PROGRAMME OUTCOMES AND COURSE OUTCOMES OF THE

DEPARTMENTS OF NETAJI NAGAR DAY COLLEGE

UNDER CBCS & CCF FRAMEWORK

প্রসঙ্গ কলকাতা বিশ্ববিদ্যালয় বাংলা সাম্মানিক ও সাধারণ নতুন পাঠক্রম বিন্যাস ও তার মূল্যায়ন।

২০২৩ সাল থেকে কলকাতা বিশ্ববিদ্যালয় নতুন সিলেবাস ও পরীক্ষা পদ্ধতি চালু করেছে। চার বছরের অনার্স/ অনার্স উইথ রিসার্চ এবং তিন বছরের এম.ডি.সি কোর্স। এর মধ্যে ছাত্রদের পড়তে হবে মেজর, মাইনর, আই.ডি.সি, এস.ই.সি, রিসার্চ ওয়ার্ক, এ.ই.সি ও সি.ভি.এ.সি। বর্তমানে সেমেস্টার ভিত্তিক স্নাতক সাম্মানিক বাংলা পাঠক্রমে Discipline Centric Core Course/Major Course স্তরে 88+12 ক্রেডিটের মোট 25 টি কোর্স 8(৮) টি সেমেস্টারে পড়তে হবে। এখানে প্রথম দুটি সেমেস্টারের পাঠক্রম বিন্যাস ও তার মূল্যায়ন করা হল।

প্রথম সেমেস্টার

এই সেমেস্টারে একজন বাংলা সাম্মানিকের ছাত্রকে দুটি কোর্স পড়তে হয়। BNGA-CC-1-1 এই কোর্সে বাংলা সাহিত্যের ইতিহাস সম্পর্কে প্রাথমিক ধারণা দেওয়া হয়। সাহিত্যের যুগবিভাগ কীভাবে করা হল এবং তার কারণ কি সেই বিষয়ে শিক্ষার্থীকে সম্যক ধারণা দেওয়ার চেষ্টা করা হয়। এরই সঙ্গে বাংলা ভাষা ও সাহিত্যের উদ্ভব ও তার গতিপ্রকৃতি নিদর্শন সম্পর্কে জানানো হয়। ১৮০০ খ্রি পর্যন্ত বাংলা সাহিত্যের বিভিন্ন প্রাগাধুনিক ও মধ্যযুগের কবি ও কাব্য সম্মন্ধে প্রাথমিক ধারণা দেওয়া হয়। যাদের বাংলা মাইনর কোর্স হিসেবে রয়েছে তারা এটি প্রথম অথবা তৃতীয় সেমেস্টারে পড়বে।

দ্বিতীয় সেমেস্টার

BNGA-CC-2-2 এই কোর্সে শিক্ষার্থীকে বর্ণনামূলক ভাষাবিজ্ঞানের জ্ঞান দেওয়া হয়। বাংলা ধ্বনির উচ্চারণ স্থান, শব্দভাণ্ডার, শব্দ ধ্বনি পরিবর্তনের রীতি, উপভাষা ও বাংলা ভাষার রূপতাত্ত্বিক পাঠের মাধ্যমে ভাষা বিজ্ঞানসম্মত রূপটি সম্পর্কে শিক্ষার্থীদের পরিচিত করা হয়। যাদের বাংলা মাইনর কোর্স হিসেবে রয়েছে তারা এটি দ্বিতীয় অথবা চতুর্থ সেমেস্টারে পড়বে।

Skill Enhancement Course

SEC 1-1 মুদ্রণ ও প্রকাশনা। প্রথম সেমেস্টারে বাংলা অনার্সের ছাত্ররা এই কোর্সটি করবে। তিন বছরের MDC ছাত্ররা প্রথম দ্বিতীয় ও তৃতীয় যেকোনো একটি সেমেস্টারে এই কোর্সটি নিয়ে পড়াশোনা করবে। এই কোর্সে শিক্ষার্থীকে মুদ্রণ ও প্রকাশনা সম্পর্কে পাঠ দেওয়া হয়। এতে করে শিক্ষার্থী চাইলে ভবিষ্যতে এই পেশায় নিজেকে

নিযুক্ত করতে পারে। এই বিষয়ে পাঠ শিক্ষার্থীকে বাংলা নিয়ে পড়াশোনার ব্যাপারে উৎসাহিত ও পেশা নির্বাচনে অন্য দিগন্ত দেখাতে পারে।

SEC-2-2 দ্বিতীয় সেমেস্টারে বাংলা অনার্সের ছাত্ররা এই কোর্সটি করবে। এই কোর্সে শিক্ষার্থীকে গল্প থেকে নাটক নির্মাণ, চিত্রনাট্য নির্মাণ, আবৃত্তিচর্চা সম্মন্ধে ধারণা দেওয়া হয়। পরবর্তী জীবনে পেশা,হিসেবে তারা নাটক রচয়িতা, সিরিয়াল সংলাপ রচয়িতা হিসাবে নিজেকে উৎসাহিত করতে পারে। বাচিক শিল্পী বা আবৃত্তিকার হিসেবেও নিজেকে গড়ে তোলার রাস্তা দেখাতে পারে এই কোর্স।

I.D.C

Internal Disciplinary Course.. এই বিষয়টি নিয়ে অন্যান্য বিভাগের ছাত্ররা যাদের বাংলা নিয়ে আগ্রহ আছে তারা পড়াশোনা করতে পারে। এখানে বাংলা কথাসাহিত্য ও নাটক পাঠ করানো হয়। প্রথম, দ্বিতীয় অথবা তৃতীয় যেকোনো সেমেস্টারে এই কোর্সটি করা যেতে পারে।

A.E.C.C

Ability Enhancement Compulsory Course (AEC-MIL Bengali) এই কোর্সটি সকল U.G ছাত্রদের দ্বিতীয় ও চতুর্থ সেমেস্টারে পড়তে হবে। এখানে বাংলা প্রবন্ধ ও পরিভাষা নিয়ে প্রাথমিক ধারণা দেওয়া হয়।

CVAC

Common value Added Cour এই কোর্সটিও সকল ইউজি ছাত্রদের পড়তে হবে। দেশের জাতীয়তাবাদী সংস্কৃতির ধারণা পাওয়ার জন্য এই কোর্সটি বাধ্যতামূলক। দ্বিতীয় সেমেস্টারে ছাত্ররা কৃত্তিবাস ওঝার রামায়ণ ও রাজশেখর বসুর মহাভারতের একটি করে অংশ পাঠ করবে।

সাম্মানিকের ক্ষেত্রে প্রতিটি ক্রেডিটের পূর্ণমান ১০০। ২৫ নাম্বার কোর্সভিত্তিক টিউটোরিয়ালের জন্য বরাদ্দ। এই নাম্বার বিভাজন শিক্ষার্থীকে পড়াশোনার ধারাবাহিকতা ধরে রাখতে সাহায্য করবে। বাকি ৭৫ নাম্বার লিখিত পরীক্ষা হবে। আপাতত দৃষ্টিতে এই নাম্বার বিভাজনের পরীক্ষায় শিক্ষার্থীরা অভ্যস্ত হয়ে উঠলে প্রচুর নাম্বার পাবার সুযোগ থাকছেযা তাদের উৎসাহিত করবে।

বর্তমান পাঠক্রম বাংলাসাহিত্যে আগ্রহী ছাত্রছাত্রীদের আরও অনেক বেশী সাহিত্যের প্রতি উৎসাহিত ও চৌকস করে তুলবে আশা করি। সুনির্দিষ্টভাবে এই পাঠক্রম বিভাজন সাহিত্যের ব্যাবহারিক ও প্রায়োগিক দুটো বিষয়কেই

ছুঁতে পেরেছে। বর্তমান সিলেবাস ও পরীক্ষা পদ্ধতি তাই অনেক বেশি যুক্তিসঙ্গত ও বিজ্ঞানভিত্তিক হয়েছে বলে আমাদের ধারণা।

Department of Botany
Netaji Nagar Day College
Course Outcomes and Program Outcomes (Honours and General)

Course Outcome B.Sc. 3 Yr and 4 Yr Botany (under CCF):

Plant Diversity (Semester I, Paper- BOT-A-CC-1-1-TH, BOT-A-CC-1-1-P; Semester I, Paper- BOT-MD-CC-1-1-TH, BOT-MD-CC-1-1-P)

- Overview of General characteristics like ultrastructure of algal cell.
- Understanding the concept of origin and evolution of sex and life cycle patterns found in different species of algae including classification of Lee (2008)
- Providing thorough knowledge about various algal groups including their Life History.
- To study detailed structure of fungus, different types of fungal spores and their mode of liberation
- To gather knowledge about different types of sexual reproduction in fungus, degeneration of sex, parasexuality and fungal lifecycle pattern.
- To develop overall idea on classification of fungus and learn about the general characteristics of each class with suitable examples.
- To know the life history of some typical class representatives of common Indian fungal species.
- To study symbiotic association between algae and fungi (lichen) and higher angiosperms (mycorrhiza) and their practical applications.
- To acquire practical experiences about the vegetative and reproductive structures, spore measurement of the above said class representative fungal specimen.
- To get an idea about the diversity of fungal flora of different localities, knowledge about their growing season, their habit and habitat, morphology of different types of fruit body etc. through field excursion.
- To teach the difference between edible and poisonous mushroom through field study which is of immense importance in practical life.
- Explaining the Fundamentals of Archegoniate and understanding the general characteristics and adaptations to land habit.
- Understanding the classification with diagnostic characters and their various phases.
- Understanding the phylogeny and their origin.
- Overview of their plant succession, pollution monitoring, economic importance.
- Excursion to familiarize with the natural habitats of these groups.

