENTAL-7**

**Course Code: EDCPCOR07T**

**Topic name: PEDAGOGICAL STUDIES**

**Course outcome: At the end of this course a student will be able to**

1. Understand concept, nature and importance of Pedagogy and Pedagogical analysis.
2. understand the concept, nature and theories of Andragogy.
3. familiarize with the assessment in Pedagogy of Education.
4. familiarize with the assessment in Andragogy of Education.

**Course Name: DEPARTMENTAL-8**

**Course Code: EDCPCOR08T**

**Topic name: CONTEMPORARY ISSUES AND TRENDS IN EDUCATION**

**Course outcome: At the end of this course a student will be able to**

1. acquaint with the meaning, nature and needs of reservation in Education.
2. understand various issues in Education.
3. recognize the trends in Education.
4. understand the various sectors in Education and their controlling agencies

**Course Name: DEPARTMENTAL-9**

**Course Code: EDCPCOR09P**

**Topic name: ICT IN EDUCATION**

**Course outcome: At the end of this course a student will be able to**

1. familiarize with the basic ideas of computer and its functions & importance in Education
2. Operate MS words and its different uses oOperate Excel and its Different Uses oOperate PPT and its Different Uses

**Course Name: DEPARTMENTAL-10**

**Course Code: EDCPCOR10T**

**PSYCHOLOGY OF LEARNER & LEARNING PROCESS**

**Course outcome: At the end of this course a student will be able to**

**1.**Understand various theories of learning
**2.**Acquaint with learning & motivation.

3. Understand transfer of learning.
4. Acquaint with social learning

**Course Name: DEPARTMENTAL-11**

**Course Code: EDCPCOR11T**

**Topic name: EDUCATIONAL TECHNOLOGY**

**Course outcome: At the end of this course a student will be able to**

1. develop the general ideas on Educational Technology
2. understand the meaning, nature & importance of system approach and various applications of Computer in Education
3. acquaint with the emerging trends in e-learning.
4. understand the uses of ICT in different sectors, advantages & disadvantages of ICT.

**Course Name: DEPARTMENTAL-12**

**Course Code: EDCPCOR12T**

**Topic name: EDUCATIONAL MANAGEMENT**

**Course outcome: At the end of this course a student will be able to**

1. understand the functions & importance of management, administration and educational management.
2. acquaint with the concept of leadership in the field of Education.
3. understand quality management in Education.
4. develop the ideas regarding the changes in management.

**Course Name: DEPARTMENTAL-13**

**Course Code: EDCPCOR13T**

**Topic name: VALUE & PEACE EDUCATION**

**Course outcome: At the end of this course a student will be able to**

1. develop the concept, need and importance of Value and Peace Education.
2. acquaint with the nature & concept of value Education.
3. acquaint with the nature & concept of Peace Education.
4. understand the approaches to Education in value and peace.

**Course Name: DEPARTMENTAL-14**

**Course Code: EDCPDSE01T**

**Topic name: GUIDANCE & COUNSELLING**

**Course outcome: At the end of this course a student will be able to**

1. understand the nature, principles, need and types of guidance
2. understand the nature, principles, need and types of counselling
3. develop the various guidance programme in different levels
4. acquaint with stress and stress management

**Course Name: DEPARTMENTAL-15**

**Course Code: EDCPCOR14P**

**Topic name: DEVELOPMENT OF A STANDARDISED ACHIEVEMENT TEST**

**Course outcome: At the end of this course a student will be able to**

1. understand how to develop a standardized achievement test.
2. acquaint with the implications of standardized achievement test in Education.

**Course Name: DEPARTMENTAL-16**

**Course Code: EDCPCOR15T**

**Topic name: CURRICULUM STUDIES**

**Course outcome: At the end of this course a student will be able to**

1. acquaint with the concept, development & bases of curriculum
2. develop the idea on various models of curriculum design

3. understand the concept, nature & importance of curriculum evaluation
4. understand the concept, need, factors & approaches of curriculum change

**Course Name: DEPARTMENTAL-17**

**Course Code: EDCPCOR16T**

**Topic name: EDUCATION OF CHILDREN WITH DIVERSE NEEDS**

**Course outcome: At the end of this course a student will be able to**

1. develop the concept, evolution, scope of Inclusive Education and Education of Children with Diverse Needs.
2. understand the types, causes & prevention of Diverse learners.
3. understand the planning and management of diverse learners.
4. acquaint with the barriers and facilitators in Inclusive Education

**Course Name: DEPARTMENTAL-18**

**Course Code: EDCPDSE03T**

**Topic name: TEACHER EDUCATION**

**Course outcome: At the end of this course a student will be able to**

1. develop the concept, nature, types, approaches of Teacher Education.
2. understand the concept, scope, organization & agencies of in-service teacher education.
3. acquaint with the concept of professionalism in education.
4. acquaint with the modern trends in Teacher Education.

**Course Name: DEPARTMENTAL-19**

**Course Code: EDCPCOR17P**

**Topic name:REVIEW OF RELATED LITERATURE ON A GIVEN TOPIC**

**Course outcome: At the end of this course a student will be able to**

1. learn the scientific method of conducting Review of Related Literature;
2. develop the appraisal report on Review of Related Studies on a given topic; **3.**find out the knowledge gap for conducting scientific study;

**4.**present the Statement of the problem of study.

**Course Name: DEPARTMENTAL-20**

**Course Code: EDCPCOR18P**

**Topic name:DISSERTATION / PROJECT**

**Course outcome: At the end of this course a student will be able to**

1. learn how to collect data
2. learn how to analyse the data

3. develop the art of writing project report
4. understand the process of presentation and defence of Project

**Course Name: AECC**

**Course Code: EDCPAEC01M**

**Topic name: COMMUNICATION SKILL**

**Course outcome: At the end of this course a student will be able to**

1. understand different types of non-verbal and oral communication and their uses in various educational sectors.
2. acquaint with different types of writing capabilities.
3. develop communication skill in different sectors of life.

**Course Name: SEC**

**Course Code: EDCPSECO1P**

**Topic name: COMMUNICATION SKILL**

**Course outcome: At the end of this course a student will be able to**

1. understand how to develop reading skill
2. understand how to develop writing skill

# DEPT OF ENGLISH
# PSO and Course Outcome of
# B.A. English (Hons) CBCS Syllabus
# With Effect from 2018-2019

After the successful completion of the three-year Programme the learners will be able to

**PSO1.** understand various aspects of Indian Classical Literature and European Classical Literature

**PSO2**. make out the status of women in India and their struggles for emancipation

**PSO3**. know the nature, history of human language and dynamic of language.

**PSO4**. observe the difference between sound and meaning- understand transmission of meaning from one person to another person-learn the communication pullers and its functions-understand why communication is important

**PSO5**. acquire a comprehensive idea about history of English Literature starting from Old English Period to Post-Modern era

**PSO6.** have a comprehensive idea about American Literature

**PSO7.** get real picture about Women's Writing and aspirations of female in the male dominated patriarchal society.

**PSO8**. comprehend the importance of contemporary literary theories.

**PSO9**. understand properly the importance of Partition Literature

**PSO10**. analyse different facets of post-colonial literature.

# BIDHANNAGAR COLLEGE

## DEPT OF ENGLISH
## Course Outcome of
## B.A. English (Hons) CBCS Syllabus
## With Effect from 2018-2019

**Course Name: Core Course-1**
**Course Code: ENGACOR01T**
**Topic Name: INDIAN CLASSICAL LITERATURE**
**Course Outcomes**: After completion of the course students will have sound knowledge about

a. Indian epic, themes and recension,
b. classical Indian drama, theory and praxis,
c. alamkara and rasa,
d. dharma and the heroism,
e. Dharma and Moksa,
f. Indian Philosophy

**Course Name: Core Course-2**
**Course Code: ENGACOR02T**
**Topic Name: EUROPEAN CLASSICAL LITERATURE**
**Course Outcomes** At the end of the course students will learn about a.

epic,

b. comedy,
c. tragedy,
d. catharsis
e. mimesis, satire,
f. literary cultures in Augustan Rome

**Course Name: Core Course-3**
**Course Code: ENGACOR03T**
**Topic Name: INDIAN WRITING IN ENGLISH**
**Course Outcomes:** The course will broaden students' ideas about

a. Indian English,
b. Indian English Literature,
c. Indian English novel,
d. the aesthetics of Indian poetry,
e. modernism in Indian English literature.

**Course Name: Core Course- 4**
**Course Code: ENGACOR04T**

**Topic Name: BRITISH POETRY & DRAMA (14TH-17TH C)**
**Course Outcomes:** After reading the course students will come to know about

a. the historical, political, socio-cultural background of the said period,
b. literary/intellectual details of the period,
c. the generic/social history of poetry and poetic forms of the period
d. the development of English drama on the Elizabethan and Jacobean stage.
e. Renaissance Humanism
f. the Stage, Court and City of the period

**Course Name: Core Course-5**
**Course Code: ENGACOR05T**
**Topic Name: AMERICAN LITERATURE**
**Course Outcomes:** At the end of the course students will be enriched with the following concepts-

a. American dream,

b. social realism and the American novel,
c. folklore and the American novel,
d. Black women's writing

**Course Name: Core Course-6**
**Course Code: ENGACOR06T**
**Topic Name: POPULAR LITERATURE**
**Course Outcomes:** Reading the course students will come to know

a. various aspects of canonical and the popular texts,
b. importance of gender and identity,
c. ethics and education in children's literature,
d. what sense and nonsense mean in popular literature
e. graphic novel

**Course Name: Core Course-7**
**Course Code: ENGACOR07T**
**Topic Name: BRITISH POETRY &DRAMA (17TH-18TH C)**
**Course Outcomes:** After reading the course students will have ideas about the following concepts:

a. History, politics and socio-cultural background of the period,
b. religious & secular thought in the 17th century, its impact on literature,
c. Poetry with special reference to the change and the emergence of new forms and styles, d. verse satires,
e. neoclassical norms,
f. emergence of mock-epic.

**Course Name: Core Course-8**
**Course Code: ENGACOR08T**
**Topic Name: 18TH C BRITISH LITERATURE**
**Course Outcomes:** At the end of the course learners will know about

a. various socio-political aspects of 18th century
b. the Enlightenment and Neoclassicism,
c. the mock-epic and satire,
d. rise of sensibility,
e. the rise of the periodical press
f. the rise of novel as a genre.

**Course Name: Core Course 9**
**Course Code: ENGACOR09T**
**Topic Name: BRITISH ROMANTIC LITERATURE**
**Course Outcomes:** At the end of the lesson learners will have ideas about

a. Backgrounds to Romantic and Victorian poetry,
b. Social, political and intellectual developments and their impact on literature. c. reason & imagination,
d. conceptions of man and nature,
e. literature & revolution,
f. the gothic; dramatic monologue, utilitarianism; Victorian novel and the novelist in society; faith and doubt; marriage and sexuality.

**Course Name: Core Course-10**
**Course Code: ENGACOR10T**
**Topic Name: 19$^{TH}$ CENTURY BRITISH LITERATURE**
**Course Outcomes:** After finishing the course students will know about a.

Utilitarianism,

b. The 19th Century Novel,
c. Marriage and Sexuality,
d. The Writer and Society,
e. Faith and Doubt,
f. The Dramatic Monologue

**Course Name: Core Course-11**
**Course Code: ENGACOR11T**
**Topic Name: WOMEN'S WRITING**
**Course Outcomes:** After completion of the course learners will know the following aspects of women's writing
:

a. The Confessional Mode in Women's Writing
b. Sexual Politics
c. Race, Caste and Gender
d. Social Reform and Women's Rights

**Course Name: Core Course-12**
**Course Code: ENGACOR12T**
**Topic Name: EARLY 20TH CENTURY BRITISH LITERATURE**

**Course Outcomes:** In this course learners will learn about

a. Modernism, Post-modernism and non-European Cultures
b. The Women's Movement in the Early 20th Century
c. Psychoanalysis and the Stream of Consciousness
d. The Uses of Myth
e. The Avant Garde

**Course Name: Core Course-13**
**Course Code: ENGACOR13T**
**Topic Name: MODERN EUROPEAN DRAMA**
**Course Outcomes:** In this course students will know about

a. Politics, Social Change and the Stage
b. Text and Performance
c. European Drama: Realism and Beyond
d. Tragedy and Heroism in Modern European Drama
e. The Theatre of the Absurd

**Course Name: Core Course-14**
**Course Code: ENGACOR14T**
**Topic Name: POSTCOLONIAL LITERATURE**
**Course Outcomes:** In this course students will be taught about

a. decolonization,
b. globalization and literature,
c. literature and identity Politics,
d. writing for the new world; region, race and gender,
e. postcolonial literatures

**Course Name: DCE 1**
**Course Code: ENGADSE01T**
**Topic Name: OLD ENGLISH LITERATURE, PHILOLOGY, RHETORIC & PROSODY**
**Course Outcomes:** completing the course students will come to know about

a. Old English Poetry- Background of the age, culture, structure of the epic, style, theme.
b. Non-epic, secular, elegiac poetry, theme, style, social picture, language, style
c. Christian poetry- Caedmon's hymn; Cynewulf, Dream of the Rood
d. Old English Prose
e. Growth and Structure of English Language
f. Indo-European family of Languages, Grimm's Law, Latin, Greek, Scandinavian, French influences, Native Resources, Impact of the Bible, Influence of Shakespeare, American Influence

**Course Name: DCE2**
**Course Code: ENGADSE02T**
**Topic Name: LITERARY TYPES & TERMS**
**Course Outcomes:** At the end of the course learners will acquire comprehensive idea about

a. Tragedy

b. Comedy
c. Novel
d. Terms related to Poetry—lyric, ballad, blank verse, caesura, carpe diem, heroic couplet, epic, mock-epic, ode, sonnet, elegy, pastoral, refrain.
e. Terms related to Fiction—bildungsroman, character (flat, static, round, dynamic, stock), point of view, gothic novel, epistolary technique, picaresque & picaro, plot and subplot, setting, omniscient narrator, first person narrator, stream of consciousness.

**Course Name: DCE 3**
**Course Code: ENGADSE04T**
**Topic Name: LITERARY CRITICISM**
**Course Outcomes:** Reading the course learners will know about

a. Summarising and Critiquing
b. Reading and Interpreting
c. Media Criticism
d. Plot and Setting
e. Citing from Critics' Interpretations

**Course Name: DCE 4**
**Course Code: ENGADSE05T**
**Topic Name: PARTITION LITERATURE**
**Course Outcomes:** After completion of the course students will have clear ideas about the following issues:
a. Colonialism,
b. Nationalism, and the Partition,
c. Communalism and Violence,
d. Homelessness and Exile,
e. Women in Partition

**Course Name: SEC1**
**Course Code: ENGSSEC01M**
**Topic Name: CREATIVE WRITING**
**Course Outcomes:** After completion the course students will know

a. What is Creative Writing
b. The Art and Craft of Writing
c. Modes of Creative Writing
d. Writing for the Media
e. Preparing for Publication

**Course Name: SEC2**
**Course Code: ENGSSEC02M**
**Topic Name: ENGLISH LANGUAGE TEACHING**
**Course Outcomes:** At the end of the course students will understand deeply the following issues:

a. how to develop Listening, Speaking, Reading and Writing skills - Basics of Skill Development
b. Approaches and Methods of English Language Teaching
c. Grammar-Translation Method
d. Direct Method
e. Communicative Approach
f. Materials for Teaching Four language Skills (LSRW)

# DEPT. OF GEOGRAPHY
# Course Outcome of
# B.A. Geography (Hons) CBCS Syllabus
# With Effect from 2018-2019

**Core Course-1**
**GEOACOR01T & GEOACOR01P**
**Geotectonics and Geomorphology**

Course outcome:

At the end of the course students would get elaborate idea about

1. Geological time scale; layering of the earth's interior through seismology; isostasy, and global tectonics
2. Degradational processes; processes and landforms: Coastal, glacial, Aeolian
3. Origin and types of folds and faults, river network on uniclinal and folded structure and landforms on granite, basalt and limestone
4. Landscape evolution of Davis, Penck and Hack
5. Megascopic identification of rocks and minerals and interpretation of geological maps

**Core Course-2**
**GEOACOR02T & GEOACOR02P**
**Cartographic techniques**

Course outcome:

At the end of the course a student learns

1. Concepts of maps and graphical construction of scales
2. Concept of old and open series topographical maps, identification of drainage basin and stream ordering, morphometric techniques, transect chart
3. Concept of coordinate system and grid
4. Map projections: classification, properties, construction and uses

**Core Course-3**
**GEOACOR03T**
**Human geography**

Course outcome:

At the end of the course a student learns

1. Nature, scope, elements, approaches and recent trends in human geography
2. Concepts of race, ethnicity, space and cultural regions
3. Evolution of human societies and adaptation to environment of selected tribes
4. Population growth, distribution, composition, demographic transition and populationresource region
5. Types and patterns of rural settlement and morphology of urban settlements