Mushroom Cultivation Technology (Semester I, Paper- BOT-H-SEC-1-Th, BOT-H-SEC-1-P; Semester I, Paper- BOT-MD-SEC-1- TH, BOT-MD-SEC-1- P, Semester II, Paper- BOT-MD-SEC 1-TH, BOT-MD-SEC-1- P)

- To study the current overview of mushroom production in the world.

- Explaining the fundamentals of mushroom culture technology describing the nutritional medicinal value of edible mushrooms, i.e. *Volvariella volvacea, Pleurotus citrinopileatus, Agaricus bisporus.*
- Brief concept of poisonous mushrooms.
- Detailed account on the cultivation of the edible mushrooms emphasizing on the infrastructure, preparation and factors affecting the process, storage and drying of mushrooms.
- Overview on the nutritional value of mushrooms and percentage of the nutritional contents with a brief knowledge on the types of foods prepared from mushroom.
- Acquire knowledge on the Research Centre working on mushroom at the national level and regional level as well.
- To develop entrepreneurship in mushroom culture technology.

Plant Systematic (Semester II, Paper- BOT-A-CC-2-2-TH, BOT-A-CC-2-2-P; Semester II, Paper- MD-CC2-2-TH, BOT-MD-CC2-2-P)

- Overview of Nomenclature, Identification, classification and studying the concept of taxonomy and its phases, system of classification with merits and demerits
- To learn the techniques of effective and valid publication and knowledge about ICN and its principles.
- Learn the subject with systematic in practice of Herbaria and Botanical Gardens of India and world
- Techniques to create dichotomous keys, phonetics, cladistics and use the data sources from various subjects and interpret the evidences in taxonomy.
- Learning the diagnostic features and characters of various families, their key and formula, systematic position, economic importance and herbarium preparation methods.
- Local and long excursions in this subject to familiarise the students with the methods of collection, preservation of plants and learning about them in their natural habitat.

Biofertilizers and Biopesticides (Semester II, Paper- BOT-H-SEC- 2-Th, BOT-H-SEC- 2-P)

- Develop their understanding on the concept of biofertilizer.
- Study the general account of microbes used as biofertilizers.
- Gain knowledge about myccorhizal association, concept about Vesicular Arbuscular Mycorrhizal (VAM) and its influence on crop plants.
- Concept of organic farming.
- Recycling of biodegradable, municipal, agricultural and industrial waste.
- Importance of nitrogen fixing bacteria in agriculture as biofertilizers mainly in rice cultivation.
- Study of prospects and limitations of biopesticides.

- Isolation, mass production, formulation, quality control, field application of various strains in agriculture.
- Use of fungus, bacteria and virus as bioinsecticides.

IDC (To be opted in 1st or 2nd or 3rd Semester)

BIOSTATISTICS (3 Yr MDC)

Course Outcome

- Develop the ability to analyze and interpret biological data using statistical methods.
- Gain expertise in applying statistical tools like Chi-square, t-tests, and F-tests in biological research.
- Understand and calculate probabilities, gene frequencies, and inheritance patterns for real-world applications.
- Acquire skills in data visualization and representation through graphs, histograms, and frequency polygons.
- Build competence in conducting univariate analysis and interpreting measures of central tendency and dispersion.
- Prepare for careers in biostatistics, data analysis, genetics research, and quality control in life sciences industries.

PLANTS AROUND US (4 Yr MDC)

Course Outcome

- Understanding the basic concepts of algae, bryophytes, pteridophytes, gymnosperms and angiosperms.
- Basic ideas on the general characteristics of fungi.
- Contributions of some researchers in the field of plant medicine.
- To study the plant cell, tissue and the morphology of plant body.
- To gain knowledge on the major cereals, pulses, oil, sugar, vegetables, fruits, timber, fiber and ornamental plants.
- To develop an understanding on the important medicinal plants and uses.

Course Outcome B.Sc. Botany (Honours): under CBCS

Palaeobotany and Palynology (Semester III, P- BOT-A-CC-3-5-TH, BOT-A-CC-3-5-P)

- Know, scope and application of Palaeobotany
- To gain knowledge about plant fossils (pteridophyte and gymnosperm) and methods of fossilization.
- They also gather knowledge about the geological time scale and the origin of life on earth.
- Knowledge of palynology helps the students to come across the various fossil records (fossil pollen and spores) and they can grow interest in the geological and palynological studies to know the past and present of our earth in a better way.
- The students also gather knowledge on the different applications of palynology.
- Morphological and microscopical slide studies of megafossils and microfossils helps students to acquire basic understanding of a fossil.

Reproductive biology of Angiosperms (Semester III, Paper- BOT-A-CC-3-6-TH, BOT-A-CC-3-6-P)

- Understanding the different types of inflorescence and flowers with proper examples.
- To learn about the genetic and molecular details of flower development.
- Understanding the types of fruits and seeds with suitable examples.
- To gather practical knowledge on inflorescence, flower, fruit, seed and embryo from fresh samples, collected from localities that enables the students to draw, describe and identify the plants properly.

Plant Systematic (Semester III, Paper- BOT-A-CC-3-7-TH, BOT-A-CC-3-7-P)

- Overview of Nomenclature, Identification, classification and studying the concept of taxonomy and its phases, system of classification with merits and demerits
- To learn the techniques of effective and valid publication and knowledge about ICN and its principles.
- Learn the subject with systematic in practice of Herbaria and Botanical Gardens of India and world
- Techniques to create dichotomous keys, phonetics, cladistics and use the data sources from various subjects and interpret the evidences in taxonomy.
- Learning the diagnostic features and characters of various families, their key and formula, systematic position, economic importance and herbarium preparation methods.
- Local and long excursions in this subject to familiarise the students with the methods of collection, preservation of plants and learning about them in their natural habitat.

Phytogeography and Ecology and Evolution (Semester IV, Paper- BOT-A-CC-4-8-TH, BOT-A-CC-4-8-P)

- In phytogegraphy students will learn about the phytogeographical regions of India.
- Students will gain basic understanding of endemism, factors of endemism, preliminary ideas on ecology, community ecology dealing with ecological succession and seral stages.
- Learn about the metalophytes and phytoremediation.
- Develop an idea on the biodiversity conservation and the different types of biodiversity.
- Long and short excursions help the students to familiarize the students with the different types of biodiversites in India.
- Determination of dissolved oxygen of water samples from different sources, determination of free carbon dioxide and comparative anatomical studies of leaves from polluted and non-polluted leaves.
- Determination of minimal quadrat size for the study of herbaceous vegetation.
- Explaining the concept evolution and various theories related to it
- Understanding gradualism, equilibrium and stasis.
- Brief idea on selection types, the relationship of man and environment, speciation, co-evolution of various organisms on earth.
- Concept of adaptive radiation and reproductive isolation
- Phylogeny of bacteria, algae, fungi, bryophyte, pteridophyte and gymnosperm and creation of phylogenetic tree.

Economic Botany (Semester IV, Paper-BOT-A-CC-4-9-TH, BOT-A-CC-4-9-P)

- Overview of origin of cultivated crops, genetic diversity, evolution of new varieties and importance of germplasm diversity.
- To learn about the morphology, processing and use of important cereals, legumes, plant source of sugar and starch, spices and beverage.
- To study general discussion, classification, extraction process, use and health implications of some oil and fat sources (mustard, soybean, coconut) and also some essential oil sources.
- Detailed concept of some therapeutic and habit-forming drugs, their morphology, uses and health hazards.
- To learn the general account of timber with special reference to shaal and teak.
- To learn about the morphology, extraction, uses and role in economy of some fibre yielding plants (jute, cotton).
- To gather the practical experiences by studying the morphology and dissection of the specimen mentioned in the theoretical syllabus, to identify their specific anatomical structures of economic importance.