**Core Course-4**
**GEOACOR04T & GEOCOR04P**
**Cartogram and thematic mapping**

Course outcome:

At the end of the course a student learns

1. Concepts of rounding, scientific notation, logarithm and anti-logarithm, natural and log scales
2. Diagrammatic representation of area and non-area data
3. Preparation and interpretation of land use and land cover maps and socio-economic maps
4. Bearing and surveying using prismatic compass and dumpy level

**Core Course-5**
**GEOACOR05T & GEOCOR05P**
**Climatology**

Course outcome:

At the end of the course a student learns

1. Nature, composition and layering of atmosphere; insolation and heat budget
2. Distribution of atmospheric temperature; green house effects and importance of ozone layers
3. Condensation and precipitation: processes and forms
4. Air mass, fronts and cyclones; climatic classification
5. General circulation of the atmosphere and monsoon mechanism
6. Interpretation of weather map, climograph and hythergraph

**Core Course-6**
**GEOACOR06T& GEOCOR05P**
**Geography of India**

Course outcome:

At the end of the course a student learns

1. Physical characteristics of India and West Bengal
2. Agriculture, mining and industry of India and West Bengal
3. Population characteristics of India and West Bengal; Population policy of India

4. Regionalisation of India and regional issues of Darjeeling Hills and Sundarbans

**Core Course-7**
**GEOACOR07T & GEOCOR07P**
**Climatology**
**Statistical methods in geography**

Course outcome:

At the end of the course a student learns

1. Significance of statistics in geography and sources of geographical data in statistics
2. Types of data, formation of statistical tables, measures of central tendency and measures of dispersion
3. Normal and probability distribution
4. Population and samples, sampling types, techniques and significance
5. Correlation, regression and time series analysis

**Core Course-8**
**GEOACOR08T**
**Regional planning and development**

Course outcome:

At the end of the course a student learns

1. Types of region and delineation; types and techniques of regional planning; multilevel planning in India and urban agglomeration
2. Growth vs development, concepts and indicators of economic, social and human development
3. Models in regional development: Myrdal, Rostow and Perroux
4. Concept and causes of underdevelopment
5. Regional disparity and diversity; need and measures of balanced regional development in India

**Core Course-9**
**GEOACOR09T**
**Economic geography**

Course outcome:

At the end of the course a student learns

1. Concepts and approaches in economic geography, concepts of economic man and theory of choices
2. Concepts of economic activities: primary, secondary and tertiary
3. Theories of location of economic activities: Von Thunen and Weber
4. Case study of tea plantation in India and mixed farming in Europe
5. Transnational sea routes, railways and highways in India; evolution, structure and function of WTO, GATT, BRICKS

**Core Course-10**
**GEOACOR010T & GEOACOR010P**
**Environmental geography**

Course outcome:

At the end of the course a student learns

1. What are the geographical approaches to environmental studies; concept of holistic environment and system approach; space-time hierarchy of environmental problems
2. Structure and function of ecosystem
3. Different types of environmental pollution and urban waste management and how to prepare check-list for Environmental Impact Assessment
4. Environmental policies (national and international) and global initiatives for environmental management
5. Preparation of questionnaire for perception survey on environmental problems and interpretation of air quality using CPCB/ WBPCB data

**Core Course-11**
**GEOACOR011T & GEOACOR011P**
**Fieldwork and research methodology**

Course outcome:

At the end of the course a student learns

1. Types and significance of research in geography; formulation of research design, defining research problems, objectives and hypothesis
2. Importance and techniques of literature review and writing of scientific reports
3. Importance of fieldwork in geographical studies, field techniques and tools
4. Preparation of field report based on field survey

**Core Course-12**
**GEOACOR012T & GEOACOR012P**
**Remote Sensing and GIS**

Course outcome:

After completing the course, students would get in-depth knowledge and ability regarding the application of remote sensing and GIS. Students will learn the followings:

1. Principles of Remote sensing : types of RS satellites and sensors (with special reference to IRS and Landsat missions)
2. Preparation of False Colour Composite and identification of features using standard FCC; principles of image correction and interpretation and preparation of inventories of landuse land cover (LULC) features from satellite images.

3. Concept and applicability of GIS: georeferencing of maps; digitisation of features; overlay and preparation of annotated thematic maps (e.g., choropleth, bar graphs etc.)
4. Principles of GNSS positioning, waypoint collection, transferring the waypoints to GIS and area calculation from the GNSS data.

**Core Course-13**

**GEOACOR013T**
**Evolution of geographical thought**

Course outcome:

At the end of the course a student learns

1. In the development of geography, the contribution of Greek, Chinese and Arabs
2. Geography during age of 'Discovery' and 'Exploration'; transition from cosmography to scientific geography; dualism and dichotomies in geography; changing concept of time-space in geography
3. Evolution of geographical thoughts in Germany, France, Britain and the U.S.A.
4. Quantitative Revolution and system approach; Evolution of critical geography: behavioural, humanistic and radical

**Core Course-14**
**GEOACOR014T & GEOACOR014P**
**Disaster management**

Course outcome:

After successful completion of the course, students will learn about

1. Classification and approaches to hazards and disasters
2. Responses to hazards and hazards mapping: data and geospatial techniques
3. Factors, vulnerability, consequences and management: earthquake, landslide, tropical cyclone, riverbank erosion and radioactive fallout
4. Preparing a project report on disaster management from secondary data

**Discipline Specific Elective-1**
**GEOADSE01T**
**Soil and biogeography**

Course outcome:

After successful completion of the course, students will learn about

1. Formation, profile development and properties of soil
2. Soil: erosion and degradation; classification

3. Concepts and characteristics: ecosystem, biome, food chain and food web, energy flow, bio-geochemical cycles
4. Spatial distribution of world fauna and conservation of biodiversity

**Discipline Specific Elective-2**
**GEOADSE03T**
**Population geography**

Course outcome:

At the end of the course a student will gain knowledge about

1. Development of population geography as a field of specialization; sources of population data
2. Population dynamics: Population growth and distribution of India and the world; determinants of population growth (fertility, mortality and migration); classical and modern theories of population growth; optimum population
3. Population composition and structure; population-resource regions; population policies in developed and developing countries
4. Contemporary issues: Ageing of population; declining sex ratios, population and environment; HIV/AIDS

**Discipline Specific Elective-3**
**GEOADSE04T**
**Hydrology and oceanography**

Course outcome:

After completing the course, students would get in-depth knowledge of the followings:

1. Hydrology: System approach, global hydrological cycle; run-off cycle, infiltration and evapotranspiration
2. Drainage basin hydrology; watershed management; water harvesting; groundwater hydrology
3. Relief of the ocean floor; properties of ocean water, water mass; ocean temperature and salinity
4. Marine resources and sea-level changes

**Discipline Specific Elective-4**
**GEOADSE06T**
**Resource geography**

Course outcome:

At the end of the course students will learn

1. Concept and classification of resources; significance of resources for economic growth and development; approaches to resource utilization
2. Pressure on resources; problems of resource depletion and sustainable resource development
3. Distribution, utilisation, problems and management of mineral resources (bauxite and iron ore) and energy resources (conventional and non-conventional)

4. Limits to growth and future energy crisis; concept of resource sharing (water)

**Skill Enhancement Course -1**
**GEOSSEC01M**
**Remote sensing**

Course outcome:

After completing the course, students would get knowledge of remote sensing in the following aspects:

1. Principles of remote sensing: Classification of RS satellites and sensors
2. Sensor resolutions and their applications
3. Preparation of False Colour Composites
4. Principles of image interpretation and preparation of inventories of land use and land cover

**Skill Enhancement Course -2**
**GEOSSEC02M**
**Advanced spatial statistical techniques**

Course outcome:

At the end of the course students will learn

1. Probability theory, probability density functions and their geographical application
2. Sampling: Sampling plans for spatial and non-spatial data, sampling distribution
3. Correlation and regression analysis: Rank order correlation and product moment correlation
4. Time series analysis: Time series processes; time series components

## Programme specific outcomes

After completion of the programme, students would have an in-depth knowledge about the theoretical concepts of physical and human geography. Students would internalize the two basic themes of geography, namely, regional differentiation and man-environment relationship.

Students learn how to read the topographical maps, air photos and satellite imageries. As they learn the basics of map making and various types of surveying using instruments like dumpy level and prismatic compass, they have an opportunity to be employed at the Survey of India and NATMO. They also learn the application of Geographical Information System which will enable them to secure employment in the sectors of geospatial analysis.

The field survey enables the students to interact with local people for the collection of data and analyse, represent and interpret them. The students will get preference in the government and non-government projects for this experience.

# DEPT OF HISTORY
# Course Outcome of
# B.A. HISTORY (Hons) CBCS Syllabus
# With Effect from 2018-2019

**Course Name: Core Course I.**
**Course Code:HISACOR01T.**
**Paper I: History of India-I (From Earliest Time to 300 BCE)**
Course Outcome: At the end of this course a student learns

1. Understanding about history as a subject.
2. How to write history on the basis of sources and other historical artifacts found in archaeological excavations.
3. Learns about Harappan Civilization and Aryan Civilization.
4. Learns about cultures in transition settlement patterns, technological and economic developments, social stratification and political relations.

**Course Name: Core Course II.**
**Course Code:HISACOR02T.**
**Paper II: Social Formations and Cultural Patterns of the Ancient World.**
Course Outcome:

1. After learning the basic ideas on historical knowledge and Indian Civilizations a student will learn about the evolution of human kind, Paleolithic and Mesolithic cultures.
2. Food production, beginnings of animal husbandry.
3. Learns about Bronze Age civilizations of the worlds e.g. Egypt, Mesopotamia, China etc.
4. Learns about Slave Society and Polis in Ancient Greece.

**Course Name: Core Course III**
**Course Code:HISACOR03T.**
**Paper III: History of India C. 300 BC to 750 CE.**
Course Outcome:

1. After learning two core courses students learn from Core Course III about agrarian expansion, craft production and social stratification during 350 BC to 750 CE.
2. About changing political formation from 300 BC to 300 CE.
3. About religion, philosophy and society of the said period.
4. Also about cultural developments from 300 CE to 750 CE.

**Course Name: Core Course IV**
**Course Code:HISACOR04T.**
**Paper IV: Social Formations and Cultural Patterns of the Medieval World.**
Course Outcome:

1. From this course students learn about Roman Republic and Roman Empire.
2. About religion and culture in Ancient Rome.
3. Economic developments in Europe from seventh to fourteenth centuries and crisis of Feudalism.

4. About societies and religious developments of the Central Islamic Lands.

**Course Name: Core Course V**
**Course Code:HISACOR05T.**
**Paper V: History of India-III (C.750 CE-1206 CE.)**
Course Outcome:

1. From this course a student learns about the evolution of political structures.
2. Agrarian structure and social changes especially proliferation of castes.
3. Learns about trade and commerce and the process if urbanization.
4. Religious and cultural developments of the said period.

**Course Name: Core Course VI**
**Course Code:HISACOR06T**
**Paper VI: Rise of the Modern West-I**
Course Outcome:

1. After studying this course a student learns about the transition from Feudalism to Capitalism.
2. About early Colonial expansion.
3. About European Reformation
4. About emergence of European Sate System.

**Course Name: Core Course VII**
**Course Code:HISACOR07T**
**Paper VII: History of India-IV(1206 CE.-1526 CE.)**
Course Outcome:

1. From this course students learn about Sultanate political structures and theories of kingship.
2. Regional political structures Bahamanies and Vijaynagar.
3. Sultanate Society and Economy.
4. Religion and Culture.

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

1. From this course students learn about the seventeenth century European crisis.
2. English Revolution, American Revolution and Italian Renaissance.
3. Mercantilism and European economies in the seventeenth and eighteenth centuries.
4. Parliamentary monarchy and patters of European Absolutism.

**Course Name: Core Course IX**
**Course Code:HISACOR09T**
**Paper IX: History of India-V (1526 CE.-1757 CE.)**
Course Outcome:

1. From this course students learn about the Historiography of Mughal India.
2. Political expansion of the Mughal rulers.
3. Administrative and land revenue systems of the Mughals.
4. Mughal Art, Architecture and Paintings.

Course Name: Core Course X

**Course Code:HISACOR10T**

**Paper X: History of India-VI (1757 CE.-1857 CE.)**

Course Outcome:

1. From this course students learn about the circumstances leading to the foundations of Company's Rule.
2. Political expansion of the East India Company and the legitimization of the Company's rule in India.
3. Administrative revenue, military, polish and educational reforms.
4. Reactions against the British Rule: Popular Resistance Movements.
5. Renaissance and Reforms.

**Course Name: Core Course XI**

**Course Code:HISACORIIT**

**Paper XI: History of Modern Europe-I (1789-1919)**

Course Outcome:

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

**Course Name: Core Course XII**

**Course Code:HISACOR12T**

Paper XII: History of India-VII (1858 CE.-1947 CE.)

Course Outcome:

1. From this course students learn about the aftermath of Great Rebellion of 1857.
2. The early phase of the India Freedom Movement.
3. The Gandhian Era especially Gandhian movements.
4. The Peasant and Working Class Movements.
5. Communal Politics and Partitions.

**Course Name: Core Course XIII**

**Course Code:HISACOR13T**

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

Course Outcome:

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

**Course Name: Core Course XIV**
**Course Code:HISACOR14T**
**Paper XIV: Trends in World Politics (1919 CE.-2001 CE.).**
Course Outcome:

1. After successful completion of the course a student develops knowledge about the trends in World Politics especially the challenges to the New European Order.
2. Circumstances leading to the outbreak of the Second World War and its impact.
3. Cold War and emergence of bipolar politics.
4. Globalization and its impact and the rise of Terrorism and its impact.

**Course Name: Discipline Specific Elective-I**
**Course Code:HISADSE01T**
**Paper I: Aspects of the History of Modern South-East Asia-I**
Course Outcome:

1. From this course students learn about the growth of Early European interests in South-East Asia.
2. Pre-Colonial polity, society, economy and culture in South-East Asia.
3. Economic impact of Colonialism.
4. Growth of Nationalism in South-East Asia.

**Course Name: Discipline Specific Elective-II**
**Course Code: HISADSE02T**
**Paper II: Aspects of the History of Modern South-East Asia-II**
Course Outcome:

1. Students became aware about early nationalist protest movements against French Rule in Indo-China.
2. They also learn about nationalism and religion in Burma.
3. Growth of anti-Spanish Nationalism in the Phillipines and anti-British Nationalism in Malaya.
4. Decolonization and Cold War Politics.

**Course Name: Discipline Specific Elective-IV**
**Course Code:HISADSE04T**
**Paper IV: History of Modern East Asia-I (1839 CE.–1919 CE.)**
Course Outcome:

1. From this course students learn about Pre-Colonial China.
2. Anglo-Chinese Relations till the Opium War.
3. Pre-Meiji Japan and Meiji-Restoration.
4. Expansion of Japan up to the First World War.

**Course Name: Discipline Specific Elective-V**
**Course Code:HISADSE05T**
**Paper V: History of Modern East Asia-II (1919-1939 CE.)**
Course Outcome:

1. After successful completion of the course students learn about Nationalism in China.
2. The communist victory in China.

3. Rise of modern Japan.
4. Japan and the World War II.

**Course Name: Skilled Enhancement Course-I**
**Course Code:HISSSEC01M**
**Paper I: Archives and Museum.**
Course Outcome:

1. After successful completion of the course student learn about the preservation of documents.
2. They came to know how archival documents being used for writing history.
3. Student knows about different Museums about their history.
4. Students learn about the process of preservation of the artifacts.

**Course Name: Skilled Enhancement Course-II**
**Course Code:HISSSEC02M**
**Paper I: Art and Architecture.**
Course Outcome:

1. After successful completion of the course students learn about the evolution and development of the Indian art and architecture.
2. Art and architecture of the South India.
3. Art and architecture of the North India.
4. Mughal Art and architecture.
5. Trends of the art and architecture based on the different religious ideas.

**Course Name: Generic Elective**
**Course Code:HISGCOR01T**
**Paper I: History of India from Earliest Times to 300 CE.**
Course Outcome:

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

**Course Name: Generic Elective-II**
**Course Code:HISGCOR02T**
**Paper II: History of India from C.300 to 1206 CE.**
Course Outcome:

1. After successful completion of the course students learn about the Gupta Empire especially its administration, society, economy, religion, art, literature, science and technology.
2. Evolution of political structures in the South Indian states.
3. Changes in the society, economy and culture during the rule of the Pallavas, Challukyas, Vardhanas, Palas, Pratiharas and Rastrakutas.
4. Struggle for power in northern India and establishment of the Sultanate.

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

1. Students learn about the foundation, expansion and consolidation of the Delhi Sultanate.
2. Knowledge about Provincial kingdoms: Mewar, Bengal, Vijaynagar and Bahamani.
3. Emergence and consolidation of the Mughal State.
4. Economy, society and culture under the Mughals.

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

1. From this course students come to know about the emergence of independent states and establishment of colonial power.
2. Knowledge about colonial administration, economy especially agriculture, trade and industry.
3. Socio-religious movements in the $19^{th}$ century.
4. Emergence and growth of Nationalism and Communalism.
5. Advent of Freedom, Constituent Assembly and establishment of the Indian Republic.

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## Overall Course Outcome

After successful completion of all the courses under CBCS system assigned to us by the West Bengal State University, Barasat, our students develop elaborate knowledge on many aspects of History of India and the World. Being a popular branch of Social Science History covers wide range of human activities of the past. Since historical events, human evolutions, migrations, social formations, wars, military alliances, creative urge of the people etc. cannot be experimented in laboratories, a historian has to reconstruct the past through his reflective ability. After studying the above courses our students develop their reflective ability or thinking skill which enables them to interpret a historical incident to a logical conclusion. Building their solid base here our students pursue higher studies and research in different Universities of both public and private sectors. It opens up their carrier prospects in different fields.

# DEPT. OF MATHEMATICS
## Course Outcome of
## B.Sc. Mathematics (Hons) CBCS Syllabus
## With Effect from 2018-2019

## Semester-1

## Paper: MTMACOR01T

## Calculus, Geometry and Ordinary Differential equations

***LearningOutcomes:*** On completion of this area of the course, the student will beable to

- UnderstandthenatureofHyperbolicfunctions.
- FindhigherorderderivativesandapplytheLeibnitzruletosolveproblemsrelated to such derivatives.
- Plotthegraphsofpolynomialsofdegree4and5,thederivativegraph,thesecondderivativegraphand comparethem.
- Apply the conceptand principles ofdifferential calculus to find the curvature,concavity and points of inflection, envelopes, rectilinear asymptotes (Cartesian &parametricformonly)ofdifferentcurves.
- Applytheconceptandprinciplesofdifferentialcalculustosolvedifferentgeometric and physical problems that may arise in business, economics and lifesciences.
- SolvevariouslimitproblemsusingL'Hospital'srule·
- DeriveReductionformulaeforsomecomplexintegrationsandhenceIntegratefunctionsofamuchhigherdegreewhichareapplicableinreallifesituations.
- Apply theintegralcalculustofindarclengthofacurve,arclengthofparametric curves,areaunderacurve,surfaceareaandvolumeofsurfaceofrevolution.
- Transformtheco-ordinatesystemespeciallybyRotationofaxes,thusreducingdifferentsecond-degreeequationstotheircorrespondingsimplestformsandalsoclassifytheconicsusingthe discriminant.
- Becomefamiliarwiththepolarequationsofconics&theirtangentsandnormal
- Understand the geometrical terminology and have a detailed clear-cut idea of thePlanes,Straightlinesin 3D,Spheres,Cylindricalsurfaces,Centralconicoids,Paraboloids, Plane sections ofconicoids along with the Tangent and normal ofthe conicoids.
- Haveanideaofclassificationofquadrics.
- Firstorderdifferentialequations:Exactdifferentialequationsandintegrating factors, special integrating factors and transformations, linearequationsandBernoulliequations,theexistenceanduniquenesstheoremofPicard(Statementonly). Linear equations and equations reducible to linear form.

Graphical Demonstration

- Visualizeandgraphically demonstrategeometricfiguresandclassifydifferentgeometricsolidsusingteachingaid-preferably freesoftware's:
  - ✓Tracingofconicsincartesiancoordinates/polarcoordinates.
  - ✓ Sketching ellipsoid, hyperboloid of one and two sheets, elliptic cone,elliptic,paraboloid,andhyperbolicparaboloidusingcartesiancoordinates.
- Understandthebasicapplicationsoftheanalyticalplaneandsolidgeometry.

## Paper: MTMACOR02T

## Algebra

***LearningOutcomes:***Oncompletionofthiscourse,thestudentwillhaveaclear-cutunderstandingofsomeimportantconceptsofClassicalAlgebra,AbstractAlgebra&LinearAlgebraasfollows:

- Polarrepresentationofcomplexnumbers,*n*-throotsofunity,DeMoivre'stheoremforrationalindicesanditsapplications.Exponential,logarithmic,trigonometricandhyperbolicfunctionsofthe complexvariable.
- Theory ofequations:Relationbetweenroots andcoefficients,transformation oftheequation,Descartesruleofsigns,Sturm'stheorem,cubicequation(solutionbyCardan's method)andbiquadraticequation(solutionbyFerrari's method).
- Inequality:Theinequalityinvolving$AM \geq GM \geq HM$,Cauchy-Schwartzinequality.
- Relation:equivalencerelation,equivalenceclasses&partition,partialorderrelation,poset,linearorderrelation.
- Mapping:injective,surjective,onetoonecorrespondence,invertiblemapping,compositionofmappings,relationbetweenthecompositionofmappingsandvarioussettheoreticoperations.
- Well-ordering property of positive integers, Principles of Mathematical induction,division algorithm, di-visibility and Euclidean algorithm. Prime numbers and theirproperties, Euclid's theorem. Congruence relation between integers. FundamentalTheorem of Arithmetic. Chinese remainder theorem. Arithmetic functions, somearithmeticfunctionssuchas$\varphi, \tau, \sigma$andtheirproperties
- Rankofamatrix,inverseofamatrix,characterizationsofinvertiblematrices.
- Systems of linear equations, row reduction and echelon forms, vector equations,the matrix equation $AX = B$, solution sets of linear systems, applications of linearsystems.

## Semester-2

## Paper: MTMACOR03T

## Real Analysis

LearningOutcomes:

After completion of this course, the students will be able to think about the basicproof techniques and fundamental definitions related to the real number system.Theycandemonstratesomeofthefundamentaltheoremsofanalysis.Thestudentswillgraduallydevelop Analysisskillsinsets,sequencesandinfiniteseriesofRealNumberscoveredbythefollowing topics:

- Intuitive idea of real numbers. Mathematical operations and usual order of realnumbersrevisitedwiththeirproperties(closure,commutative,associative,identity, inverse, distributive). Idea of countable sets, un-countable sets anduncountability ofR.Conceptofbounded andunbounded setsin R.L.U.B.(supremum),G.L.B. (infimum) ofa setand their properties.L.U.B. axiom ororder completenessaxiom.Archimedeanpropertyof R.Densityofrational(and Irrational)numbersin R.
- Intervals.Neighbourhoodofapoint.Interiorpoint.Openset.Union,intersectionofopensets .Limitpointandisolatedpointofaset.Bolzano-Weirstrass theoremfor sets. Existence oflimit pointofevery uncountable setas a consequence of Bolzano-Weirstrass theorem. Derived set. Closed set.Complementofopensetandclosedset.Unionandintersectionofclosedsetsas a consequence. No nonempty proper subset of R is both open and closed.DensesetinRasasethavingnon-emptyintersectionwitheveryopeninterval.
- Realsequence.Boundedsequence.Convergenceandnon-convergence.Examples. Boundedness of convergent sequence. Uniqueness of limit. Algebraof limits.
- Relation between the limit point of a set and the limit of a convergent sequenceof distinct elements. Monotone sequences and their convergence. Sandwichrule.Nestedintervaltheorem.Limitofsomeimportantsequences.Cauchy'sfirst and secondlimittheorems.
- Everysequencehasamonotonesubsequence. Bolzano-Weirstrasstheoremforsequence.Cauchy'sconvergencecriterion.Cauchysequence.
- Infiniteseries,convergenceandnon-convergenceofinfiniteseries,Cauchy criterion, tests for convergence: comparison test, limit comparison test, ratio test,Cauchy'sn-throottest,Alternatingseries,Leibniztest.Absoluteandconditionalconvergence.

***GraphicalDemonstration(TeachingAid-Preferablybycomputersoftware's)***

Thestudentswillgainhandsonexpertiseingraphicaldemonstrationofthefollowing, usingcomputer softwareorotherwise:

- Plottingofrecursivesequences.
- Studytheconvergenceofsequencesthroughplotting.
- VerifyBolzano-

Weierstrasstheoremthroughplottingofsequencesandhenceidentifyconvergentsubseq uencesfromtheplot.

- Studytheconvergence/divergenceofinfiniteseriesbyplottingtheirsequencesofpartialsu m.
- Cauchy'srootestbyplotting*n*-throots.
- Ratiotestbyplottingtheratioof*n*-thand(*n*+1)-thterm.

## Paper: MTMACOR04T

## Differential Equation and Vector Calculus

On completion of this course, the student will be able to identify the type of agivendifferentialequationandselectandapplytheappropriateanalyticaltechnique for finding the solution. The students will be well conversant with thefollowing typesofdifferentialequations and vector calculus:

- First order higherdegreeequationssolvablefor*x*,*y*and*p*.Clairaut'sequationsandsingularsoluti on.
- BasicTheoryoflinearsystemsinnormalform,homogeneouslinearsystemswithcons tantcoefficients:TwoEquationsintwounknownfunctions.
- Lineardifferentialequationsofsecond order, Wronskian:itspropertiesandapplications,Eulerequation,methodofundeterminedc oefficients,method ofvariationofparameters.
- System of linear differential equations, types of linear systems, differentialoperators,anoperatormethodforlinearsystemswithconstantcoefficients .
- Planarlinearautonomoussystems:Equilibrium(critical)points,Interpretationofthe phaseplaneandphaseportraits.
- Power series solution of a differential equation about an ordinary point,solutionaboutaregularsingularpoint(uptosecondorder).
- Vector triple product, introduction to vector functions, operations with vector valued functions, differentiation and integration of vector functions.
- Plotting of family of curves which are solutions of second order and third order differential equations.

## Semester-3

## Paper: MTMACOR05T

## Theory of Real Functions

***Learning Outcomes:*** After completion of this course, the students will be able tounderstandtheconceptofreal-valuedfunctions,limit,continuity,and differentiability in detail. They can find expansions of real functions in series forms.Thestudentswillbecomeconversantwithmanyoftheimportanttheoremsof Differential Calculus afterthecompletionofthisCoreCoursewhichhasbeencovered in thefollowing topics:

- Limits of functions, sequential criterion for limits. Algebra of limits for functions,effect of limit on inequality involving functions, one sided limit. Infinite limits andlimits atinfinity.SomeImportantexamplesoflimits.
- Continuity ofa function on an intervalandatan isolated point.Sequentialcriteria for continuity. Conceptofoscillation ofa function ata point.A functioniscontinuousat$x$ifandonlyifitsoscillationat$x$iszero.Familiaritywiththe figuresofsomewell-knownfunctions:$y=x^a$($a$=2,3,−1,-2),$|x|$,sin$x$,cos$x$, tan$x$,log$x$,$e^x$.Algebraofcontinuousfunctionsasaconsequenceofalgebraof limits.Continuityofcompositefunctions.Examplesofcontinuousfunctions. Continuityofafunctionatapointdoesnotnecessarilyimplythecontinuityin someneighbourhoodofthatpoint.
- Boundedfunctions.Neighbourhoodpropertiesofcontinuousfunctionsregardingbounded nessandmaintenanceofthesamesign.Continuousfunctionon[$a$,$b$]isboundedandattainsit sbounds.Intermediatevaluetheorem.
- Discontinuityoffunctions,typeofdiscontinuity.Stepfunctions.Piecewisecontinuity.Mo notonefunctions.Monotonefunctionscanhaveonlyjumpdiscontinuity. Monotone functions can have at most countably many points ofdiscontinuity.Monotonebijectivefunctionfromanintervaltoanintervaliscontinuousan ditsinverseisalsocontinuous.
- Uniformcontinuity.Functionscontinuousonaclosedandboundedintervalisuniformlycon tinuous.Anecessaryandsufficientconditionunderwhichacontinuous function on a bounded open interval will be uniformly continuous. Asufficientconditionunderwhichacontinuousfunctiononanunboundedopenintervalwill beuniformlycontinuous(statementonly).Lipschitzconditionanduniformcontinuity.
- Differentiabilityofafunctionatapointandinaninterval,algebraofdifferentiablefunctions.

Meaningofsignofderivative.Chainrule.

- Darbauxtheorem,Rolle 's Theorem,MeanvaluetheoremsofLagrangeandCauchy—asanapplicationofRolle'stheorem.Taylor'stheoremonclosed andboundedintervalwithLagrange'sandCauchy'sformofremainderdeducedfromLagrange'sandCauchy'smeanvaluetheoremrespectively.Expansionof$e^x$,log(1+$x$),$(1+x)^m$,sin$x$,cos$x$withtheirrangeofvalidity (assumingrelevanttheorems).ApplicationofTaylor'stheoremtoinequalities.
- Statement of L' Hospital's rule and its consequences. Point of local extremum(maximum, minimum) of a function in an interval. Sufficient condition for theexistenceofa localmaximum/minimum ofafunction ata point(statementonly).Determinationoflocalextremumusingfirstorderderivative.Application oftheprincipleofmaximum/minimumingeometricalproblems.

## Paper: MTMACOR06T

## Group Theory-1

***LearningOutcomes:***Onthecompletionofthiscourse,thestudentswillunderstandthebasicconceptsofGroupTheoryinAbstract/ModernAlgebra covered by the followingtopics:

- Symmetriesofasquare,definitionofgroup,examplesofgroupsincludingpermutation groups, dihedral groups and quaternion groups (through matrices),elementary properties of groups, examples of commutative and non-commutativegroups.Subgroupsandexamplesofsubgroups,necessaryandsufficientconditionforanonemptysubsetofagrouptobeasubgroup.Normalizer,centralizer,center ofagroup,productoftwosubgroups.
- Propertiesofcyclicgroups,classificationofsubgroupsofcyclicgroups. Cyclenotation for permutations, properties of permutations, even and odd permutations,alternating group, properties ofcosets, order ofan element, order ofa group.Lagrange'stheoremandconsequencesincludingFermat'sLittletheorem.
- Normalsubgroupanditsproperties.Quotientgroup.Grouphomomorphisms,propertiesofhomomorphisms,correspondencetheoremandone-onecorrespondence between the set of all normal subgroups of a group and the set ofallcongruenceonthatgroup,Cayley'stheorem,propertiesofisomorphisms.First,SecondandThirdisomorphismtheorems.

## Paper: MTMACOR07T

## Numerical Methods

***LearningOutcomes:***Onthecompletionofthiscourse,thestudentswillbeableto:

- Apply numerical methods to obtain approximate solutions to mathematical problems.
- Solve the nonlinear equations, system of linear equations and interpolation problems using numerical methods.
- Examine the appropriate numerical differentiation and integration methods to solve problems.
- Apply the numerical methods to solve algebraic as well as differential equations. The course will be covered in the following topics:
- Representation of real numbers, Machine Numbers - floating point and fixed point. Sources of Errors, Rounding of numbers, significant digits and Error Propagation in machine arithmetic operations. Numerical Algorithms - stability and convergence.
- Approximation: Classes of approximating functions, Types of approximations-polynomial approximation, The Weierstrass polynomial approximation theorem (statement only).
- Interpolation: Lagrange and Newton's methods. Error bounds. Finite difference operators. Newton (Gregory) forward and backward difference interpolation.
- Different interpolation zones, Error estimation. Hermite interpolation.
- Numerical differentiation: Methods based on interpolations; methods based on finite differences.
- Numerical Integration: Newton Cotes formula, Trapezoidal rule, Simpson's 1/3-rd rule, Simpson's 3/8-th rule, Weddle's rule, Boole's Rule, midpoint rule. Composite trapezoidal rule, composite Simpson's 1/3-rd rule, composite Weddle's rule. Gaussian quadrature formula.
- Transcendental and polynomial equations: Bisection method, Secant method, Regula-falsi method, fixed point iteration, Newton-Raphson method. Condition of convergence (if any), Order of convergence, Rate of convergence of these methods. System of linear algebraic equations:
- Direct methods: Gaussian elimination and Gauss Jordan methods, Pivoting strategies.
- Iterative methods: Gauss Jacobi method, Gauss Seidel method and their convergence analysis. LU decomposition method (Crout's LU decomposition method).
- Matrix inversion: Gaussian elimination and LU decomposition method (Crout's LU decompositionmethod)(operationalcounts).
- Thealgebraiceigenvalueproblem:Powermethod.
- Ordinarydifferentialequations:Single-stepdifferenceequationmethods-error,convergence.Themethodofsuccessiveapproximations(Picard),Euler'smethod,themodifiedEulermethod,Runge-Kuttamethodsoforderstwoandfour.