Genetics (Semester IV, Paper-BOT-A-CC-4-10-TH, BOT-A-CC-4-10-P)

- Overview of the Mendel's principles with emphasis on Mendelian genetics.

- Understanding the concept of Linkage and Crossing Over and the concept Molecular mapping in brief -ISH, FISH and Gene Mapping along with the idea of co-efficient of coincidence and interference and mapping function.
- Explaining the concept of Epistasis and Polygenic inheritance in plants and various aspects of Aneuploidy, Polyploidy (role in Speciation and Evolution) and Chromosomal aberration.
- Explaining the concept of Mutation (types and example).
- Understanding the process of DNA repair in brief, Transposon (Ac-Ds system) and Homoeotic gene in plants (ABCE Quartet model of flowering).
- Discussing the One Gene- one polypeptide concept, Split Gene, Overlapping Gene and Repetitive DNA (briefly).
- Understanding the basic technique of chromosome preparation in *Allium cepa.*
- Developing the ability to study of various aspects of mitotic chromosome from root tips of *Allium cepa, Aloe vera, Lens esculenta,* chromosomal aberrations and meiotic chromosome from flower buds: *Allium cepa* and *Setcreasea s*p.
- Developing capability to identify different stages from permanent slides: Normal and Abnormal stages Meiosis and Mitosis.
- Assessment on the basis of Classroom performance (Laboratory Records and slides).
- Viva- voce on *Practical* experiments help students to visualize the various concepts of Genetics.

Cell and Molecular Biology (Semester V, Paper-BOT-A-CC-5-11-TH, BOT-A-CC-5-11-P)

- Understanding the concept of Origin and Evolution of Cells including Evolution of nucleic acid (from RNA to DNA) along with the Concept of RNA world, Ribozymes and First cell.
- Familiarise with the concept of origin of eukaryotic cell (endosymbiotic theory).
- Discussing the basic concept of Small RNA and Organellar DNA (chloroplast and mitochondrial DNA).
- Getting an idea on Nuclear envelope, Nuclear lamina and Nuclear pore complex with an emphasis on Nucleolus and ribosome biogenesis including the structure of Centromere type and function and Chromatin ultrastructure and DNA packaging in eukaryotic chromosome.
- Understanding the basic concept of Cell cycle and its regulation and mechanism of cell cycle control in Yeast (checkpoints and role of MPF),
- Discussing structure of Kinetochore, spindle apparatus, Microtubules and Apoptosis (brief idea).
- Understanding the concept of DNA Replication, Transcription and Translation (Prokaryotes & Eukaryotes) including Central Dogma.
- Discussing the mechanism of Semiconservative DNA replication highlighting the role of different enzymes and Eukaryotic replication including telomerase concept including fidelity of DNA replication in prokaryotes and in eukaryotes.
- Imparting knowledge about the process of Transcription, RNA processing, Aminoacylation of tRNA and Translation.
- Familiarising with the concept of Lac-operon (Positive and negative control).
- Highlighting the properties of Genetic Code with evidences & exceptions, with an emphasis on the decipherence of codon (Binding technique).

- Understanding the importance of Restriction endonuclease including types and role in Recombinant DNA Technology.
- Explaining the structure of Vector (plasmid pBR 322) and Marker gene and the steps of cloning technique.
- Describing the concept of PCR and its application and overview of Genomic DNA and cDNA library.
- Basic discussion on the Development and causes of Cancer (in general and brief) including tumor suppressor gene and oncogene.
- Developing capability to Study the plant cell structure of *Onion/Rhoeo/Crinum* and measuring cell size and counting cells per unit volume using haemocytometer in Yeast or pollen grains.
- Understanding the process of Cytochemical staining of DNA using Pyronine-methyl green staining and the ability to estimate the DNA and RNA content.
- Study of nucleolus and determination of nucleolar frequency.
  cultivating interest among students concerning the subject through preparation of models/ charts on different topics of relevant areas along with Assessment on the basis of Classroom performance (Laboratory Records and slides) and Viva voce.

Biochemistry (Semester V, Paper- BOT-A-CC-5-12-TH, BOT-A-CC-5-12-P)

- Brief idea on covalent and non-covalent bonds; Hydrogen bonds; Vander Waal's forces.
- Overview of structure and properties of water, pH and buffer (Inorganic and Organic),Handerson-Hasselbach equation and isoelectric point.
- Detailed structure of Nucleic Acids, B & Z form of DNA, RNA, ATP, NADP.
- Structure of Proteins and Amino Acids, Carbohydrates, Lipids and Fatty Acids.
- Detailed account of bioenergetics and inter-relationship between redox potentials and biological redox reactions.
- Comprehensive account of enzymes and classification.
- Understanding the mechanism of enzyme action, inhibition, kinetics and related problems.
- Detailed account of membrane chemistry, transport and mechanism.
- Mechanism of ATP synthesis, mechanism and differences of Oxidative and Photophosphorylation.

Plant Physiology (Semester VI, Paper- BOT-A-CC-6-13-TH, BOT-A-CC-6-13-P)

- Concept of plant-water relations, potential and its components.
- Understanding the soil-plant-atmosphere continuum concept and stomatal physiology and the mechanisms along with the antitranspirant
- Learning about mechanisms of mineral nutrition, organic translocation and various plant growth regulators and their biosynthesis and bioassay.
- Concept of photomorphogenesis, phytochrome, vernalization, biological clock and biorhythm.
- Learning about the seed dormancy, its types, causes and biochemistry of germination.
- Learning about physiology of senescence and ageing.
- Hands on training to determine the physiological experiments related to plants and their

seeds.

Plant Metabolism (Semester VI, Paper- BOT-A-CC-6-14-TH, BOT-A-CC-6-14-P)

- Understanding the concept of metabolism, pathways and their regulation, various cycles/pathways in plants like Calvin, HSK, C3, C4, CAM etc
- Learning about the photosynthesis in plants and bacteria, biological significance, photosystems, electron transport and water splitting mechanisms
- Understanding the efficiency and productivity of plants and discussing photorespiration.
- Describing Respiration with EMP pathway, glycolysis, TCA cycle, PP Pathway, ETS system, stoichiometry of glucose oxidation.
- Nitrogen and lipid metabolism in plants highlighting all the assimilation, biochemical, biosynthetic and signal transduction pathways
- Hands on training of various chromatography techniques, biochemical and measurement test and their calculation.

Applied Mycology, Applied Phycology, Applied Microbiology (Semester III, Paper- BOT-A-SEC-A-3-1)

- To study the importance of fungi as food.
- Role of fungi in the industrial production of fermented food (cheese, ethanol).
- Brief idea about the fungal source of some common enzymes, amino acids, vitamins, antibiotics, aflatoxins and pharmaceuticals.
- Discussing usage of algae as food and source of phycocolloid (Agar Agar, Carrageenan), Diatomite and Algal Toxin.
- Understanding the idea of various concepts of algal biotechnology.
- Brief outline of industrial production of Vinegar and Streptomycin.
- Overview of microbial sources and uses of Enzyme (Amylase, Protease), Amino Acid (Glutamic Acid, Lysine), Polysaccharides (Dextran).
- Brief account on the use of microbes as Biofertilizer and Biopesticides
- Comprehensive account on the use of microbes in mineral processing.

Biofertilizer (Semester III, Paper-BOT-A-SEC-A-3-2)

- Develop their understanding on the concept of biofertilizer.
- Study the general account of microbes used as biofertilizers.
- Gain knowledge about myccorhizal association, concept about Vesicular Arbuscular Mycorrhizal (VAM) and its influence on crop plants.
- Concept of organic farming.

Plant Breeding (Semester IV, Paper- BOT-A-SEC-B-4-3)

- Familiarise with the concept of plant breeding and its objectives.
- Explaining the method of breeding systems along with the modes of reproduction in crop plants including achievements and undesirable consequence of plant breeding.
- Understanding different methods and various aspects of crop improvement.
- Discussing different selection methods and procedure and hybridization including their advantages and limitations.
- Imparting knowledge about maintenance of germplasm, Mass selections and Pure line selection including Back cross method and the concept of Heterosis with hybrid seed production.
- Describing the concept of Male sterility and its use.
- Understanding the process of Inbreeding and inbreeding depression (brief idea on effect of outcrossing) and Molecular Breeding including the use of DNA markers in plant breeding).
- Understanding the role of mutations, polyploidy, distant hybridization and biotechnology in crop improvements.