**CoreCourse-7Practical(NumericalMethodsLab)**

***LearningOutcomes:***For any of the CAS (Computer Aided software),studentsareintroducedtoDatatypes-simpledatatypes,floatingdatatypes,characterdatatypes,arithmeticoperatorsandoperatorprecedence,variablesandconstantdeclarations,expressions,input/output,relationaloperators,logical operators and logical expressions, control statements andloop statements,

Arrays. The students become expert in solvingdifferentnumericalproblems(listedbelow)byusingcomputerprogrammingtechniques*ofC/C++/FORTRAN90*

- Calculatethesum1+½+1/3+ +1/N
- Enter100integersintoanarrayandsortthemin anascendingorder.
- Solutionoftranscendentalandalgebraicequationsby
  - i) Bisectionmethod
  - ii) NewtonRaphsonmethod(Simpleroot,multipleroots,complexroots).
  - iii) Secantmethod.
  - iv) RegulaFalsimethod.
- Solut onofsystemoflinearequations
  - i) LUdecompositionmethod
  - ii) Gaussianeliminationmethod
  - iii) Gauss-Jacobimethod
  - iv) Gauss-Seidelmethod
- Interpolation
  - i)LagrangeInterpolation
  - i) Newton's forward, backward and divided differenceinterpolations
- NumericalIntegration
  - i) TrapezoidalRule
  - ii) Simpson'sonethirdrule
  - iii) Weddle'sRule
  - iv) GaussQuadrature
- MethodoffindingEigenvaluebyPowermethod(upto4×4)
- FittingaPolynomialFunction(uptothirddegree)
- Solutionofordinarydifferentialequations
  - i) Eulermethod
  - ii) ModifiedEulermethod
  - iii) RungeKuttamethod(order4)

## Semester-4

## Paper: MTMACOR08T

## Riemann Integration and series of Functions

LearningOutcomes: Oncompletionofthiscourse,thestudentwillbeableto

- Understand Partition and refinement of partition of a closed and boundedinterval.
- Conceptualise Upper Darboux sum U(P, f) and lower Darboux sum L(P, f)andassociated results.Upper integralandlowerintegral.
- UnderstandDarboux'stheoremalongwithDarboux'sdefinitionofintegration overaclosedandboundedinterval.
- LearnRiemann'sdefinitionofintegrabilityanditsEquivalencewithDarboux definition of integrability along with the Necessary and sufficientcondition forRiemannintegrability.
- Conceptualize negligible set (or zero set) defined as a set covered bycountable number ofopen intervals sum of whose lengths is arbitrarysmall, Examples of negligible sets:any subset ofa negligible set, finiteset,countableunion ofnegligiblesets.
- LearnthataboundedfunctiononaclosedandboundedintervalisRiemannintegrableifandonlyi fthesetofpointsofdiscontinuityisnegligible.
- Develop the capacity to integrate, while understanding the examples ofRiemann integrable functions.
- DeveloptheconceptofIntegrabilityofsum,scalarmultiple,product,quotient,modulusofRiem annintegrablefunctions&propertiesofRiemannintegrablefunctionsarisingfromtheaboveres ults.
- Haveanideaofthefunctionsdefinedbydefiniteintegralanditsproperties,Antiderivative(primi tiveorindefiniteintegral)andalsothepropertiesofLogarithmicfunctiondefinedasthe definiteintegral.\
- Understand the Fundamental theorem of Integral Calculus & First MeanValuetheoremofintegralcalculus.
- Understand well the Range of integration-finite or infinite and learn theNecessary andsufficientcondition for convergenceofimproperintegralin both cases.
- LearntheTestsofconvergence:ComparisonandM-test,Absoluteandnon-absolute convergenceandinter-relations.
- UnderstandtheStatementofAbel'sandDirichlet'stestforconvergenceonthe integralofa product.
- DevelopanideaofconvergenceandworkingknowledgeofBetaandGamma and theirinterrelation.
- Computedifferentintegralswhentheyexist(usingBetaandGammafunction).
- Sequenceoffunctionsdefinedonaset,Pointwiseanduniformconvergence. Cauchy criterion of uniform convergence. Weirstrass' M-test. Boundedness, continuity, integrability and differentiability of the limitfunctionofasequenceoffunctionsincaseofuniformconvergence.
- Series of functions defined on a set, Pointwise and uniform convergence.Cauchycriterionofuniformconvergence.Weierstrass'M-test.Passagetothelimittermbyterm.Boundedness,continuity,integrability,differentiabilityo faseriesoffunctionsincaseofuniformconvergence.
- Power series: Fundamental theorem of power series. Cauchy-Hadamardtheorem. Determination of radius of convergence. Uniform and absoluteconvergence of power series. Properties of sum function. Differentiationand integration ofpower series. Abel's limit theorems. Uniqueness ofpowerserieshaving sumfunction.
- Fourier series:Trigonometric series.Statementofsufficient condition foratrigonometricseriestobeaFourierseries.Fouriercoefficientsforperiodic functions

defined on [−π, π]. Statement of Dirichlet's condition ofconvergence.StatementoftheoremofsumofFourierseries.

## Paper: MTMACOR09T

## Multivariate Calculus

LearningOutcomes: Oncompletionofthiscourse,thestudentwillbeableto

- Understand the concept of neighborhood of a point in Rn (n > 1), interior point,limit point,open setand closedset inRn (n> 1).
- Identify functions from Rn(n > 1) to Rm(m ≥ 1)
- Developconceptsonlimitandcontinuityoffunctionsoftwoormorevariables,theirpartialderivatives,totalderivativeanddifferentiability,along with the sufficient condition for differentiability, Chain rule for one and two independent parameters, directional derivatives, the gradient, maximal and normal property of the gradient, tangent planes.
- Find Extrema of functions of two variables & understand the use of themethodofLagrangemultipliers&solveconstrainedoptimizationproblems.
- Multiple integral: Concept of upper sum, lower sum, upper integral,lower-integralanddoubleintegral(norigoroustreatmentisneeded). Statement of existence theorem for continuous functions.Iterated or repeated integral, change of order of integration. Tripleintegral. Cylindricaland sphericalcoordinates. Change of variablesindoubleintegralsandtripleintegrals.Transformationofdoubleand triple integrals (problems only). Determination of volume andsurface area by multiple integrals (problems only). Differentiationunderthe integralsign,Leibniz'srule(problemsonly).
- Definitionofvectorfield,divergenceandcurl.Lineintegrals,applicationsoflineintegral:massandwork.Fundamentaltheoremforlineintegrals,conservativevectorfields,independenceofpath.
- Green'stheorem,surfaceintegrals,integralsoverparametricallydefinedsurfaces.Stoke'stheorem,TheDivergencetheorem.

## Paper: MTMACOR10T

## Ring theory and Linear Algebra-I

***LearningOutcomes:*** Aftercompletionofthiscourse,thestudentswillmainlybeableto

- DevelopaconceptonRingTheoryofAbstractAlgebraindetails.
- Understandvectorspacesovera field andsubspacesandapplytheirproperties.
- Understandlinearindependenceanddependence.
- Findthebasisanddimensionofavectorspace,andunderstandthechangeofbasis.
- Compute linear transformations, kernel and range, and inverse linear transformations, and find matrices of general linear transformations.
- Find Eigenvalues and eigenvectors of a matrix and of linear transformation.

- TheCayley-HamiltonTheoremanditsuseinfindingtheinverseofamatrix.

## Semester-5

## Paper: MTMACOR11T

Partial Differential Equation and Application of Ordinary differential Equations

LearningOutcomes:On completion of this course, the student will be able tounderstand,derive andsolvedifferenttypesofpartialdifferentialequationswhichmayariseinreallifeproblems:

- Partialdifferentialequationsofthefirstorder,Lagrange'ssolution non- linear first order partial differential equations, Charpit's generalmethod of solution, some special types of equations which can besolvedeasilybymethodsotherthanthegeneralmethod
- DerivationofheatequationwaveequationandLaplaceequation.Classificationofsecondorder linearequationsashyperbolic,paraboliccorelliptic.Reductionofsecondorderlinearequationst ocanonicalforms.
- TheCauchyproblem,Cauchy-Kowalewskayatheorem,Cauchyproblem of finite and infinite string. Initial boundary value problems.Semi-infinite string with a fixed end, semi-infinite string with a free end.Equationswithnon-homogeneousboundaryconditions.Non-homogeneouswaveequation.Methodofseparationofvariables,solvingthevibratingstringpro blem.Solvingtheheatconductionproblem.
- Applications of Ordinary differential equations in different problems of Mechanics namely, Central Force, Constrained motion, Varying Mass, tangent and normal components of acceleration, modelling ballistics and planetary motion, Kepler's Second Law.
- Graphical demonstration of solution of Cauchy Problem for first order Partial differential equations, plotting integral surfaces for first order PDE with initial data.

## Paper: MTMACOR12T

## Group Theory-II

Learning outcomes: After completion of this course the students will be abletodemonstratethemathematicalmaturityofunderstandingtheadvanceaspectsofGroupTheory

- Automorphism,innerautomorphism,automorphismgroups,automorphism groups of finite and infinite cyclic groups, applicationsof factorgroupstoautomorphismgroups.
- External direct product and its properties, the group of units modulo n as an external direct product, internal direct product, Fundamental theorem of finite abelian groups, Fundamental theorem of finite abelian groups.

- Group actions, generalized Cayley's theorem, Index theorem, Stabilizer and Kernels etc.
- Groups acting on themselves by conjugation, Sylow's theorems and consequences,

Cauchy’s theorem etc.

## Paper: MTMACOR13T

## Metric Spaces and Complex Analysis

LearningOutcomes:On successfulcompletion ofthe coursestudentswillbeabletodevelopconceptualunderstandingofthefollowing:

- Definitionandexamplesofmetricspaces.Openball.Openset.Closedsetascomplementofopenset.Interiorpointandinteriorofa set. Limit point and closure of a set. Boundary point and boundaryof a set. Properties of interior, closure and boundary. Bounded setand diameter of a set. Distance between two sets. Subspace of ametricspace.
- Convergentsequence.Cauchysequence.EveryconvergentsequenceisCauchyandbounded,buttheconverseisnottrue.Completeness. Cantor's intersection theorem. R is a complete metricspace.Qisnotcomplete.
- Continuousmappings,sequentialcriterionofcontinuity.Uniformcontinuity.
- Compactness, Sequential compactness, Heine-Borel theorem in R.Finiteintersectionproperty,continuousfunctionsoncompactsets.
- ConceptofconnectednessandsomeexamplesofconnectedmetricspaceconnectedsubsetsofR, C.
- ContractionmappingsBanachFixedpointTheoremanditsapplication
- toordinarydifferentialequations.
- Limits,limits involving the point at infinity. Continuity of functions of complexvariables.
- Derivatives,differentiationformulas,Cauchy-Riemannequations,sufficientconditionsfordifferentiability.Analyticfunctions,exponentialfunction,logarithmicfunction,trigonometricfunctions,hyperbolic functions.
- Determinationofradiusofconvergence. Uniform and absolute convergence of power series. Analyticfunctionsrepresentedbypowerseries.Uniquenessofpowerseries.
- Contours,complex integrationalong acontour anditsexamples,upperboundsformoduliofcontourintegrals.Cauchy-Goursattheorem(statementonly)anditsconsequences,Cauchyintegralformula.

## Paper: MTMACOR14T

## Ring Theory and Linear Algebra II

LearningOutcomes:On successfulcompletion ofthe coursestudentswillbeabletodevelopconceptualunderstandingofthefollowing:

- Polynomial rings over commutative rings, Division algorithm and consequences, Unique Factorization domains, Euclidean Domains etc.

- Inner product spaces and norms, Gram-Schmidt orthonormalizationprocess, orthogonalcomplements, Bessel's inequality, the adjoint ofa linearoperatorandits basicproperties.
- Bilinear and quadratic forms, Diagonalization of symmetric matrices,Secondderivativetestforcriticalpointofafunctionofseveralvariables,Hessianmatrix, Sylvester'slawofinertia.Index,signature.
- Dualspaces,dualbasis,doubledual,transposeofalineartransformationanditsmatrixinthedualb asis,annihilators.Eigen spaces of a linear operator, diagonalizability, invariant subspacesandCayley-Hamiltontheorem,theminimalpolynomialforalinearoperator,canonicalforms (Jordan&rational).

## Skill Enhancement Courses (Semester-III, Semester-IV)

After the completion of these courses the students will acquireskills in thinking more logically in Mathematics, as well as theywillunderstandtheimportanceofCprogrammingorobject-orientedprogrammingC++,bothofwhichareverygoodprogrammingtoolsforsolvingmanyreal-lifeproblems.

### Generic Elective of Mathematics

### Semester-I

### Paper: MTMHGEC01T

### Differential calculus

***LearningOutcomes:***On completion of this area of the course,the studentwillbeable todevelopaclearconceptofthefollowing:

- Limit and continuity, successive differentiation, partial differentiation, Euler's theorem on homogeneous functions.
- Tangents and normal, curvature, asymptotes, singular points, tracing of various types of curves.
- Rolle's Theorem and different type of Mean Value Theorems, Concept of Taylor Series and Maclaurin Series, indeterminate forms.

### Semester-II

### Paper: MTMHGEC02T

## Differential Equations

***LearningOutcomes:***On completion of this area of the course,the studentwillbeable todevelopaclearconceptofthefollowing:

- First order exact equations, first order higher degree equations, methods of solutions and properties.
- Solving a differential equation by reducing it order.
- Linear homogeneous equation, linear non-homogeneous equations, Cauchy-Euler equation, Simultaneous Differential equations, Total differential Equations.
- Formation, different methods of solutions of Partial Differential equations (first order).
- Classification of second order partial differential equations.

## Course Outcome

The Bachelor's Degree in B.Sc. (Hons) Mathematics is awarded to the students on the basis of knowledge, understanding, skills, attitudes, values and academic achievements sought to be acquired by learners at the end of this program. Hence, the learning outcomes of mathematics for this course are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for knowledge of mathematics. Mathematics is the study of quantity, structure, space and change. It has very broad scope in science, engineering and social sciences. The key areas of study in mathematics are Calculus, Algebra, Geometry, Analysis, Differential Equations and Mechanics. Programme Specific Outcome of B.Sc. (Hons) Mathematics

 Think in a critical manner.

 Familiarize the students with suitable tools of mathematical analysis to handle issues and problems in mathematics and related sciences.

 Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of mathematics and statistics.

 Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in mathematics and its allied areas on multiple disciplines concerned with mathematics.

 Encourage the students to develop a range of generic skills helpful in employment, internships and social activities.

Bachelor's degree in mathematics is the culmination of in-depth knowledge of algebra, calculus, geometry, differential equations and several other branches of mathematics. This also leads to study of related areas like computer science, Financial Mathematics, statistics and many more. Thus, this programme helps learners in building a solid foundation for higher studies in mathematics. The skills and knowledge gained has intrinsic beauty, which also leads to proficiency in analytical

reasoning. This can be utilized in modelling and solving real life problems. They also share ideas and insights while seeking and benefitting from knowledge and insight of others. This helps them to learn behave responsibly in a rapidly changing interdependent society. Students completing this programme will be able to present mathematics clearly and precisely, describe mathematical ideas from multiple perspectives and explain fundamental concepts of mathematics to non-mathematicians. Completion of this programme will also enable the learners to join teaching profession in Primary, Secondary and Higher Secondary schools. This programme will also help students to enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

## DEPT OF MICROBIOLOGY

## Course Outcomes of

## B.Sc. Microbiology CBCS Syllabus

## With Effect from 2019-2020

### Core Course

**MCBACOR01T/P:IntroductiontoMicrobiologyandMicrobialDiversity**

**Courselearningoutcomes**:Attheconclusionofthiscoursethestudents -

**Outcome 1**. Have developed a good knowledge of the development of the discipline of Microbiology and the contributions made by prominent scientists in this field.
**Outcome 2**. Have developed a very good understanding of the characteristics of different types of microorganisms, methods to organize/classify these into and basic tools to study these in the laboratory.
**Outcome3**.Areabletoexplaintheusefulandharmfulactivitiesofthemicroorganisms.
**Outcome 4**. Are able to perform basic experiments to grow and studymicroorganisms in the laboratory.

**MCBACOR02T/P: Bacteriology**

**Course learning outcomes**: At the completion of this course, the students are able to –

**Outcome 1**. Describe characteristics of bacterial cells, cell organelles, cell wall compositionand various appendages like capsules, flagella or pili.
**Outcome 2**. Differentiate a large number of common bacteria by their salient characteristics; classify bacteria into groups.
**Outcome 3**. Describe the nutritional requirements of bacteria for growth; developedknowledge and understanding that besides common bacteria there are several other microbes which grow under extreme environments.
**Outcome4**.Performbasiclaboratoryexperimentstostudymicroorganisms;methodsto preservebacteriainthelaboratory;calculategenerationtimeofgrowingbacteria.

**MCBACOR03T/P: Biochemistry**

**Courselearningoutcomes:**Bytheendofthiscoursethestudents-

**Outcome1**. Developed a verygood understandingofvarious biomolecules which arerequired for development and functioning of a bacterial cell.
**Outcome 2.** Have developed how the carbohydrates make the structural and functional components such as energy generation and as storage food molecules for the bacterial cells
**Outcome 3**. Well conversant about multifarious function of proteins; are able to calculate enzyme activity and other quantitative and qualitative parameters of enzyme kinetics; also knowledge about lipids and nucleic acids.
**Outcome 4**. Student areable to make buffers, studyenzyme kinetics and calculate Vmax, Km, Kcat values.

**MCBACOR04T/P:EnvironmentalMicrobiology**

**Courselearningoutcomes:** Bythecompletionofthiscourse,thestudents-

**Outcome1**.Havedevelopedafairlygoodknowledgeandunderstandingofdifferenttypesof environments and habitats where microorganisms grow including the microbiomes of the human gut and animal gut.
**Outcome2**.Areabletoidentifytheimportantrolemicroorganismsplayinmaintaininghealthy environment by degradation of solid/liquid wastes; how these activities of microorganisms are used in sewage treatment plants, production of activated sludge and functioning of septic tanks
**Outcome3**.HaveunderstoodthesignificanceofBOD/CODandvarioustestsinvolvinguseof enumerating fecal *E.coli* for assessing quality of water.
**Outcome 4.** Have developed the practical skills for conducting experiments to assess the BOD/CODofwastewatersandtheirinterpretation;practicallyassesstheportabilityofdrinking water by the use of standard microbiological tests.

**MCBACOR05T/P:MicrobialPhysiologyandMetabolism**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudentsarecapableof-

**Outcome1**. Describingthe growth characteristics of themicroorganisms capable of growing underunusualenvironmentalconditionoftemperature,oxygen,andsoluteandwateractivity.
**Outcome 2**. Describing the growth characteristics of the microorganisms which require differentnutrientforgrowthandtheassociatedmechanismsofenergygenerationfortheir survival like autotrophs, heterotrophs, chemolithoautotrophy etc.
**Outcome3**.Differentiatingconceptsofaerobicandanaerobicrespirationandhowtheseare manifested in the form of different metabolic pathways in microorganisms.

**MCBACOR06T/P:Cell Biology**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudentsarecapableof-

**Outcome1**. Conceptsofcell-Prokaryotic&Eukaryoticcells. Experimental evidences for nucleic acid as genetic material.StructureofDNA; Models of DNA
**Outcome 2**. Replication. Enzymes, proteins and other factors involved in DNA replication. Mechanism of DNA replication In prokaryotes &eukaryotes.Super helicityin DNA ,linking number,topolo gical
**Outcome 3**. Plasmids:Concept, Properties,typesandapplication.
**Outcome 4.** Studyarepresentative plantandanimalcellby microscopy. Studyofthestructureof cellorganellesthroughelectronmicrographs. CytochemicalstainingofDNA–Feulgen. StudyofpolyploidyinOnionroottipbycolchicinetreatment. Studyofcancercellsbyphotomicrographs.

**MCBACOR07T/P:MolecularBiology**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudents-

**Outcome1**.Hasacquiredknowledgeofgene,theirexpressionandregulationofexpression.
**Outcome2**.Hasacquiredafairlygoodunderstandingmechanismsofgeneticexchange,mutationsand their implications.
**Outcome3**.Hasdevelopedpracticalskillforisolationofbacteria/plasmidDNAanditsvisualizationingel after separation by electrophoresis.

**MCBACOR08T/P:MicrobialGenetics**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudentshave-

**Outcome1**.Understoodgenomeorganizationofmodelorganismsnamely*E.coli*and

*Saccharomyces,*andthemolecularmechanismsthatunderliemutations.
**Outcome2**.Developedafairlygoodknowledgeaboutthethreewellknownmechanismsby which genetic material is transferred among the microorganisms namely transformation, transduction and conjugation.
**Outcome 3**.Are able to describe different types of the extrachromosomal elements or the plasmids;thenatureofthetransposableelementsintheprokaryoticandtheeukaryoticcells.
**Outcome4.**HandsonskillsofisolationofplasmidDNAfrombacterialcellsanditsvisualization by performing agarose gel electrophoresis.

**MCBACOR09T/P: Virology**

**Courselearningoutcomes:**Studentshave-

**Outcome1**.Understoodwhatarevirusesandthechemicalnatureofviruses,differenttypesof viruses infecting animals, plants and bacteria (bacteriophages)
**Outcome2**.Understandingaboutthebiologyof bacteriophages.
**Outcome3**.Gainedknowledgeofavarietyofplantvirusesandanimal viruses.
**Outcome4.**Theabilitytodescriberoleofvirusesinthecausationofthecancer'

**MCBACOR10T/P: Food and Dairy Microbiology**

**Courselearningoutcomes:**Studentshave-

**Outcome1**.Areabletodescribetheroleofmicroorganismsintheproductionoffood,its spoilage, including their role in homemade fermented foods.
**Outcome2**.Areabletoidentifytheroleofmicroorganismsinthecausationofthediseases and how to protect against food-borne pathogens.
**Outcome3.**Developedexperimentalskillsfortestingthemilkanddifferentfoodsforthe presence of microorganisms

**MCBACOR11T/P: Industrial Microbiology**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudents -

**Outcome1**.Arecapableofdescribingalargenumberofsubstratethatareusedforthe industrial fermentation processes.
**Outcome2**.Havedevelopedanunderstandingofdifferenttypesofreactorsorfermenterswhich are used for laboratory, pilot and industrial scale fermentations and their processes parameters.
**Outcome3**.Haveacquiredadetailedknowledgeofnumberofproductswhichareproducedby industrial fermentation processes

**MCBACOR12T/P: Immunology**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudentsclearly-

**Outcome 1**. Conceptualized the protective role of the immune system of the host and developed an understanding of the basic components as well as the mechanisms underlying the immune system and its response to pathogenic microorganisms.

**MCBACOR13T/P: Medical Microbiology**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudentsclearly-

**Outcome 1**. Understood the basic and general concepts of causation of disease by the pathogenic microorganisms and the various parameters of assessment of their severity including the broad categorization of the methods of diagnosis.

**Outcome 2**. Developed a thorough understanding of common bacterial, viral, fungal, parasitic diseases of human being including some very important diseases of the animals also.

**MCBACOR14T/P:RecombinantDNATechnology**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudents-

**Outcome1**.Hasacquiredafairlygoodknowledgeofthetoolsandthemethodsforgenetic engineering.
**Outcome2**.Has acquiredafairlygoodunderstandingofhow thesetoolsandmethodsareemployedinthe laboratory for manipulation of DNA so as to make it relevant for biotechnological uses.
**Outcome3**.StudentscanperformisolationofDNA,amplificationofanygenebyPCRanditsanalysisby gel electrophoresis.

**DisciplineSpecificElective(AnyFour)**
**(outof3any2tobetakenineachsemester)**

**MCBADSE01T/P: Advances in Microbiology – Semester V**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudents -

**Outcome1**.Canexplainsalientcharacteristicsofgenomesofrepresentativemicroorganisms.
**Outcome2**.Haveunderstoodtheconceptandimportanceof metagenomics.
**Outcome3**.Havedevelopedaninitialunderstandingofrecentdevelopmentsofhost-microbe interactions, synthetic biology, viable but non-culturable forms of microorganism etc.

**Outcome4.**AreabletoextractDNAfrombacteria/soilandperformPCRfor16sRibosomal genes using universal primers and interpret the results.

**MCBADSE02T/P:BiomathematicsandBiostatistics-SemesterV**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudentsclearly-

**Outcome1**.Understandthebasicphysicalparametersofcellsorbiologicalprocessesandbasic methods used to study these.
**Outcome2**.Havedevelopedbasicknowledgeofmathematicsasappliedtobiological phenomenon.
**Outcome3.**Havedevelopedbasicconceptsofstatisticsandtheirimportance
**MCBADSE03T/P: Inheritance Biology - Semester V**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudentshave-

**Outcome1**.Developedperceptionofevolutiontakingexamplesfromwell-studiedmodels organisms of bacteria, fungi and other organisms.
**Outcome2**.GoodunderstandingofconceptsofMendeliangenetics andstructural organizations of chromosomes.
**Outcome3**.Developedpracticalskillstodokaryotypingandpedigree analysis.

**MCBADSE04T/P:MicrobesinSustainableAgricultureandDevelopment-**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudents-

**Outcome1**.Has acquiredafairlygoodunderstandingofmicrobesinthesoil.
**Outcome2**.Hasdevelopedafairlygoodunderstandingoftheuseofmicrobesinsustainableagriculture namely role in biogeochemical recycling, nitrogen fixing, organic matter degradation, use as bio fertilizers, as bio pesticides, production of biofuels
**Outcome3**.Hasdevelopedskillsforgrowingmicroorganismsinthelaboratoryfortheproductionof different enzymes by different microorganisms.

**SemesterVI MCBADSE05T/P: Biosafety and Intellectual Property Rights –**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudentshave-

**Outcome 1**. Full knowledge of working in a microbiology laboratory taking all safety measures,handingoflivebacteria,disposalofinfectiouswaste,careoftheequipmentrequiring safety audit

**Outcome2**.DevelopedknowledgeofbasicconceptsrelatedtoIPR.
**Outcome3.**Developedknowledgeofpatentfiling,andsomewell-known/well-publicizedcase studies related to IPR

**Semester VI MCBADSE06T/P: Instrumentation and Biotechniques – Semester VI**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudentshave-

**Outcome1**.Developedunderstandingofprincipals,andapplicationsofdifferentmicroscopic and spectrophotometric methods.
**Outcome2**.Developedunderstandingofprincipals,andapplicationsofdifferentseparation techniques especially chromatographic, electrophoretic and centrifugation techniques.
**Outcome3**.**Skillsinhandlinganduseoflightmicroscope,spectrophotometerand centrifugation equipment to study/analyze various microbiological samples.**

## SkillEnhancementElectiveCourses

**MCBSSEC01M: Food fermentation techniques**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudents-

**Outcome1**.Havedevelopedaverygoodunderstandingofpracticalaspectscommercially produced food and fermentative products.
**Outcome2**.Havedevelopedaverygoodunderstandingofpracticaluseofmicrobiologyfor better production of home based food and fermentation products for day to day use

**MCBSSEC02M:MicrobiologicalAnalysisofAirandWater**

**Courselearningoutcomes:** Bytheconclusionofthiscourse,thestudents-

**Outcome1**.Havedevelopedaverygoodunderstandingandskillsofthe analysis of air, water and soil.

**Outcome2**.Havedevelopedaverygoodunderstandingofhowanalysisof water, air and soil contribute to control of environmental pollution.

# DEPT OF PHILOSOPHY

## Dept. of Philosophy

## Course Outcomes of

## B.A. Philosophy CBCS Syllabus

## With Effect from 2018-2019

**Course Name:** **Core Course-1**
**Course Code:** **PHIACOR01T**
**Topic Name:** **Western Philosophy-1**

**Course Outcome:**
1. Western Philosophy encompasses the Philosophical thought and work of the western world. It enables the students to know about ancient Greek Philosophy and Medieval Philosophy.
2. Students also come to know about the Rationalistic approach.
3. Students can learn the metaphysical and epistemological aspects of Western Philosophy.

**Course Name:** **Core Course-2**
**Course Code:** **PHIACOR02T**
**Topic Name:** **Western Logic**

**Course Outcome:** Studying and Practicing Western Logic develops and enhances--
(1) Mathematical and reasoning Aptitude
(2) Crafting compelling arguments in speech act.
(3) Preparation for Competitive examinations
(4) The power of sense of reasoning for Day-to- day life
(5) Critical thinking Skills

**Course Name:** **Core Course-3**
**Course Code:** **PHIACOR03T**
**Topic Name:** **History of Indian Philosophy**

**Course Outcome:** Indian thought has been concerned with nature of Reality, Nature of Knowledge, and Ethics etc. After successful completion of the course students will be able to
1. Know about the comprehensive study of different Indian schools like, astika and nastika tradition, namely, Carvaka, Jainism, Buddhism, Nyaya-Vaishesika.
2. Learn about the rich argumentative heritage of India.
3. Develop the power of critical thinking.

**Course Name:** **Core Course-4**
**Course Code:** **PHIACOR04T**
**Topic Name:** **Western Logic-II**

**Course Outcome:** Practicing Western Logic enhances--
(1) The power of sense of reasoning
(2) Logical Application
(3) Preparation for Competitive examinations
(4) The ability of calculating probability of different events.

**Course Name:** **Core Course-5**
**Course Code:** **PHIACOR05T**
**Topic Name:** **History of Western Philosophy-II**

**Course Outcome:**
1. Students come to know about the Empericistic approach of Western Philosophy
2. Students can also understand the importance of both experience and rationality in Kantian Philosophy.
3. Students can differentiate between the rationalistic and empericistic thought.

**Course Name:** **Core Course-6**
**Course Code:** **PHIACOR06T**
**Topic Name:** **History of Indian Philosophy 2**

**Course Outcome:** After completion of the course the students will be able to
1. learn about some major astika schools of Indian Philosophy, namely, Sankhya, Yoga, Mimamsa and Vedanta
2. compare between realistic and idealistic schools on the one hand, on the other between materialistic and spiritualistic traditions
3. Develop the power of critical thinking.

**Course Name:** **Core Course-7**
**Course Code:** **PHIACOR07T**
**Topic Name:** **Western Ethics**

**Course Outcome:** After successful completion of the course, the students will:
(1) Know the basic concept of the ethical terms i.e., Moral and Immoral right and wrong, good and bad and their usage.
(2) Understand the meaning of moral judgment.
(3) Know the main tenets of the different theories of ethics.
(4) Understand the moral principles and their application in decision-making throughout their life.
(5) Develop a sense of value that will help them to become a good human being.

**Course Name:** **Core Course-8**
**Course Code:** **PHIACOR08T**
**Topic Name:** **Social and Political Philosophy-Western**

**Course Outcome:** Studying Social and Political Philosophy-Western students will be able to
(1) Get a clear idea about the basic concepts like community, institution, social group etc.
(2) Develop a critical analysis of society and politics.
(3) Understand the true meaning of Democracy.
(4) Become a thoughtful and responsible citizen.

**Course Name:** **Core Course-9**
**Course Code:** **PHIACOR09T**
**Topic Name:** **Psychology and Philosophy of Mind**

**Course Outcome:** After successful completion of the course, the students will:
(1) Know the different concepts and theories of psychology.
(2) Be able to relate psychology with philosophy of mind.
(3) Understand the difference between various theories regarding the relation between mind and body.
(4) Be able to engage themselves into basic psychological research work in future.

**Course Name:** **Core Course-10**
**Course Code:** **PHIACOR10T**
**Topic Name:** **Indian Logic: Tarkasamgraha**

**Course Outcome:** After successful completion of the course students will be able to
1. Read and analyse an ancient sanskrit text Tarkasamgraha
2. learn about the rich logic of Nyaya Philosophy
3. Compare the logical traditions of Indian philosophy and western philosophy.
4. Give logical argument in support of their opinion and place their position more strongly

**Course Name:** **Core Course-11**
**Course Code:** **PHIACOR11T**
**Topic Name:** **Philosophy of Language: Indian and Western**

**Course Outcome:** After successful completion of the course the students will be able to
1. Understand the problem of philosophy of language from both the modern view point and traditional Indian view point.
2. understand some basic concepts of Philosophy ofLanguage
3. know an emerging topic of western philosophy of language, i.e., Speech Act theory
4. learn about Indian philosophy of language from Nyaya perspective
4. compare the two traditions of philosophy of language: Indian and western

**Course Name:** **Core Course-12**
**Course Code:** **PHIACOR12T**
**Topic Name:** **Ethical and Social Philosophy of India**

**Course Outcome:** After successful completion of the course, the students will:
1. Learn the basic concept of morality from the perspective of Indian philosophy.
2. Realise that moral and ethical life would lead them to attain the highest goal.
3. Understand the importance of karma in Indian ethics.
4. Feel encouraged to research extensively in this field.
5. Become more responsible towards their duties and responsibilities.
5. Help to become a good-hearted individual as well as a member of this society.

**Course Name:** **Core Course-13**
**Course Code:** **PHIACOR13T**
**Topic Name:** **Western Epistemology & Metaphysics**

**Course Outcome:** After successful completion of the course, students will:
1. Acquire a clear concept of nature, origin and scope of 'knowledge'.
2. Learn the notions that are beyond the empirical world.
3. Be able to distinguish between appearance and reality.
4. Be able to enhance their reasoning aptitude.
5. Learn to differentiate between truth and what seems to be real

**Course Name:** **Core Course-14**
**Course Code:** **PHIACOR14T**
**Topic Name:** **Some Modern Indian Thinkers**

**Course Outcome:** Reading "Some Modern Indian Thinkers' is helpful in:-
(1) Getting updated with the works of Indian Philosophers
(2) Opens up research Avenues for the same
(3) Enhances the power Nationality and commitments towards the nation
(4) Being inspired and encouraged by the idealistic thoughts of the philosophers

**Course Name:** **Discipline Specific Elective-1**
**Course Code:** **PHIADSE01T**
**Topic Name:** **Elective logic**

**Course Outcome:**
1. Students are able to know the difference between sentence and propositions.
2. It increases the reasoning power of the students.
3. Different calculative methods help students to solve problems in practical life.
4. It increases the ability of argumentation.
5. It helps the students to solve various reasoning questions for different competitive exams, placement interviews, and entrance tests.