Mushroom Culture Technology (Semester IV, Paper-BOT-A-SEC-B-4-4)

- Explaining the fundamentals of mushroom culture technology describing the nutritional medicinal value of edible mushrooms, i.e. *Volvariella volvacea, Pleurotus citrinopileatus, Agaricus bisporus.*
- Brief concept of poisonous mushrooms.
- Detailed account on the cultivation of the edible mushrooms emphasizing on the infrastructure, preparation and factors affecting the process, storage and drying of mushrooms.
- Overview on the nutritional value of mushrooms and percentage of the nutritional contents with a brief knowledge on the types of foods prepared from mushroom.
- Acquire knowledge on the Research Centre working on mushroom at the national level and regional level as well.

Biostatistics (Semester V, Paper- BOT-A-DSE-A-5-1-TH, BOT-A-DSE-A-5-1-P)

- Explaining the Definition, statistical methods, basic principles and variables- with measurements with emphasis on its functions, limitations and uses in various fields.
- Familiarise with the concept of Biometry and Central tendency and Probability (multiplicative and additive rules, application and importance).
- Imparting knowledge about the Test of significance by chi- square test for goodness of fit.
- Understanding the method of Measurement of gene frequency using Hardy-Weinberg equilibrium with conditions applied for its implications,calculation of genotypic and allelic frequencies.
- Developing basic capability to workout and calculate Univariate analysis of various statistical data, correlation coefficient values,'F' value and probability value for the F value.
- Developing the capability to determine of goodness of fit in Mendelian and modified mono-and dihybrid ratios by Chi-square analysis also with comment on the nature of inheritance.

- Emphasizing basic idea of computer programme for statistical analysis of correlation coefficient,'t' test, standard error and standard deviation.
- Assessment on the basis of class performance (laboratory records) and Viva voce.

Industrial and Environmental Microbiology (Semester V, Paper- BOT-A-DSE-A-5-2-TH, BOT-A-DSE-A-5-2-P)

- Applications and scope of microbiology in industries and environment with Concepts on Bioreactors/Fermenters and microbial fermentation process.
- Overview of Solid-State Fermentation (SSF) and Liquid-State Fermentation (LSF) and basic differences between Batch and Continuous Fermentation process.
- Understanding about the components of a typical bioreactor and different types of bioreactors-laboratory. Assessing the importance of pilot-scale and production fermenters.
- Acquire knowledge about Constantly Stirred Fermenters, Tower Fermenters, Fixed-bed and Fluidized bed Bioreactors and Air-lift Fermenters.
- To know about various kinds of microbial production of industrial products- Involvement of microorganisms, media; Know about the role and procedure of filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, liophilisation, spray drying, hands on microbial fermentations for the production and estimation of enzymes amylase or lipase activity, organic acids(citric or glutamic acid), alcohol (ethanol) and antibiotics (Penicillin).
- A broader view of microbial enzymes of industrial products and immobilization of enzymes- Role of microorganisms for industrial applications, advantages and applications of immobilization, large scale application of immobilized enzymes (glucose isomerase and penicillin acylase).
- Association and Co-relations between microbes and quality of environment.Techniques of isolation method of microorganisms from soil, air and water.
- Different types of microbial flora of water and relation between flora and water pollution. Determination of BOD, COD of water samples, Understanding the role of microbes as indicators of water quality. Learn to check coliform and fecal coliform in water sample.
- Role of microbes in agriculture and remediation of contaminated soils with concept of biological fixation, mycorrhizae, bioremediation of contaminated soils, isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots.

Medicinal and Ethnobotany (Semester VI, Paper- BOT-A-DSE-A-6-3-TH, BOT-A-DSE-A-6-3-P)

- An overview of history, scope and importance of medicinal plants and brief knowledge about our traditional medicinal systems – Ayurveda, Sidhha and Unani.
- Detailed concept of crude drugs, chemical and pharmacological classification and different aspects of evaluation of drugs.
- To learn about the primary and secondary metabolites, biosynthesis of secondary metabolites and mode of action of terpenoids, phenolics, flavonoids and alkaloids against pathogenic microbes and herbivores.

- To learn about some important pharmacologically active constituents under steroids, tannins, resins, alkaloids and phenol.
- A brief idea about ethnobotany-definition, method of study, application and Indian scenario.
- To study the importance of folk-medicine and its application in certain diseases.
- To study the histological and histochemical tests of certain drug plants to make the student capable of screening the adulterant and also to gain knowledge on differentiating between alkaloid and tannin through the chemical test.

Stress Biology (Semester VI, Paper- BOT-A-DSE-A-6-4-TH, BOT-A-DSE-A-6-4-P)

- Describing and analyzing the concepts of Plant stress, acclimation and adaptation
- Understanding the environmental factors and the stress conditions faced by a plant.
- Study of pathogenesis related to PR proteins, systemic acquired resistance, mediation of insect and disease resistance.
- Emphasizing the significance of stress sensing mechanisms in plants and signaling processes.
- Studying the developmental and physiological mechanisms that protect plant from various stresses, their adaptation, physiological changes, ROS generation and their scavenging mechanism.
- Hands on training in quantitative estimation of enzyme activity, comparative studies of plants under various degrees and type of stress.

Plant biotechnology (Semester V, Paper- BOT-A-DSE-B-5-5-TH, BOT-A-DSE-B-5-5-P)

- Understand the fundamentals of plant tissue culture.
- Understand tissue culture techniques and its application like callus culture, haploid culture and protoplast culture.
- Understand the basic concepts of genetic engineering, its achievement in crop biotechnology, environment and industry.
- Basic concept of the different methods of gene transfer.
- Familiarization of basic equipments of plant tissue culture.
- Hands on training on the preparation of basal media, sterilization techniques and tissue culture techniques.

Horticultural Practices and Post-Harvest Technology (Semester V, Paper- BOT-A-DSE-B-5-6-TH, BOT-A-DSE-B-5-6-P)

- Brief idea about the scope and importance, role in rural economy, employment generation, nutritional security and ecotourism of horticulture.
- To learn about the types, classification, identification and salient features of some common ornamental plants (herbs, shrubs and trees).

- Concept of origin, distribution, morphology, production and marketing of some vegetable and fruit crops.
- To become familiar about the method of application of suitable manures, chemical fertilizers, biofertilizers, nutrients, PGRs, biocontrol agents, irrigation methods, hydroponics and various methods of propagation.
- To learn about the importance of cut flower, bonsai, their aesthetic and commercial role in society.
- Understanding the different post-harvest technology, preservation, transportation of fruits, vegetables, cut flowers etc. along with food irradiation and food safety.
- To have a sound knowledge on symptoms of some common diseases and pests, their control measures and management, IPM, quarantine practices.
- Concept of conservation and management of best traits, documentation of germplasm, role of micropropagation and tissue culture technique in crop improvement, IPR issues.
- To learn about some national, international and professional societies of horticultural science.
- Field visit to garden, nurseries, horticultural field and in some cold storage for giving an overall idea to the students on cultivation process, maintenance, preservation and packaging of horticultural products before marketing successfully.

Research methodology (Semester VI, Paper- BOT-A-DSE-B6-7-TH, BOT-A-DSE-B-6-7-P)

- Understand the concept of research and different types of research in the context of biology.
- A fundamental understanding of research methodology will help students to read about and correctly interpret the results of research in any field of science.
- Develop laboratory experiment related skills.
- Develop competence on data collection and process of scientific documentation.
- Analyze the ethical aspects of research.
- Evaluate the different methods of scientific writing and its presentation.
- Gain practical Knowledge on research based calculations, plant microtechnique experiments.
- Idea on powerpoint presentation, poster presentation etc.

Natural Resource Management (Semester VI, Paper- BOT-A-DSE-B-6-8-TH, BOT-A-DSE-B-6-8-P)

- Discussing basic concepts of Natural resources, sustainable utilization, biological resources, significance, threats, management strategies and their bio prospecting.
- Study of the management of agricultural, pastoral, horticultural, silvicultural utilisation and soil degradation.
- Study of all types of freshwater sources, their threats and management strategies; forest cover and its significance, its depletion and management; renewable and non-renewable sources of energy.

- Learning about the contemporary practices in resource management, EIA, GIS, ecological footprint, carbon footprint, waste management.
- Understanding National and International efforts in resource management and conservation.
- Hands on training in estimation, determination of chemical properties, physiological properties of water, soil, dust, carbon.

Course Outcome B.Sc. Botany (General):

Semester	Course name	Course tyye	Course outcome
III	CELL BIOLOGY, GENETICS AND MICROBIOLOGY BOT-G-CC-3-3-TH PRACTICALS BOT-G-CC-3-3-P	CORE COURSES (CC-1-4)	• Overview of cell biology and genetics with emphasis on nucleus, chromosome, transcription, translation, mutation, split gene and transposons. • Understanding Virus and Bacteria in brief with their general structure.
	SEC A Plant breeding and biometry (BOT-G-SEC-A-3/5-1)	SKILL ENHANCEMENT COURSE (SEC-1-4)	• Basic knowledge of plant breeding and role of biotechnology in crop improvement. • Basic concept of biometry
IV	PLANT PHYSIOLOGY AND METABOLISM BOT-G-CC-4-4-TH PRACTICALS BOT-G-CC-4-4-P	CORE COURSES (CC-1-4)	• Understanding proteins and physiology of plants like respiration, transpiration, photosynthesis, nitrogen metabolism, hormones, photoperiodism, senescence
	SEC B Plant biotechnology (BOT-G-SEC-B-4/6-3)	SKILL ENHANCEMENT COURSE (SEC-1-4)	• Understanding plant tissue culture techniques • Understanding recombinant DNA technology
V	SEC A Biofertilizers (BOT-G-SEC-A-3/5-2)	SKILL ENHANCEMENT COURSE (SEC-1-4)	• Develop their understanding on the concept of biofertilizer and microbes used as biofertilizers • Understanding VAM
	DSE A Phytochemistry and medicinal botany- a) Theoretical- BOT-G-DSE-A-5-1-TH, b)	DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE-1&2)	• An overview of history, scope and importance of medicinal plants and brief knowledge about our traditional medicinal systems. • Basic concepts of Natural resources, sustainable utilization,

	Practical- BOT-GDSE-A-5-1-P Natural resource management- a) Theoretical- BOT-G-DSE-A-5-2-TH, b) Practical- BOT-G-DSE-A-5-2-P		biological resources, significance, threats, management strategies and their bio prospecting
VI	SEC B Mushroom culture technology (BOT-G-SEC-B-4/6-4)	SKILL ENHANCEMENT COURSE (SEC-1-4)	• Explaining the fundamentals of mushroom culture technology with basic ideas of the edible and poisonous mushrooms.
	DSE B Economic botany- a) Theoretical BOT-G-DSE-B-6-3-TH, b) Practical- BOT-G-DSE-B-6-3-P Horticultural practices and post harvest technology – a) Theoretical- BOT-G-DSE-B-6-4-TH,	DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE-1&2)	• Learn about the economically important plants like cereals, pulses, spices, beverages, oil yielding plants, fibre yielding plants, timber yielding plants and fruits. • Brief idea about the scope and importance, role in rural economy, employment generation, nutritional security and ecotourism of horticulture. • To learn about the types, classification, identification and salient features of some common ornamental plants (herbs, shrubs and trees). • Concept of origin, distribution, morphology, production and marketing of some vegetable and fruit crops.

Program Specific Outcomes, B.Sc. Botany (CBCS+ CCF)

- **Govt. Department:** After completion of the courses, a botanist can avail job opportunities in government departments (like planning and developmental commissions, forestry, environmental, agricultural, stress management organization, botanic garden and disaster management departments etc.
- **Laboratory Technician/ Laboratory Instructor:** Knowledge about the various types of microscopy, preparing solutions, stains, pre-treatment techniques, basic understanding of different plant families and identification of plant taxa will help a student in achieving jobs as laboratory technician or laboratory instructor.

- **Private Agencies:** There are opportunities in private agencies also such as travel agencies requiring data of flora of an area. Prior knowledge of Industrial and Environmental Microbiology helps in the research related fields and in the Pharmaceutical Industries, Private Hospitals, Environmental agencies, Food Industry, Beverage Industry, Chemical Industry and also in Agriculture Department. With further knowledge, students can become a Biochemist in public as well as private sector. They can engage in research related works, quality control and safety section in the companies like food, pharmaceuticals, health and beauty care.
- **Entrepreneur:** There are opportunities to get engaged into mushroom farming and agri-based industry and to start up a business.
- **Surveyor:** Many others with a degree in Botany can also opt to work as a surveyor in disaster management, forest, environment agencies, NGOs etc.
- **Tourism:** There is some scope for the students of Botany (After further study in the relevant field i.e., taxonomy, palaeobotany) in the field of Tourism.
- **Researcher:** In several research institutes there are enormous job openings as Research Assistant, Research Associate, Research Consultant, Project Fellow etc. With further knowledge student can become Food, Industrial or Environmental Microbiologists, Biomedical Scientists or Clinical Research Associate. Develop the ability to analyze and interpret biological data using statistical methods. Gain expertise in applying statistical tools like Chi-square, t-tests, and F-tests in biological research.
- **Teacher/Professor:** After completing higher studies in Botany, there are scopes to opt for state or national level college teacher position (CSC, PSC, and UGC), school teachers (SSC, MSC, PSC, KVS, Army Public School etc.) and university teacher.
- **Govt. Job:** After completing graduation degree a student can appear in different competitive examinations such as Bank, Railway, Public Service Commission, Stuff Selection Commission, Union Public Service Commission, West Bengal Civil Service etc.
- During this Covid-19 pandemic situation in absence of any specific drug in hand, the knowledge of pharmacognosy and ethnobotany can act as an armour to boost up our body immunity, the primary weapon to fight against the virus. The AYUSH Mantrak of India caters to popularise the use of herbal drugs as a mass safety venture till a proper remedy comes out.
- **Biostatistician**: Analyze biological data for clinical trials, epidemiological studies, and public health research.
- **Data Analyst**: Apply statistical methods to interpret complex datasets in biotechnology, healthcare, and pharmaceutical industries.
- **Genetics Counselor**: Use statistical tools to analyze gene frequencies and provide insights into genetic inheritance and disorders.
- **Research Scientist**: Contribute to scientific advancements by applying statistical techniques in academic and industrial research.
- **Quality Assurance Specialist**: Utilize statistical testing methods for quality control in biotechnology and life science industries.
- **Educator**: Teach and mentor students in biostatistics and biometrics, preparing the next generation of scientists and statisticians.

Department of Chemistry
Course Outcomes and Program Outcomes

COURSE OUTCOMES (UNDER CBCS)

B.Sc 1ST SEMESTER		
SUBJECT	**PAPER**	**OBJECTIVES**
INORGANIC CHEMISTRY-1	CEMA-CC-1-1-TH	Students will come to learn about the following:- 1. Extra nuclear Structure of atom 2. Acid-Base reactions 3. Redox Reactions
ORGANIC CHEMISTRY-1A		1. Students shall acquire the knowledge about the basic of organic chemistry. 2. They will learn about the bonding and physical properties 3. General Treatment of Reaction Mechanism I
1) INORGANIC CHEMISTRY: I(1)LAB 2) ORGANIC CHEMISTRY: O (1A) LAB	CEMA-CC-1-1-P	Students will acquire practical knowledge of the following: 1. Acid and Base Titrations by demonstration. 2. Oxidation-Reduction Titrations. 3. Separation
PHYSICAL CHEMISTRY-1	CEMA-CC-1-2-TH	Students will acquire practical knowledge of the following: 1. Kinetic theory and gaseous state 2. Transport Process 3. Chemical Kinetics
ORGANIC CHEMISTRY-1B		Students will acquire practical knowledge of the following: 1. Stereochemistry I 2. General Treatment of Reaction Mechanism II
PHYSICAL CHEMISTRY P(1) LAB	CEMA-CC-1-2-P	This topic shall enlighten the students about:- 1. Study of Kinetics of decomposition of H2O2 2. Study of Kinetics of acid catalyzed hydrolysis of methyl acetate. 3. Study of viscosity of unknown liquid. 4. Determination of solubility of sparingly soluble salt in water.