**Course Name:** **Discipline Specific Elective-2**
**Course Code:** **PHIADSE02T**
**Topic Name:** **Practical Ethics**

**Course Outcome:** Studying Practical Ethics helps in
(1) Distinguishing ethics and practical ethics.
(2) In personal situations students can apply their own value.
(3) It becomes a guide to principle based decision-making.
(4) Enhances interest in research for future.
(5) Living a life of meaning and worth
(6 ) Solving problems related to ethics with the help of these theoretical ideas

**Course Name:** **Discipline Specific Elective-3**
**Course Code:** **PHIADSE05T**
**Topic Name:** **Russell: Problems of Philosophy**

**Course Outcome:**
1. Students can understand the problems that may arise through our simple perception and reasoning.
2. It can distinguish between appearance and reality.
3. Students can analyze the value of Philosophy
4. Students can be interested in research work on Russell
5. It helps the students to think more reasonably and coherently, and to find clarity in different concepts and presuppositions

**Course Name:** **Discipline Specific Elective-4**
**Course Code:** **PHIADSE06T**
**Topic Name:** **Hume: An Enquiry concerning Human Understanding**

**Course Outcome:**
After successful completion of the course the students will be able to
1 be acquainted with a famous text written by David Hume, a renowned philosopher
2. understand empiricist tradition of western philosophy
3. Differentiate between two types of knowledge in practical life.
4. critically evaluate the concept of metaphysics, concept of causality and scpticism from Hume' viewpoint
5.compare Hume's philosophy and Immanuel Kant's philosophy and thus develop a critical aptitude.
6.Think more rationally and helps in questioning the basis of superstitions and inappropriate beliefs.

**Course Name:** **Skill Enhancement Course-1**
**Course Code:** **PHISSEC01M**
**Topic Name:** **Media Ethics**

**Course Outcome:**
After successful completion of the course, students will:
1.Be able to know about the functions and responsibility of media in society.
2. Understand the indispensable relationship between media and democracy.
3. Realize the importance of maintaining accuracy and unbiased attitude in reporting any incident.
4. Become interested in choosing this field as future profession.
5. Be inculcated with values of respect for life and the rule of law and legality

**Course Name:** **Skill Enhancement Course-2**
**Course Code:** **PHISSEC02M**
**Topic Name:** **Business Ethics**

**Course Outcome:**
1. This subject helps students to become aware about the values which should be adopted in Business
2. By studying Business Ethics, one can develop his or her own values.
3. Students come to know that business guided by moral principles leads to profits in business.
4. Open scope for several researches.
5. This study enhances the potentiality to have a customer-friendly image as well as greater success in business field

# DEPT OF PHYSICS
# POs and Course Outcomes of
# B.Sc. Physics CBCS Syllabus

## With Effect from 2018-2019

### Program Specific Outcomes

After the completion of this Course, students will be able to

- PSO1: Comprehend the laws of Nature and understand the basic concepts, principles and applications of Physics.
- PSO2: Apply Mathematics as a very powerful tool in the analysis and interpretation of the subject.
- PSO3: Learn the skilful use of equipment in the laboratories to understand Physics through experiments.
- PSO4: Learn the basic and advanced techniques of computer programming, and use of data processing software.
- PSO5: Prepare and deliver Powerpoint Presentations on the topics learned during the Program.
- PSO6: Learn the safety measures and maintenance protocols of equipment in a Physics laboratory and work cohesively in a group.
- PSO7: Understand the importance of Physics at the global level and in the advancement of Science & Technology.
- PSO8: Pursue career in higher studies & research and find placement in high-end jobs.

# Course Outcome/Learning Outcome

**Semester - I**

**Course Name: Core Course – 1**
**Course Code: PHSACOR01T & PHSACOR01P**

**Topic Name: Mathematical Physics I**

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Calculus and Vector Calculus,
(2) Orthogonal Curvilinear Coordinate Systems,
(3) Basics of the Theory of Probability,
(4) Dirac Delta – function and its properties,
(5) Basics of Scientific Computing; Errors and error analysis,
(6) Introduction to Computer Programming in PYTHON and applications (Least Square Fitting, Data Generation & Plotting, Graph plortting, Sorting of Numbers, Solution of Algebraic and Transcendental Equations).

**Course Name : Core Course – 2**
**Course Code: PHSACOR02T & PHSACOR02P**
**Topic Name: Mechanics**

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Fundamentals of Dynamics: Translational and Rotational Motions,
(2) Theory of Collisions,
(3) Motion under Central Force,
(4) Theory of Gravitation,
(5) Fluid Motion,
(6) Theory of Elasticity
(7) Theory of Oscillations,
(8) Non-inertial Systems,
(9) Special Theory of Relativity, (10)Experiments on items 1 – 7 above.

**Semester - II**

**Course Name : Core Course – 3**
**Course Code: PHSACOR03T & PHSACOR03P**
**Topic Name: Electricity and Magnetism**

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Electric Field and Electric Potential,
(2) Dielectric Properties of Matter,
(3) Magnetic Field,
(4) Magnetic Properties of Matter,
(5) Electromagnetic Induction,
(6) Electrical Circuits and Network Theorems,

(7) Experiments on the above topics (mainly on topic 6).

**Course Name: Core Course – 4**
**Course Code: PHSACOR04T & PHSACOR04P**
**Topic Name: Waves and Optics**

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Simple Harmonic Motions and their Superposition,
(2) Wave Motion; Superposition of Harmonic Waves,
(3) Wave Optics: Interference, Diffraction and Holography,
(4) Experiments based on the knowledge of the above topics.

**Semester - III**

**Course Name : Core Course – 5**
**Course Code: PHSACOR05T & PHSACOR05P**
**Topic Name: Mathematical Physics II**

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Fourier Series,
(2) Frobenius Method and Special Functions,
(3) Some Special Integrals,
(4) Solution of Partial Differential Equations,
(5) Calculus of Variation,
(6) Analytical Dynamics,
(7) Introduction to Numerical computation using numpy and scipy,
(8) Curve fitting, Least square fit, Goodness of fit, standard deviation,
(9) Solution of Linear system of equations by Gauss elimination method and Gauss-Seidel method; Diagonalization of matrices, Inverse of a matrix, Eigenvectors and Eigenvalue problems,
(10) Generation of Special functions using User defined functions,
(11) Solution of ODE First order Differential equation Euler; modified Euler and Runge-Kutta second order methods; Second order differential equation; Fixed difference method.

**Course Name : Core Course – 6**
**Course Code: PHSACOR06T & PHSACOR06P**
**Topic Name: Thermal Physics**

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Introduction to Thermodynamics; Thermodynamic Potentials,
(2) Maxwell's Thermodynamic Relations,
(3) Kinetic Theory of Gases,
(4) Experiments based on Thermal Physics.

**Course Name:** **Core Course – 7**
**Course Code:** **PHSACOR07T & PHSACOR07P**
**Topic Name:** **Digital Systems & Applications**

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Integrated Circuits,
(2) Digital Circuits; Boolean Algebra,
(3) Arithmetic, Data Processing& Sequential Circuits,
(4) Timers; Shift Registers; 4-bit Counters,
(5) Computer Organization,
(6) Electronic Experiments on Digital Systems & Applications.

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

**Course Outcome:** At the completion of this course, a student learns

(1) Basics of Measurement,
(2) Electronic Voltmeter,
(3) Cathode Ray Oscilloscope,
(4) Signal Generators and Analysis Instruments,
(5) Impedance Bridges and Q-meters, (6)Digital Instruments: Digital Multimeter, (7)Laboratory Skills.

**Semester - IV**

**Course Name : Core Course – 8**
**Course Code: PHSACOR08T & PHSACOR08P**
**Topic Name: Mathematical Physics III**

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Complex Analysis,
(2) Integral Transforms,
(3) Matrices: Eigenvalues & Eigenvectors,
(4) Python Programming of problems on the above.

**Course Name: Core Course – 9**
**Course Code: PHSACOR09T & PHSACOR09P**
**Topic Name: Elements of Modern Physics**

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Wave Mechanics,
(2) Quantum Mechanics: Applications to Simple Systems,
(3) Elementary Nuclear Physics,
(4) Lasers: an Introduction,
(5) Experiments based on topics of Modern Physics.

**Course Name : Core Course – 10**
**Course Code: PHSACOR10T & PHSACOR10P**
**Topic Name: Analog Systems and Applications**

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) History of Development of Electronics,
(2) Semiconductor Diodes,
(3) Two-terminal Devices and their Applications,
(4) Bipolar Junction transistors and Field Effect transistors,
(5) Amplifiers,
(6) Sinusoidal Amplifiers; Oscillators,
(7) Operational Amplifiers,
(8) Electronic Experiments on Analog Systems & Applications.

**Course Name : Skill Enhancement Course – 2**
**Course Code: PHSSSEC02M**
**Topic Name: Computational Physics**

**Course Outcome:** At the completion of this course, a student learns

(1) Introduction to Scientific Programming; Control Statements,
(2) Programming in different languages: FORTRAN 90/95 or C++,
(3) Scientific Word Processing: Introduction to LaTeX,
(4)Visualization: Graphical Plots and Analyses,
(5)Hands on Exercises with computers.

**Semester - V**

**Course Name: Core Course – 11**
**Course Code: PHSACOR11T & PHSACOR11P**
**Topic Name: Quantum Mechanics and Applications**

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Schrodinger Equation: General discussion of bound states in an arbitrary potential,
(2) Quantum theory of hydrogen-like atoms,
(3) Atoms in Electric & Magnetic Fields: Atomic Spectroscopy,
(4) Many electron atoms,
(5) Python Programming of problems on the above.

**Course Name : Core Course – 12**
**Course Code: PHSACOR12T & PHSACOR12P**
**Topic Name: Solid State Physics**

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Crystal Structure,
(2) Elementary Lattice Dynamics,
(3) Magnetic Properties of Matter,
(4) Dielectric Properties of Materials,
(5) Ferroelectric Properties of Materials,
(6) Elementary band theory,
(7) Superconductivity,
(8) Experiments on selected topics of Solid State Physics.

**Course Name : Discipline Specific Elective Course – 1**
**Course Code: PHSADSE02T**
**Topic Name: Advanced Dynamics**

**Course Outcome:** At the completion of this course, a student learns

(1) Lagrangian and Hamiltonian Dynamics,
(2) Rigid Body Dynamics,
(3) Small Amplitude Oscillations,
(4) Fluid Dynamics, (5)Dynamical Systems.

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

**Course Outcome:** At the completion of this course, a student learns

(1) General Properties of Nuclei,
(2) Nuclear Models,
(3) Radioactivity decay,
(4) Nuclear Reactions,
(5) Interaction of Nuclear Radiation with matter; Detection of Nuclear Radiations, (6)Particle Accelerators, (7)Particle Physics.

Semester - VI

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

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Maxwell Equations,
(2) EM Wave Propagation in Unbounded & Bounded Media,
(3) Polarization of Electromagnetic Waves,
(4) Wave Guides& Optical Fibres,
(5) Experiments on some selected topics from above.

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

**Course Outcome:** At the completion of the theory and practical modules of this course, a student learns

(1) Classical Statistical Mechanics;Classical Theory of Radiation,
(2) Quantum Theory of Radiation,
(3) Quantum Statistical Mechanics:Bose-Einstein & Fermi-Dirac Statistics, (4)Experiments on selected topics from above.

**Course Name : Discipline Specific Elective Course – 3**
**Course Code: PHSADSE04T**
**Topic Name: AdvancedMathematical Physics II**

**Course Outcome:** At the completion of this course, a student learns

(1) Partial Differential Equations,
(2) Group Theory,
(3) Advanced Probability Theory.

**Course Name: Discipline Specific Elective Course – 4**
**Course Code: PHSADSE05T**
**Topic Name: Astronomy and Astrophysics**

**Course Outcome:** At the completion of this course, a student learns

(1) Astronomical Scales,
(2) Astronomical Techniques,
(3) Application of Physical Principles,
(4) The Sun and the Solar Family,
(5) The Milky Way; Galaxies,
(6) Large Scale Structure & Expanding Universe.

**Course Outcome or Learning Outcome**
**Three year B.A. degree course**
**Under CBCS semester system**
**HONOURS COURSE IN POLITICAL SCIENCE**
**With effect from the session : 2018-2019**

**Course Name : Core Course-1**
**Course Code : PLSACOR01T**
**Topic Name : Understanding Political Theory**

Course Outcome : This course would help students get a basic idea about the discipline of political science and its evolution over the years. It will also enable them to learn about different perspectives on political science- Traditional, Marxist, Behavioural and Post-Behavioural. This particular course offers an analytical study of the interplay between power, authority and politics including Weber's authority models. At the end of the course, students will get a comprehensive idea about how the political system works and different variables impacting the same .

**Course Name : Core Course-2**
**Course Code : PLSACOR02T**
**Topic Name : Constitutional Government and Democracy in India**

Course Outcome : Students will get a fair introduction to the main elements relating to the exhaustive body of the Indian Constitution and the functioning of the parliamentary democracy in the country including a contextual analysis of the functioning of three wings of government both at the union and state level- legislature, executive, judiciary.

**Course Name : Core Course-3**
**Course Code : PLSACOR03T**
**Topic Name : Political Theory : Concepts and Debates**

Course Outcome : This particular course is meant to train the young minds into the fundamental concepts of Political Science like nationalism and sovereignty. It also helps them develop a comprehensive idea about rights, liberty, equality and justice. This paper also seeks to enlighten the students about main theories regarding the nature of the state .

**Course Name : Core Course-4**
**Course Code : PLSACOR04T**
**Topic Name : Political Process in India**

Course Outcome : It offers a detailed view of the functioning of the Indian political system – right from the nature and elementary traits of the Indian party system to the recent trends in the same including special emphasis on the coalition politics in India-its origin and evolution. At the end of this course will learn to delve deep into the impact of different factors which are peculiar to India, on the evolution of Indian politics- caste, religion, regionalism, gender etc. And they also would learn to analyze the remarkably unique impact of factors like corruption and media on Indian politics including the recent trends in the same.

**Course Name : Core Course-5**
**Course Code : PLSACOR05T**
**Topic Name : Introduction to Comparative Government and Politics**

Course Outcome: Students would develop a more diverse and cross-cultural perspective on the functioning of political systems in different countries, thanks to the broad spectrum study of politics in different nations, it offers. This course would also enable the students to look beyond the prolonged Eurocentric bias that the discipline of comparative politics suffered from. It also seeks to give a fair introduction to the foundational basis of modern government – with special emphasis on the origin and evolution of Capitalism, Socialism, Colonization and Decolonization. The theme for comparative analysis in this course focus on the evolution and functioning of three different types of political economy i.e. Britain, China and Brazil.

**Course Name : Core Course- 6**
**Course Code : PLSACOR06T**
**Topic Name : Perspectives on Public Administration**

Course Outcome: It offers a basic idea about administration and especially public administration – its origin, nature, scope and evolution including the recent trends in the discipline. Students will get acclimatized with the main theoretical approaches to public administration- classical, neo-classical and contemporary theories and it will help them analyze the existing structure and functioning of the Indian administration, identify its loopholes and offer remedies for improvement. The course would also enhance their understanding of the major changes that confronted the discipline like New Public Administration, New Public Management, Good Governance etc.

**Course Name : Core Course-7**
**Course Code : PLSACOR07T**
**Topic Name : Perspectives on International Relations and World History**

Course Outcome : This is an elementary course on International Relations. It seeks emphasize on the foundational and contextual learning , through a fair coverage of topics like levels of analysis, evolution of the international state system, Pre and Post- Westphalian world order and so on. It also offers extensive number of theories of international relations, which are absolutely necessary for further understanding of global politics. And it also comes with a brief but compact overview of the most important events of world history ranging from the WWI to Cold war and afterwards.

**Course Name : Core Course-8**
**Course Code : PLSACOR08T**
**Topic Name : Political processes and Institutions in Comparative Perspective**

Course Outcome : Students will have a better understanding of the diverse political systems across the world with as they learn to analyse the evolution of different political culture and its impact on the functioning of the political systems. They will also have a fair idea about the post- colonial notion of ‘ nation’, ‘state’ and the debates revolving around these concepts. The course focuses on comparing the two very important traits of political system i.e. party system and federalism (distribution of power between the union and regional governments), across different typologies of government like parliamentary, presidential and socialist systems. It will help them have a more holistic view of a political system, its main components, its functioning, and different variables regulating its functioning.