B.Sc 2ND SEMESTER		
SUBJECT	**PAPER**	**OBJECTIVES**
ORGANIC CHEMISTRY-2 INORGANIC CHEMISTRY-2	CEMA-CC-2-3-TH CEMA-CC-2-4-TH	Students will acquire the knowledge about the following:- 1. Stereochemistry-II 2. General Treatment of Reaction Mechanism III 3. Chemical Bonding-I and II 4. Radioactivity
ORGANIC INORGANIC	CEMA-CC-2-3-P CEMA-CC-2-4-P	Students will acquire the knowledge about the following:- 1. Organic Preparations 2. Iodo-/Iodimetric Titrations 3. Estimation of metal content in some selective samples

B.Sc 3rd SEMESTER		
SUBJECT	**PAPER**	**OBJECTIVES**
INORGANIC CHEMISTRY-3 ORGANIC CHEMISTRY-3	CEMA-CC-3-6-TH CEMA-CC-3-7-TH	In this course students can know about the following:- 1. Chemical periodicity, 2. Chemistry of s and p Block Elements 3. Noble Gases 4. Inorganic Polymers 5. Coordination Chemistry-I 6. Chemistry of Alkanes and Alkenes 7. Aromatic Substitution 8. Carbonyl and Related Compounds 9. Organometallics 10.
INORGANIC CHEMISTRY-3 ORGANIC CHEMISTRY-3	CEMA-CC-3-6-P CEMA-CC-3-7-P	Students can become familiar with the following topics:- 1. Complexometric titration 2. Chromatography of metal ions 3. Gravimetry 4. Identification of a Pure Organic Compound 5. Quantitative Estimations
PHYSICAL CHEMISTRY-2	CEMA-CC-3-5-TH	The students will develop more advanced level of idea about 1. Chemical Thermodynamics-I 2. Chemical Thermodynamics-II 3. Electrochemistry 4. Ionic Equilibrium

PHYSICAL CHEMISTRY-2	CEMA-CC-3-5-P	Students can get accustomed with the following topics:- 1. Conductometric titration of dibasic, monobasic acid against a strong base. 2. Study of Saponification reaction conductometrically. 3. Potentiometric titration of Mohr salt against standard K2Cr2O7 4. Determination of solubility product of AgCl potentiometrically. 5. Determination of ionization constant of weak acid conductometrically.
SKILL ENHANCEMENT COURSES : SEC-A	1.SEC 1 2. SEC 2	To explore and develop their skills on the following:- 1.Mathematics and Statistics for Chemicals 2. Analytical Clinical Biochemistry

B.Sc 4th SEMESTER		
SUBJECT	**PAPER**	**OBJECTIVES**
ORGANIC CHEMISTRY-4 INORGANIC CHEMISTRY-4	CEMA-CC-4-8-TH CEMA-CC-4-10-TH	The students will get accustomed with the following topic:- 1. Nitrogen Compounds 2. Rearrangements 3. The Logic of Organic Synthesis 4. Organic Spectroscopy 5. Coordination chemistry-II 6. Chemistry of d- and f- block elements i) transition element ii) Lanthanoids and Actinoids 7. Reaction Kinetics and Mechanism
ORGANIC CHEMISTRY-4 INORGANIC CHEMISTRY-4	CEMA-CC-4-8-P CEMA-CC-4-10-P	Students will understand the following: 1. Qualitative Analysis of Single Solid Organic Compounds 2. Inorganic preparations 3. Instrumental Techniques
PHYSICAL CHEMISTRY-3	CEMA-CC-4-9-TH	To impart the following ideas on: 1. Colligative Properties 2. Phase Equilibrium 3. Quantum Mechanics 4. Crystal Structure.
PHYSICAL CHEMISTRY-3	CEMA-CC-4-9-P	The students will be able to understand: 1. Kinetic Study of inversion of cane sugar by using digital polarimeter.

		2. Study of phase diagram of phenol-water system. 3. pH metric titration of mono, dibasic and tribasic acid against a strong base. 4. Determination of partition coefficient for distribution of iodine between water and CCl4. 5. Determination of pH of unknown buffer solution by color matching method.
SKILL ENHANCEMENT COURSES : SEC-B	1. SEC-3 2. SEC-4	To impart the knowledge of: 1. Pharmaceutical Chemistry 2. Pesticide Chemistry

B.Sc 5th SEMESTER		
SUBJECT	**PAPER**	**OBJECTIVES**
ORGANIC CHEMISTRY-5	CEMA-CC-5-12-TH	Students will be able to understand the mechanism of the following reactions and stereochemistry. 1. Carbocycles and Heterocycles 2. Cyclic Stereochemistry 3. Pericyclic Reactions 4. Carbohydrates 5. Biomolecules
ORGANIC CHEMISTRY-5	CEMA-CC-5-12-P	To impart the knowledge of separation techniques and characterization of organic molecules 1.Chromatographic Separations 2.Spectroscopic Analysis of Organic Compounds
PHYSICAL CHEMISTRY-4	CEMA-CC-5-11-TH	The students will get idea about 1. Quantum mechanics-II 2. Statistical Thermodynamics 3. Numerical Analysis
PHYSICAL CHEMISTRY-4	CEMA-CC-5-11-P	Students will increase their skill of computer programming through 1. Computer programming to find roots of equation 2. Computer programming on numerical differentiation. 3. Computer programming on numerical integration.

DISCIPLINE SPECIFIC ELECTIVE COURSES	1. DSE-A(DSEA-1 & DSEA-2) 2.DSE-B (DSEB-1 & DSEB-2	Discipline Specific Effective courses will helpful for students to gather knowledge about industrial importance of various chemicals. DSEA-1 and Practical –DSE-A-1: Molecular Modelling and Drug Design DSE-A-2 and Practical –DSE-A-2: Applications of Computers in Chemistry DSE-B-1 and Practical-DSE-B-1: Inorganic Materials of Industrial Importance DSE-B-2 and Practical-DSE-B-2: Novel Inorganic Solids

B.Sc 6th SEMESTER		
SUBJECT	**PAPER**	**OBJECTIVES**
INORGANIC CHEMISTRY-5	CEMA-CC-6-13-TH	Students will be able to understand the qualitative analysis and will get brief idea about different metallobiosites. 1. Theoretical Principles in Qualitative Analysis 2. Bioinorganic Chemistry 3. Organometallic Chemistry 4. Catalysis by Organometallic Compounds
INORGANIC CHEMISTRY-5	CEMA-CC-6-13-P	Students can get accustomed with the following topics:- Qualitative semimicro analysis of mixtures containing Cation Radicals, Anion Radicals, Insoluble Materials
PHYSICAL CHEMISTRY-5	CEMA-CC-6-14-TH	1. Molecular Spectroscopy 2. Photochemistry 3. Surface Phenomenon.
PHYSICAL CHEMISTRY-5	CEMA-CC-6-14-P	Students can get familiar with the following topics:- 1. Determination of surface tension of a liquid using Stalagmometer. 2. Determination of indicator constraint of an acid base indicator spectrophotometrically. 3. Verification of Beer and Lambert law

		4. Study of kinetics of $K_2S_2O_8$+KI reaction spectrophotometrically. 5. Determination of CMC of a micelle from surface tension measurement.
DISCIPLINE SPECIFIC ELECTIVE COURSES	1. DSE-A(DSEA-3& DSEA-4) 2.DSE-B (DSEB-3 & DSEB-4)	Students can apply their knowledge of this following topics in research and familiar with different laboratory technique. DSE-A-3: Green Chemistry and Chemistry of Natural Products PRACTICALS-DSE-A-3: Green Chemistry DSE-A-4: Analytical Methods in Chemistry PRACTICALS-DSE-A-4: Analytical Methods in Chemistry DSE-B-3 & PRACTICALS- DSE-B-3: Polymer Chemistry DSE-B-4: Dissertation

PROGRAMME OUTCOMES

- After completing three years of Bachelor Degree in Science (B.Sc) programme, students would gain a thorough conception in basic science in the field of Chemistry.
- They will gain systematic subject skills in the areas of Inorganic Chemistry, Organic Chemistry and Physical Chemistry.
- Students will also be able to recognise and handle different chemical Instruments required during their practical classes.
- The students will learn to handle and use chemicals in the laboratory.
- After completing the course it is expected that they will be able to show their efficiency to qualify different competitive exams like NET, SET, and GRE etc.
- This course opens the field of higher education and advance research in India as well as in Abroad for every student.

SUBJECT: CHEMISTRY (GENERAL ELECTIVE COURSE)(UNDER CBCS)

COURSE OUTCOMES

SEM	COURSE CODE [CEM-G]	PAPER	OBJECTIVES
1	CC1/GE1	PAPER 1 (Theory)	Students will get the knowledge about organic, inorganic and physic chemistry 1.Kinetic theory of gases and real gases 2. Liquids 3. Chemical kinetics Atomic structure 5. Chemical Periodicity 6. Acid and Bases 7. Fundamenta of Organic Chemistry 8. Stereochemistry 9. Nucleophilic substitution ar elimination reaction
		PAPER 1 (practical)	Students will get to know about the quantitative estimation of metal ions. 1.Estimationofsodiumcarbonateandsodiumhydrogencarbonatepresentinamixtur 2. EstimationofoxalicacidbytitratingitwithKMnO4. EstimationofwaterofcrystallizationinMohr'ssaltbytitratingwithKMnO4. 4. EstimationofFe(II)ionsbytitratingitwith$K_2Cr_2O_7$usinginternalindicator. EstimationofCu(II)ionsiodometricallyusing$Na_2S_2O_3$. 6. Estimatio ofFe(II)andFe(III)inagivenmixtureusing$K_2Cr_2O_7$solution.

2	CC2/GE2	PAPER 2 (theory)	To impart the knowledge of: 1.Chemical thermodynamics 2. Chemical equilibrium 3. Solutions 4. Pha equilibria 5. Solids 6. Aliphatic hydrocarbons 7. Error analysis and comput applications 8. Redox reactions Students will get the idea about kinetics of different chemical reaction
		PAPER 2 (practical)	1.Study of kinetics of acid-catalysed hydrolysis of methyl acetate 2. Studyofkineticsof decompositionofH_2O_2(Clock Reaction) 3. Studyofviscosityofunknownliquid(glycerol,sugar)withrespecttowater.4. Determination of solubility of sparingly soluble salt in water, in electrolyte with common ions and in neutral electrolyte (using common indicator) 5. Preparation of buffer solutions and find the pH of an unknown buffer solution bycolourmatching method 6. DeterminationofsurfacetensionofaliquidusingStalagmometer
3	CC3/GE3	PAPER 3 (Theory)	The students will develop more advanced level of idea about 1.ChemicalBondingandMolecularStructure 2. Comparativestudyof blockelements 3. TransitionElements(3*d*series) 4. CoordinationChemist 5.ELECTROCHEMISTRY(I.IonicEquilibria II.Conductan III.Electromotiveforce)6. AromaticHydrocarbons OrganometallicCompounds 8. ArylHalides The students will develop idea about acid radicals and basic radicals.
		PAPER 3 (PRACTICAL)	Qualitative semimicro analysis of mixtures containing two radicals. Emphasis should begivento theunderstanding of thechemistry ofdifferentreactions.

4	CC4/GE4	PAPER 4 (Theory)	Students will get brief idea about organic substances, inorganic spectroscop and quantum chemistry 1.Alcohols,PhenolsandEthers 2. CarbonylCompounds 3. CarboxylicAcidsandTheirDerivatives 4. AminesandDiazoniumSalts 5. AminoAcidsandCarbohydrates 6. CrystalFieldTheory 6. QuantumChemistry&Spectroscopy
		PAPER 4 (PRACTICAL)	Students will get idea about 1.QualitativeAnalysisofSingleSolidOrganicCompound(s) 2. Identificationofapureorganiccompound

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE)

Discipline Specific Effective courses will helpful for students to gather knowledge about industrial importance of various chemicals and understanding of different chemical techniques.

DSE-A(Any one either in semester V)

DSEA-1:NovelInorganicSolids

DSEA-2:InorganicMaterialsofIndustrialImportance

DSE-B (Any one either in semester VI)

DSEB-1 : Green Chemistry and Chemistry of Natural Products

DSEB-2:AnalyticalMethods in Chemistry

SKILLENHANCEMENTCOURSES[SEC]

Students will explore and develop their skills on the following: -

SEC(A): (Any one either in semester III or V)

SEC1- Basic Analytical Chemistry

SEC2–AnalyticalClinicalBiochemistry

SEC(B)(Anyoneeitherinsemester IVor VI)

SEC 3 – Pharmaceuticals Chemistry

SEC4 –PesticidesChemistry

PROGRAMME OUTCOME

- After completion of the general elective (GE) course in the area of Chemistry students will acquire depth knowledge about the subject.
- Practical works in laboratory will help them to become experts in the instrument handling as well as in chemical handling.
- It will also help the students to make them successful in any kind of competitive examination and to achieve a great success in their lives.

Department of Chemistry
Course Outcomes and Program Outcomes

COURSE OUTCOMES (UNDER CCF)

Four-YearB.A./B.Sc (Honours and Honours with Research) Courses of Studies (Under Curriculum & Credit framework, 2022)

Chemistry Course Structure
Four-year Chemistry Major Course Structure (Theory)

Semester	Paper Code	Paper Name	Brief Descriptions
I	CHEM-H-CC1-1	Fundamentals Of Chemistry-I	Extra nuclear structure of atoms and Periodicity, Basics of Organic Chemistry Bonding and Physical Properties, Stereochemistry – I, Thermodynamics –I, Chemical Kinetics-I.
	CHEM-H-SEC1-1Th	Quantitative Analysis and Basic Laboratory Practices	Introduction to Quantitative analysis and its interdisciplinary nature, Titrimetric analysis etc. , Water analysis, Basic laboratory practices.
II	CHEM-H-CC2-2Th	Fundamentals Of Chemistry-II	Kinetic Theory and Gaseous state, Chemical Bonding – I , Theoretical principles of inorganic qualitative analysis , Stereochemistry – II, General Treatment of Reaction Mechanism-I
	CHEM-H-SEC2-2Th	AI for Everyone	Introduction to Artificial Intelligence, Subfields and technologies, Applications of AI.

Summer Internship: All the students are required to do one 3 credits Summer Internship at the end of the 2nd or 4th or 6th semester. Students completing Internship at the end of the 2nd semester will be allowed to take exit from the course and will be awarded Certificate of 45 credits. Students completing Internship at the end of the 4th semester will be allowed to take exit from the course and will be awarded Diploma of 88 credits. Students completing Internship at the end of the 6th semester will be allowed to take exit from the course and will be awarded three-year Single major Degree of 132 credits [Following the Notification No. CSR/05/2023, dated 23rd June, 2023 of University of Calcutta].

Four-year Chemistry Major Course Structure (Practical / Tutorial)

Semester	Paper Code	Paper Name	Brief Descriptions
1	CHEM-H-CC1-1-P	Fundamentals Of Chemistry-I	Acid-Base Titration, OxidationReduction Titrimetry.
	CHEM-H-SEC1-1-Tu	Quantitative Analysis and Basic Laboratory Practices	Tutorial
2	CHEM-H-CC2-2-P	Fundamentals Of Chemistry-II	Qualitative semimicro analysis of mixtures containing three radicals

CHEMISTRY MINOR COURSE STRUCTURE (Theory)

Semester	Paper Code	Paper Name	Brief Descriptions
I orIII	CHEM-H-CC1-1-Th Or CHEM-H-CC1-3-Th	Chemistry MINOR-I	Extra nuclear structure of atoms and Periodicity, Basics of Organic Chemistry Bonding and Physical Properties, Stereochemistry – I, Thermodynamics –I, Chemical Kinetics-I.
II or IV	CHEM-H-CC2-2-Th Or CHEM-H-CC2-4-Th	Chemistry MINOR-II	Kinetic Theory and Gaseous state, Chemical Bonding – I , Theoretical principles of inorganic qualitative analysis , Stereochemistry – II, General Treatment of Reaction Mechanism-I

CHEMISTRY MINOR COURSE STRUCTURE (Practical)

Semester	Paper code	Paper name	Brief Description
1or 3	CHEM-H-CC1-1-P Or CHEM-H-CC1-3-P	Chemistry MINOR-I	Acid-Base Titration, Oxidation-Reduction Titrimetry
2 or 4	CHEM-H-CC2-2-P Or CHEM-H-CC2-4-P	Chemistry MINOR-II	Qualitative semimicro analysis of mixtures containing three radicals

Interdisciplinary Course Structure in Chemistry

Semester	Paper Code	Paper Name	Brief Descriptions
1	CHEM-H-IDC1-1-Th	Quantitative Analysis and Basic Laboratory Practices	Introduction to Quantitative analysis and its interdisciplinary nature, Titrimetric analysis etc. , Water analysis, Basic laboratory practices.
2	CHEM-H-IDC2-2-Th	Quantitative Analysis and Basic Laboratory Practices	Introduction to Quantitative analysis and its interdisciplinary nature, Titrimetric analysis etc. , Water analysis, Basic laboratory practices.