**Course Name : Core Course-9**
**Course Code : PLSACOR09T**
**Topic Name : Public Policy and Administration in India**

Course Outcome : Students will get a transparent idea about the formulation and implementation of public policies in India, the complexity of the process, and variables impacting the same. It

enhances their ability to analyse the existing scenario in Indian administration and recommend the measures to be taken to make it more responsive to public interest and effective and sustainable. Students will learn how the administration works at the very grassroot level in India with special reference to west Bengal and the different facets of citizen-administration interactions including the Lokpal, RTI , E-governance etc. The course also offers a detailed analysis of Budget in India, the idea of Budget cycle and different types of Budget.

**Course Name : Core Course-10**
**Course Code : PLSACOR010T**
**Topic Name : Global Politics**

Course Outcome : It is an elementary paper on Global Politics. It offers a detailed take on globalization, its different dimensions and alternative perspectives. Students will have a fair idea about the main anchors of global economy – the Bretton Woods System (the IMF and World Bank), its overall performance. Students will also learn about the alternative trends in the global political economy i.e. the global social movements and the role of NGOs. The course enhances their understanding about the contemporary global issues like environmental degradation, nuclear proliferation, terrorism, migration, human security etc. and enlightens them about the changing power dynamics in the post-cold war world and its manifestations.

**Course Name : Core Course-11**
**Course Code : PLSACOR011T**
**Topic Name : Classical Political Philosophy**

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

**Course Name : Core Course-12**
**Course Code : PLSACOR012T**
**Topic Name : Indian Political Thought I**

Course Outcome: Students will get to know the myriad dimensions of Pre-colonial and ancient Indian political thought. They will also get an exposure to the main tenets of the Islamic and Syncretic thought.

**Course Name : Core Course-13**
**Course Code : PLSACOR013T**
**Topic Name : Modern Political Philosophy**

Course Outcome : It introduces students to the ideas of the most remarkable modern political philosophers like Kant and Hegel. Students will get a grip on the feminist discourse with special emphasis on Mary Wollstonecraft and Betty Friedan. It imparts basic ideas of liberal socialists and radicals to the students.

**Course Name : Core Course-14**
**Course Code : PLSACOR14T**

**Topic Name : Modern Indian Political Thought**

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

**Course Name : Discipline Specific Elective -1**
**Course Code : PLSADSE01T**
**Topic Name : Reading Gandhi**

Course Outcome : Students are introduced to some problematic areas of Indian society, and Gandhi's take on resolving or at least redressing the existing social maladies and working towards betterment of society. It seeks to offer some of the most popular ideas of Gandhi like Satyagraha, Sarvodaya, Trusteeship, Women empowerment etc.

**Course Name : Discipline Specific Elective -2**
**Course Code : PLSADSE03T**
**Topic Name : Understanding Global Politics**

Course Outcome : It is an elementary paper on Global Politics. It offers a detailed take on globalization, its different dimensions and alternative perspectives. Students will have a fair idea about the main anchors of global economy – the Bretton Woods System (the IMF and World Bank), its overall performance. Students will also learn about the alternative trends in the global political economy i.e. the global social movements and the role of NGOs. The course enhances their understanding about the contemporary global issues like environmental degradation, nuclear proliferation, terrorism, migration, human security etc. and enlightens them about the changing power dynamics in the post-cold war world and its manifestations.

**Course Name : Discipline Specific Elective -3**
**Course Code : PLSADSE05T**
**Topic Name : Human Rights in Comparative Perspective**

Course Outcome: Students will be introduced to the idea of Human Rights, its evolution and typologies, the main components of the global human rights regime. Some controversial but relevant issues like torture, censorship and terrorism are compared across certain political systems to get a more holistic view. Students will also get a comprehensive idea about structural violence through comparing its manifestations in different countries.

**Course Name : Discipline Specific Elective -4**
**Course Code : PLSADSE06T**
**Topic Name : Governance : Issues and Challenges**

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

**Course Name : Skill Enhancement**

**Course Code : PLSSSEC01M**
**Topic Name : Democratic Awareness with Legal Literacy**

Course Outcome : Students will get acquainted with the important provisions of the Indian Constitution and the major components of the Indian legal system. It gives a detailed idea about the most important laws and rights in India, which are meant for the redressal of the grievances of the people. Students are also trained this way to confront the political system, ask for rights and justice leading to remarkable increase in the degree of political participation in India.

**Course Name : Skill Enhancement**
**Course Code : PLSSSEC02M**
**Topic Name : Public Opinion and Survey Research**

Course Outcome : Students will be introduced to public opinion and survey research. It works as a basic course for aspiring researchers.

**Course Name : Generic Elective- 1**
**Course Code : PLSHGEC01T**
**Topic Name : Introduction to Political Theory**

Course Outcome: It introduces students to the subject and takes them through the fundamental concepts like liberty, equality, democracy , justice etc. And they are introduced to some of the fundamental problem areas i.e. the major debates of political science.

**Course Name : Generic Elective- 2**
**Course Code : PLSHGEC02T**
**Topic Name : Indian Government and Politics**

Course Outcome : Students will get a fair introduction to the main elements relating to the exhaustive body of the Indian Constitution and the functioning of the parliamentary democracy in the country including a contextual analysis of the functioning of three wings of government both at the union and state level- legislature, executive, judiciary.

**Course Name : Generic Elective- 3**
**Course Code : PLSHGEC03T**
**Topic Name : Comparative Government and Politics**

Course Outcome : Students would develop a more diverse and cross-cultural perspective on the functioning of political systems in different countries, thanks to the broad spectrum study of politics in different nations, it offers. This course would also enable the students to look beyond the prolonged Eurocentric bias that the discipline of comparative politics suffered from. It also seeks to give a fair introduction to the foundational basis of modern government – with special emphasis on the origin and evolution of Capitalism, Socialism, Colonization and Decolonization. The theme for comparative analysis in this course focus on the evolution and functioning of three different types of political economy i.e. Britain, China and Brazil.

**Course Name : Generic Elective- 4**

**Course Code : PLSHGEC04T**
**Topic Name : Introduction to International Relations**

Course Outcome :This is an elementary course on International Relations. It seeks emphasize on the foundational and contextual learning , through a fair coverage of topics like levels of analysis, evolution of the international state system, Pre and Post- Westphalian world order and so on. It also offers extensive number of theories of international relations, which are absolutely necessary for further understanding of global politics. And it also comes with a brief but compact overview of the most important events of world history ranging from the WWI to Cold war and afterwards.

At the completion of this program, students will be able to

**PSO1**: Basics of data handling including collection, compilation and presentation of data. Descriptive analysis of data using different statistical tools.

**PSO2**: Developing motivational outlook to give ideas a concrete shape and to communicate the same in mathematical terms.

**PSO3**: Give a solid logical foundation of a newly proposed statistical tool, comparing its efficacy with already existing tools

**PSO4**: Fit various statistical models on observed data for explaining the data dynamics over space and time in both univariate and multivariate setup.

**PSO5**: Plan statistical experiments and trials. Analyze the data for reaching at the objective of the trial

**PSO6**: Plan complex survey with samples drawn in multiple stages and getting subsequent estimates.

**PSO7**: Write computer program using C &R-code that are required for analysis of statistical data and subsequent development of statistical software.

Course Outcome or Learning Outcome
Three yearB.Sc. degree course
Under CBCS semester system
HONOURS COURSE IN STATISTICS
With effect from the session: 2018 – 2019

**Course Name: Core Course-1**
**Course Code: STSACOR01T & STSACOR01P**
**Course Name: Descriptive Statistics**

**Course Outcome**:After successful completion of this course the students will learn

1. Basics of data handling including collection, compilation and presentation of data.
2. Descriptive analysis of data using different statistical tools.
3. Studying of relationship between different characteristics of objects observed as a data point.
4. Estimating characteristic variable from the knowledge of auxiliary variables using simple statistical models.

**Course Name: Core Course-2**
**Course Code: STSACOR02T**
**Course Name: Mathematical Analysis and Algebra-I**

**Course Outcome**:After successful completion of this course the students will learn

1. Basics Mathematical techniques used in the deduction of various theoretical results of Statistics.
2. Developing motivational outlook to give ideas a concrete shape and to communicate the same in mathematical terms.
3. Giving a solid logical foundation of a newly proposed statistical tool, comparing its efficacy with already existing tools.
4. Giving a cosmetic look to the results derived for arriving at a conclusive decision.

**Course Name: Core Course-3**
**Course Code: STSACOR03T & STSACOR03P**
**Course Name: Probability and Probability Distribution-I**

**Course Outcome**:After successful completion of this course the students will learn

1. Explain the uncertain parts of real life statistical data.
2. Derive the basic results used for statistical inference under different stochastic models.
3. Fit various statistical models on observed data for explaining the data dynamics over space and time.

4. Explain any random behaviour of the natural data and finding some regularity in irregularities that helps projecting a random event of nature.

**Course Name: Core Course-4**
**Course Code: STSACOR04T**
**Course Name: Mathematical Analysis and Algebra-II**

**Course Outcome**:After successful completion of this course the students will learn

1. Some advanced topics related to Real Analysis and Vector & Matrix Algebra.
2. Different mathematical techniques used in the deduction of various theoretical results of Statistics.
3. Developing motivational outlook to give ideas a concrete shape and to communicate the same in mathematical terms.
4. Giving a solid logical foundation of a newly proposed statistical tool, comparing its efficacy with already existing tools.
5. Giving a cosmetic look to the results derived for arriving at a conclusive decision.

**Course Name: Core Course-5**
**Course Code: STSACOR05T & STSACOR05P**
**Course Name: Probability and Probability Distribution-II**

**Course Outcome**:After successful completion of this course the students will learn
Course outcome in this case is same as that in Course-3 except the fact while in Course-3 the students learn, what has been stated earlier, in a single variable situation under mostly in a single parameter setup, in Course- 5 they learn the same in a multivariate situation in a multi parameter setup.

**Course Name: Core Course-6**
**Course Code: STSACOR06T & STSACOR06P**
**Course Name: Sampling Distribution and Statistical Inference-I**

**Course Outcome**:After successful completion of this course the students will learn

1. Determine the probability distributions of functions of random observations.
2. To develop foundation for statistical estimation and hypothesis testing.
3. To conceptualize the errors associated with statistical decision.
4. To conduct hypotheses testing without going into details of theory.

**Course Name: Core Course-7**
**Course Code: STSACOR07T & STSACOR07P**

**Course Name: Survey Sampling**

**Course Outcome**:After successful completion of this course the students will learn

1. Draw random sample from a closed finite homogeneous population.
2. Estimate different population parameters along with their error of estimate
3. Draw sample from a large heterogeneous population and subsequent estimation process based on that sample.
4. Different optimization technique for drawing samples from different segments of a population within a limited resource.
5. Designing complex survey with samples drawn in multiple stages and getting subsequent estimates.

**Course Name: Core Course-8**
**Course Code: STSACOR08T & STSACOR08P**
**Course Name: Statistical Inference-II**

**Course Outcome**:After successful completion of this course the students will learn

1. The Sir R.A Fisher's and Jerzy Neman's theory of estimation and testing under parametric setup.
2. To derive some optimum estimators and test procedures under Neyman-Pearson setup.
3. Theory of confidence estimation in Statistics
4. Besides theory also some established methods of Statistical Estimation and Testing along with their optimality properties.
5. Wald's theory of sequential analysis in statistics.

**Course Name: Core Course-9**
**Course Code: STSACOR09T & STSACOR09P**
**Course Name: Linear Models**

**Course Outcome**:After successful completion of this course the students will learn

1. To learn the basic tools for extracting the different components of variability within data under linear parametric model.
2. To learn to find the optimal estimators of parameters in a Gauss-Markov setup under square error loss.
3. To learn to use the Gauss-Markov technique in Analysis of Variance of statistical data classified in one or two directions.
4. To learn the general theory of multiple linear regression.
5. To learn stochastic modelling in multivariate setup
6. To learn isolating the different components variation in multivariate date.
7. To learn classifying a multivariate data point in one of a finite group of observations.

**Course Name: Core Course-10**
**Course Code: STSACOR10T & STSACOR10P**
**Course Name: Statistical Quality Control**

**Course Outcome**:After successful completion of this course the students will learn

1. To define, measure, analyze and control quality.
2. History of quality control techniques with modern modifications.
3. Use of statistical tools to improve and maintain the quality.

**Course Name: Core Course-11**
**Course Code: STSACOR11T & STSACOR11P**
**Course Name: Stochastic Process & Time Series**

**Course Outcome**:After successful completion of this course the students will learn

1. Compute probabilities of transition between states and return to the initial state after long time intervals in Markov chains.
2. Identify classes of states in Markov chains and characterize the classes
3. Understand the different components of a time series
4. Understand the different models of time series
5. Understand the process generating a time series
6. Estimate the parameters of different models of a time series
7. Forecast values of a time series at future time points.

**Course Name: Core Course-12**
**Course Code: STSACOR12T & STSACOR12P**
**Course Name: Economic Statistics & Official Statistics**

**Course Outcome**:After successful completion of this course the students will learn

1. Weighted and un-weighted Index Numbers
2. Consumer price index number & wholesale price index number
3. Base shifting, splicing and deflating of Index Numbers
4. Different measures of poverty and income inequality & their properties
5. Official statistical system in India
6. Functions of different agencies.

**Course Name: Core Course-13**
**Course Code: STSACOR13T & STSACOR13P**
**Course Name: Designs of Experiment**

**Course Outcome**:After successful completion of this course the students will learn

1. The knowledge about and ability to understand and analyze the application of the technique of Analysis of Variance and combinatorial problems. A detailed expected result is as follows.
2. Learning about planning of a statistical experiment.
3. Designing of an experiment as per plan including blocking, both complete and incomplete, of experimental units in one or multi direction for ensuring homogeneity.
4. Random allocation of treatments over the experimental units.
5. Detailed analysis of experiment using both complete and missing data.

**Course Name: Core Course-14**
**Course Code: STSACOR14T & STSACOR14P**
**Course Name: Multivariate Analysis & Non-Parametric Methods**

**Course Outcome**:After successful completion of this course the students will learn

1. Learn handling of data in a multivariate setup.
2. Measure the marginal and joint influence of different variables on the characteristic of interest and thus taking decision on retaining the variables of real importance in the model of analysis.
3. Learn fitting of multiple linear regression model under square error loss.
4. Learn isolating different components of variation in multivariate data and reduction of data dimension to a considerable extent retaining most of the components of variability in the original data.
5. Learn to classify a data point in one of a several groups of data.
6. Learn to test hypothesis relaxing the assumption of distribution from which the data has been generated.

**Course Name: Discipline Specific Elective-01**
**Course Code: STSADSE01T & STSADSE01P**
**Course Name: Discrete Data Analysis**

**Course Outcome**:After successful completion of this course the students will learn

1. Some measures for association for categorical data.
2. Generalized linear model with its application.
3. Some models for contingency table.

**Course Name: Discipline Specific Elective-02**
**Course Code: STSADSE02T & STSADSE02P**

**Course Name: Large Sample Theory**

**Course Outcome**:After successful completion of this course the students will learn

1. Some fundamental idea of different modes of convergence of a sequence of random variables.
2. How to modify the distributional aspects of different theories related to statistical inference in the presence of a large sample.
3. The application of asymptotic theory for comparing the efficiency of different approaches available under a specific setup.
4. How to test certain distributional assumption, test for independence, and test for homogeneity using Pearson's Chi-square under large sample.
5. Test of statistical hypothesis through variance stabilizing transformation.

**Course Name: Discipline Specific Elective-04**
**Course Code: STSADSE04T & STSADSE04P**
**Course Name: Demography**

**Course Outcome**:After successful completion of this course the students will learn

1. Basic concepts of Demographic and Vital Statistics data, and errors therein.
2. Sources and processes of data collection on Vital Statistics
3. Basic measures of Fertility and how to interpret the results
4. Basic measures of Mortality, their interpretations and the concepts of Stable and Stationary Populations.
5. Different measures of Population Growth and their interpretation.
6. Concept of Life Tables, their construction and uses.
7. Estimation, projection and forecasting of the size of a given population.
8. Fitting of population size curve for population forecasting using Rhode's method.

**Course Name: Discipline Specific Elective-04**
**Course Code: STSADSE05T & STSADSE05P**
**Course Name: Numerical Analysis and Monte Carlo Computation**

**Course Outcome**: After successful completion of this course the students will learn

1. Different types of operators for numerical analysis.
2. How to solve transcendental equations.
3. How to use Monte Carlo methods for integration.

**Course Name: Skill Enhancement Course-1**
**Course Code: STSSSEC01M**

**Course Name: Statistical Data Analysis Using C-programming and Software Packages**

**Course Outcome**: After successful completion of this course the students will learn

1. How to take the advantage of the calculation process of computer to solve a laborious mathematical and statistical problem.
2. To represent a solution process (algorithm) of mathematical and real-life problems with the help of C-programming.
3. Use of statistical packages like, MS Excel and Minitab to get some readymade calculation and analysis.

**Course Name: Skill Enhancement Course-2**
**Course Code: STSSSEC02M**
**Course Name: Computation using R**

**Course Outcome**: After successful completion of this course the students will learn

1. How to take the advantage of the calculation process of computer to solve a laborious mathematical and statistical problem.
2. How to construct functions that help to analyze different data arise from different real life situation.
3. The most advanced statistical software which can be used research level analysis.

# DEPT OF ZOOLOGY
## Course Outcomes of
## B.Sc. Zoology (Hons) CBCS Syllabus
## With Effect from 2018-2019

### CC1- Non-Chordates I (ZOOACOR01T)

#### Course outcomes

Aftersuccessfullycompletingthiscourse, thestudents will be able to:

- Developunderstandingonthediversityoflifewithregardtonon-chordates.
- Classifyanimalsonthebasisoftheirmorphologicalcharacteristics/ structures.
- Develop critical understanding how animals changed from a primitive cell to acollectionofsimple cellsto form acomplexbodyplan.
- Examine the diversity and evolutionary history of a taxon through the constructionofabasic

phylogenetic/ cladistics tree.

- Understand how morphological change due to change in environment helps driveevolution overalongperiod of time.
- The project assignmentwill alsogive thema flavour of research tofind theprocess involved in studying biodiversity and taxonomy besides improving theirwriting skills. It will further enable the students to think and interpret individuallydueto different animal species chosen.

## CC2 –Ecology (ZOOACOR02T)

**Course outcomes**

After successfully completing this course, the students will be able to:

- Know the evolutionary and functional basis of animal ecology.
- Understand what makes the scientific study of animal ecology a crucial and exciting endeavour.
- Engage in field-based research activities to understand well the theoretical aspects taught besides learning techniques for gathering data in the field.
- Analyse a biological problem, derive testable hypotheses and then design experiments and put the tests into practice.
- Solve the environmental problems involving interaction of humans and natural systems at local or global level.

## CC3–Non-Chordates II (ZOOACOR03T)

**Course outcomes**

Aftersuccessfullycompletingthiscourse, thestudents will be able to:

- Developunderstandingonthediversityoflifewithregardtonon-chordates.
- Classifyinvertebratesonthebasisoftheirmorphologicalcharacteristics/ structures.
- Develop critical understanding about basic body plan of the non-chordates.
- Examine the diversity and evolutionary history of a taxon through the constructionofabasic phylogenetic/ cladistics tree.

- Understand basic physiological processes carried out in the organisms for their survival.
- The project assignmentwill alsogive thema flavour of research tofind theprocess involved in studying biodiversity and taxonomy besides improving theirwriting skills. It will further enable the students to think and interpret individuallydueto different animal species chosen.

**CC 4 - Cell Biology (ZOOACOR04T)**

**Course outcomes**

After successfully completing this course, the students will be able to

- Understand the functioning of nucleus and other cellular organelles and understand the intricate cellular mechanisms involved.
- Acquire the detailed knowledge of different pathways related to cell signaling and apoptosis thus enabling them to understand the anomalies in cancer.
- Develop an understanding how cells work in healthy and diseased states and to give a 'health forecast' by analyzing the genetic database and cell information.
- Get new avenues of joining research in areas such as genetic engineering of cells, cloning, vaccines development, human fertility programme, organ transplant, etc.
- Understand how tissues are produced from cells in a normal course and about any malfunctioning which may lead to benign or malignant tumor.

**CC 5 – Chordates (ZOOACOR05T)**

**Course outcomes**

Aftersuccessfullycompletingthiscourse, thestudents will be able to:

- Developunderstandingonthediversityoflifewithregardtochordates.
- Classifyinvertebratesonthebasisoftheirmorphologicalcharacteristics/ structures.
- Develop critical understanding about basic body plan of the chordates.
- Examine the diversity and evolutionary history of a taxon through the constructionofabasic

phylogenetic/ cladistics tree.

- Understand basic physiological processes carried out in the organisms for their survival.
- The project assignmentwill alsogive thema flavour of research tofind theprocess involved in studying biodiversity and taxonomy besides improving theirwriting skills. It will further enable the students to think and interpret individuallydueto different animal species chosen.

**CC 6 - Animal Physiology: Controlling & Coordinating Systems (ZOOACOR06T)**

**Course outcomes**

After successfully completing this course, the students will be able to:

- Understand the process of digestion and its control
- Develop understanding in muscle structure and contraction mechanism
- Learn the process of respiration and transport of gases
- Understand kidney structure and regulation of urine formation
- Understand heart structure and functioning
- Understand function of endocrine glands and formation of gametes.

**CC 7 – Biochemistry (ZOOACOR07T)**

**Course outcomes**

After successfully completing this course, the students will be able to:

- Understand about the importance and scope of biochemistry.
- Understand the structure and biological significance of carbohydrates, amino acids, proteins, lipids and nucleic acids.
- Understand the concept of enzyme, its mechanism of action and regulation.
- Understand the basic biochemical process going inside the living cell.
- Learn the preparation of models of peptides and nucleotides.
- Learn biochemical tests for amino acids, carbohydrates, proteins and nucleic acids.

- Learn measurement of enzyme activity and its kinetics.

**CC 8 - Comparative Anatomy (ZOOACOR08T)**

**Course outcomes**

After successfully completing this course, the students will be able to:

- Develop an understanding of the evolution of vertebrates thus integrating structure, function and development.
- Understand the basic plan of different organ system in different classes of vertebrates in relation to evolutionary significance.
- Have an overview of the evolutionary concepts including homology and homoplasy, and detailed discussions of major organ systems.
- Develop an understanding of the related disciplines, such as cell biology, neurophysiology, pharmacology, biochemistry etc.
- Get a flavor of research besides improving their writing skills and making them well versed with the current trends. It will further enable the students to think and interpret individually due to different aspects chosen.

**CC 9 - Physiology: Life Sustaining Systems (ZOOACOR09T)**

**Course outcomes**

After successfully completing this course, the students will be able to:

- Understand the physiology at cellular and system levels.
- Understand the mechanism and regulation of breathing, oxygen consumption and determination of respiratory quotient.
- Understand how mammalian body gets nutrition from different biomolecules.
- Understand the process of digestion and excretion.
- Understand the organization of nervous system and process of nerve conduction.
- Understand the process of vision and hearing.
- Understand the process of muscle contraction.
- Learn the determination of hemoglobin content, blood groups and blood pressure.

**CC 10 – Immunology (ZOOACOR10T)**

**Course outcomes**

After successfully completing this course, the students will be able to:

- Carry out common procedures for culturing, purifying and diagnostics antigens, and the responses of the immune system.
- Describe the mechanisms for transmission, virulence and pathogenicity in pathogens.
- Understand the structure and functions of antibodies.
- Know how resistance development and resistance transfer occur.
- Identify the major cellular and tissue components which comprise the innate and adaptive immune system.
- Understand how are immune responses by CD4 and CD8 T cells, and B cells, initiated and regulated.
- Understand how does the immune system distinguish self from non-self.
- Gain experience at reading and evaluating the scientific literature in the area.

**CC 11 - Molecular Biology (ZOOACOR11T)**

**Course outcomes**

After successfully completing this course, the students will be able to:

- Develop an understanding of concepts, mechanisms and evolutionary significance and relevance of molecular biology in the current scenario.
- Get well versed in recombinant DNA technology which holds application in biomedical & genomic science, agriculture, environment management, etc. Therefore, a fundamental understanding of Molecular Biology will help in career building in all these fields.
- Apply their knowledge in problem solving and future course of their career development in higher education and research.
- Get new avenues of joining research in related areas such as therapeutic strategies or related opportunities in industry.

**CC 12 – Genetics (ZOOACOR12T)**

**Course outcomes**

After successfully completing this course, the students will be able to:

- Understand how DNA encodes genetic information and the function of mRNA and tRNA
- Apply the principles of Mendelian inheritance.
- Understand the cause and effect of alterations in chromosome number and structure.
- Relate the conventional and molecular methods for gene manipulation in other biological systems.
- Discuss and analyse the epigenetic modifications and imprinting and its role in diseases.
- Get new avenues of joining research in related areas such as genetic engineering of cells, cloning, genetic disorders, human fertility programme, genotoxicity, etc

**CC 13 - Developmental Biology (ZOOACOR13T)**

**Course outcomes**

Aftersuccessfullycompletingthecourse, the studentswill beable to

- Developcriticalunderstandinghowasingle-celledfertilizedeggbecomesan embryo and then a fully formed adult by going through the important processesofcell division, cell differentiation and morphogenesis.
- Understand how developmental processes and gene functions within a particular tissue or organism can provide insight into functions of other tissues andorganisms.
- Realize that very similar mechanisms are used in very diverse organisms; anddevelopment is controlled through molecular changes resulting in variation in theexpressionand function of genenetworks.
- Understandhowthefieldofdevelopmentalbiologyhaschangedsincethebeginning of it with different phasesof developmentalresearch predominatingat different times.
- Understand the relevance of developmental biology in medicine or its role indevelopmentof diseases.

**CC 14–Evolutionary Biology (ZOOACOR14T)**

**Course outcomes**

Aftersuccessfullycompletingthecourse, the studentswill beable to

- Developcriticalunderstandingabout the evolution of different organisms over time.
- Acquire an in-depth knowledge on the diversity and relationships in animal world.
- Understand about the process and theories in evolutionary biology.
- Understand how evolutionary processes are acting on the population to produce new species.
- Realize that mutations resulting in variations in the species and the role of Natural Selection in evolution.
- Develop a holistic appreciation on the phylogeny and adaptations in animals.
- Understand the relevance of phylogenetic tree construction for the study of evolution.

## COURSE OUTCOMES OF DISCIPLINE SPECIFIC ELECTIVES

### DSE 1 (ZOOADSE01T) -Animal Behaviour and Chronobiology

**Course outcomes**

After successfully completing this course, the students will be able to:

- Learn a wide range of theoretical and practical techniques used to study animal behaviour.
- Develop skills, concepts and experience to understand all aspects of animal behaviour.
- Objectively understand and evaluate information about animal behaviour and ecology encountered in our daily lives.
- Understand and be able to objectively evaluate the role of behaviour in the protection and conservation of animals in the wild.
- Consider and evaluate behaviour of all animals, including humans, in the complex ecological world, including the urban environment

### DSE 3 (ZOOADSE03T) –Endocrinology

**Course outcomes**

Aftersuccessfullycompletingthecourse, the studentswill beable to

- Understand neurohormones and neurosecretions.
- Learn about hypothalamo and hypapophysial axis.
- Understand about different endocrine glands and their disorders.
- Understand the mechanism of hormone action.

## DSE Paper 4 (ZOOADSE04T)- Fish and Fisheries

**Course outcomes**

After successfully completing this course, the students will be able to:

- Understand and apply relevant scientific principles in the area of aquatic biology
- Employ scientific methodologies such as experimentation and data analysis in the area of fisheries
- Critically analyse, interpret and evaluate information relevant to fisheries
- Understand the life cycles and behaviour of fish and diseases of them
- Assess and identify the disease causing organisms of fish and their control measures
- Appreciate the multidisciplinary nature of the study of aquatic biology and engage positively with people and ideas beyond their own discipline.

## DSE Paper 5 (ZOOADSE05T)- Parasitology

**Course outcomes**

After successfully completing this course, the students will be able to:

- Carry out common procedures for isolating and identifying the disease-causing potential of parasites, and the responses of the immune system.
- Summarise and orally present current thrust areas in the field of parasitology.
- Describe the mechanisms for transmission, virulence and pathogenicity in pathogens.
- Diagnose the causative agents, describe pathogenesis and treatment for important

diseases like malaria, leishmaniasis, trypanosomiasis, toxoplasmosis, schistosomiasis, cysticercosis, filariasis etc.

- Assess the importance of incidence, prevalence and epidemiology in parasitological diagnostic activities.

- Assess and identify the disease causinginsects and their control measures
- Appreciate the multidisciplinary nature of the study of insect biology and engage positively with people and ideas beyond their own discipline.
- Explore some of the unique environmental problems affecting the beneficial insects.

## COURSE OUTCOMES OF SKILLED ENHANCEMENT COURSES

### SEC Paper 1 (ZOOASEC)– Sericulture

**Course outcomes**

Upon successful completion of this course, the student should be able to:

- Understand the life cycle of silkworm, their diseases and causative agents with control measures.
- Generation of skilled man power in the field of sericulture,
- Impart training in extension management and transfer of technology,
- Impart training in Post Cocoon Technology
- Describe the economic importance of silk and development of silk industries
- Provide field exposure

### SEC Paper 2 (ZOOASEC) –Apiculture

**Course outcomes**

Upon successful completion of this course, the student should be able to:

- Explain what are the prerequisite to get started in apiculture
- Describe the laws around apiculture
- Understand the life cycle of bee, their diseases and causative agents with control measures.
- Discuss the responsibilities of urban beekeepers
- Identify where to purchase equipment and demonstrate how to assemble it
- Name and identify major parts of the honeybee such as the stinger or mandibular parts
- Describe bee biology and anatomy from the perspective of managing bees
- Describe the importance of wax and identify what to look for in comb during hive inspections

## COURSE OUTCOMES OF GENERIC ELECTIVES

### GE PAPER 1 (ZOOHGEC01T) -Animal Diversity

**Course outcomes**

Aftersuccessfullycompletingthiscourse, thestudents will be able to:

- Developunderstandingonthediversityoflifewithregardtonon-chordates and chordates.
- Classifyanimalsonthebasisoftheirmorphologicalcharacteristics/ structures.
- Develop critical understanding how animals changed from a primitive cell to acollectionofsimple cellsto form acomplexbodyplan.
- Examine the diversity and evolutionary history of a taxon through the constructionofabasic phylogenetic/ cladistics tree.
- Understand how morphological change due to change in environment helps driveevolution overalongperiod of time.
- The project assignmentwill alsogive thema flavour of research tofind theprocess involved in studying biodiversity and taxonomy besides improving theirwriting skills. It will further enable the students to think and interpret individuallydueto different animal species chosen.

### GE PAPER 2 (ZOOHGEC02T) –Physiology and Biochemistry

**Course outcomes**

After successfully completing this course, the students will be able to:

- Understand the process of digestion and its control
- Develop understanding in muscle structure and contraction mechanism
- Learn the process of respiration and transport of gases
- Understand kidney structure and regulation of urine formation
- Understand heart structure and functioning
- Understand function of endocrine glands and formation of gametes.
- Understand the structure and biological significance of carbohydrates, amino acids, proteins, lipids and nucleic acids.
- Understand the concept of enzyme, its mechanism of action and regulation.
- Understand the basic biochemical process going inside the living cell.

## GE PAPER 3 (ZOOHGEC03T) -Insect Vectors and Diseases

**Course outcomes**

After successfully completing this course, the students will be able to:

- Understand the morphology, life cycles and behaviour of insects and their physiology
- Develop awareness about the causative agents and control measures of many commonly occurring diseases.
- Develop understanding about the favourable breeding conditions for the vectors.
- Devise strategies to manage the vectors population below threshold levels, public health importance.
- Undertake measures or start awareness programmes for maintenance of hygienic conditions, avoidance of contact from vector, destruction of breeding spots in the vicinity of houses and cattle shed by public health education campaign.

## GE PAPER 4 (ZOOHGEC04T) -Environment and Public Health

**Course outcomes**

After successfully completing the course, the students will be able to

- Identify current national and global public health problems.
- Aware about the issues of food safety, water safety, vaccination, exercise and obesity, exposure to toxins.
- frame a public health plan during any epidemic or spread of infectious disease etc.
- Analyze case studies of infant mortality and obesity.
- Analyse a biological problem, derive testable hypotheses and then design experiments and put the tests into practice.
- Solve the environmental problems involving interaction of humans and natural systems at local or global level.
- Assess the health inequalities with regard to gender, race, ethnicity, income etc.

**PROGRAMME SPECIFIC OUTCOMES:**

- **Understand the relationship among animals, plants and microbes**
- **Understand the nature and basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied zoology**
- **Learn the laboratory procedures in different areas of Zoology, Applies Zoology, tools and techniques used in molecular biology, biochemistry, biotechnology, toxicology etc.**
- **Understand the applications of Zoology in the fields of sericulture, apiculture, aquaculture and medicine.**
- **Acquire knowledge regarding research methodologies, effective communication skills and problem solving methods.**
- **Contribute the knowledge and expertise in the progress of biological research.**