THREE-YEAR B.A./B.Sc (Multidisciplinary Courses of Studies, under Curriculum & Credit framework, 2022)

Chemistry Course Structure (CC1 & CC2) For Three-year MULTIDISCIPLINARY Studies (Theory)

Semester	Paper code	Paper name	Brief Description
I	CHEM-MD-CC1-1-Th	Chemistry MDC- I	Extra nuclear structure of atoms and Periodicity, Basics of Organic Chemistry Bonding and Physical Properties , Stereochemistry – I, Thermodynamics I, Chemical Kinetics-I.
II	CHEM-MD-CC2-2-Th	Chemistry MDC- II	Kinetic Theory and Gaseous state, Chemical Bonding – I , Theoretical principles of inorganic qualitative analysis , Stereochemistry – II, General Treatment of Reaction Mechanism-I

Chemistry Course Structure (CC1 & CC2) For Three-year MULTIDISCIPLINARY Studies (Practical)

Semester	Paper code	Paper name	Brief Description
1	CHEM-MD-CC1-1-P	Chemistry MDC- I	Acid-Base Titration,

			OxidationReduction Titrimetry.
2	**CHEM-MD-CC2-2-P**	**Chemistry MDC- II**	**Qualitative semimicro analysis of mixtures containing three radicals**

SKILL ENHANCEMENT COURSE CHEMISTRY (SEMESTER I & II)
PAPER CODE :CHEM-MD-SEC-Th
PAPER NAME: CHEMISTRY IN DAILY LIFE

Interdisciplinary Course in Chemistry(SEMESTER I & II)
PAPER: CHEM-MD-IDC-Th
PAPER NAME: CHEMISTRY IN DAILY LIFE

PROGRAMME OUTCOME

- After completion of thecourses in the area of Chemistry students will acquire depth knowledge about the subject.
- Practical works in laboratory will help them to become experts in the instrument handling as well as in chemical handling.
- It will also help the students to make them successful in any kind of competitive examination and to achieve a great success in their lives.
- Introduction of Artificial intelligence(AI) in education can improve the learning experience for students and increase their ability to provide personalized learning experiences through data-driven insights.

- Introduction of Internship in the CCF course helps the students to increase their ability to apply theoretical knowledge in real-world situations, build professional networks, and improve employability. It also helps to give insights into various career paths, helping students make informed decisions about their futures.

Department of Commerce
Course Outcomes and Program Outcomes
2023-24

COURSE OUTCOMES

B.COM SEM I CCF

SUBJECT	Course	OBJECTIVES
FINANCIAL ACCOUNTING 1	**Major**	1. Recapitulation of various accounting concepts and deepening the fundamental understanding about accounting. 2. To instil the knowledge about accounting rules, procedures, methods and techniques, that builds the foundation for this course as well as related professional courses like CA, CMA, CS.
PRINCIPLES OF MANAGEMENT	**Minor**	1. Providing introductory idea about the concept of business management. 2. To create an understanding about various functions and importance of management.
ENTREPRENEURSHIP DEVELOPMENT	**SEC**	1. To orient the learner towards entrepreneurship as a career option. 2. Inculcate creative thinking and behaviour for effectiveness in work and life.

B.COM SEM II CCF

SUBJECT	Course	OBJECTIVES
COST AND MANAGEMENT ACCOUNTING 1	**Major**	1. To impart the knowledge of the fundamental concepts of cost. 2. To provide an understanding of various methods and techniques of costing and their applications.
MARKETING MANAGEMENT AND HUMAN RESOURCE MANAGEMENT	**Minor**	1. To explain how marketing creates value for the consumer, the company and the society andwhy the customer is the focal point of marketing. 2. To help acquire a clear understanding of the marketing concept 3. To help the students understand the human resource functions in an organization. 4. To help them realise the intricacy of human management, the most complex and important

		resource of a company, as well as nation.
INFORMATION TECHNOLOGY AND ITS APPLICATION IN BUSINESS	**SEC**	1. To help students understand how technology can be used to make a business more effectively 2. To make them aware about the basic computer applications like Microsoft Office 3. To provide an understanding of various methods and techniques of interpreting data into information.

B.COM SEMESTER III (CBCS)

SUBJECT	PAPER	OBJECTIVES
INFORMATION TECHNOLOGY & ITS APPLICATION IN BUSINESS	**SEC 3.1 CHG**	1. To understand the impact of information technology on business 2. To make them aware about the basic computer applications like Microsoft Office 3. To provide an understanding of various methods and techniques of interpreting data into information.
FINANCIAL ACCOUNTING II	**CC 3.1 CH & CC 3.1 CG**	1. To understanding of the advanced mechanisms of have a comprehensive accounting. 2. To acquire the knowledge of specialised accounting areas.
INDIAN FINANCIAL SYSTEM	**CC 3.2 CH**	1. To make the students familiar with the financial system, financial markets and different financial institutions 2. To understand the role of SEBI, judiciary and the media regarding the protection of Investors.

B.COM SEMESTER IV (CBCS)

SUBJECT	PAPER	OBJECTIVES
ENTREPRENEURSHIP DEVELOPMENT AND BUSINESS ETHICS	**CC 4.1 CHG**	1. To orient the learner towards entrepreneurship as a career option. 2. Inculcate creative thinking and behaviour for effectiveness in work and life. 3. To emphasise that 'Business Ethics' is not an oxymoron.
TAXATION I	**CC4.1 CH**	1. To provide basic knowledge about direct tax

	& CC4.1 CG	under provisions of the Income Tax Act, 1961.
COST AND MANAGEMENT ACCOUNTING II	**CC4.1 CH & CC4.1 CG**	1. To learn about the higher application of cost accounting techniques and methods. 2. To know the application of cost control techniques. 3. To be able to ascertain, control and reduce costs in a business enterprise.

B.COM SEMESTER V (CBCS)

SUBJECT	PAPER	OBJECTIVES
AUDITING AND ASSURANCE	**CC 5.1 CH & CC 5.1 CG**	1. To provide basic knowledge of auditing principles, procedures and techniques in accordance with current legal requirements and professional standards.
TAXATION II	**CC 5.2 CH & DSE 5.1A**	1. To learn to compute Total Income and to gain knowledge of Tax Management. 2. To understand the provisions of Goods & Services Tax (Indirect Tax).
CORPORATE ACCOUNTING	**DSE 5.2A**	1. To teach the procedures of issue, Redemption and Buy Back of Equity shares, Preference shares, Debentures and other Corporate Accounting issues that are rudimentary in the CA, CMA, CS courses. 2. To know the methods of valuation of goodwill and share. 3. To acquaint the students with the amalgamation and reconstruction procedures of Companies as well as the preparation of Company Final Accounts.
CONSUMER BEHAVIOUR AND SALES MANAGEMENT	**DSE 5.1 M**	1. To study the behavioural changes of consumer in the perspective of change in socio-economy pattern. 2. This paper helps to study the contributory role of sales in the perspective of globalized economy.
PRODUCT AND PRICING MANAGEMENT AND MARKETING COMMUNICATION	**DSE 5.2 M**	1. To study the role of product development and it's pricing in the overall performance of marketing. 2. To help how the communication can be made with the customer regarding marketing activities.

B.COM SEMESTER VI (CBCS)

SUBJECT	PAPER	OBJECTIVES
COMPUTERISED ACCOUNTINGAND E- FILING OF TAX RETURNS	**SEC 6.1 CHG**	1. To enable the students to develop skills for Computerized Accounting, the need of the hour. 2. To enable the students to prepare and submit the Income Tax Return (ITR) offline/online for individual taxpayer.
PROJECT WORK	**CC 6.1 CH**	1. This paper helps the students to understand the research techniques, sampling etc used in business research. It prepares them for more advanced academic research in masters and post-masters level. 2. It also suggests techniques to prepare project reports for various functional needs of a business.
FINANCIAL REPORTING AND FINANCIAL STATEMENT ANALYSIS	**DSE 6.1 A**	1. This paper helps to read a financial statement to analyse and interpret corporate performance. 2. To explain how such quantitative measures of corporate performance are used to assess credit worthiness of a business. 3. To prepare consolidated balance sheet of a Holding Company.
FINANCIAL MANAGEMENT	**DSE 6.2 A**	1. In this paper the students acquire the knowledge to manage the finance and financial requirements in business. 2. To provide guidance in taking decisions pertaining to financing, investing and dividend payment of a corporate entity.
RETAIL MANAGEMENT AND MARKETING SERVICES	**DSE 6.1 M**	1. To study contribution of retailing in national economy. 2. To study the increasing contribution of service sector in economy.
RURAL MARKETING AND INTERNATIONAL MARKETING	**DSE 6.2 M**	1. This paper helps to study gradual growth of rural marketing as compared to urban marketing. 2. This paper helps to study and explain the relevance of international marketing in the perspective of globalised economy.

PROGRAMME OUTCOMES

After completing three years of Bachelor in Commerce (B.Com) programme, students enriched their knowledge in the field of Commerce and Finance.By the end of the programme students gain in-depth knowledge on core subject like accounting, law, statistics, finance, different types of marketing just to name a few.The base work to prove proficiency in competitive exams like CA, CS,CMA and other

courses is also achieved by the advanced learners of this course. The main benefits of the course study are with regards to the career. They can find career opportunities to different sectors especially in banking, industrial houses, inventory control, retailing, marketing and many other commercial fields. B.Com. degree is structure to provide the students managerial skill in discipline related to commerce. The student acquires adequate knowledge of adapting to the changes in the flexible business world. On the other hand they can choose to start their own business.

DEPARTMENT OF COMPUTER SCIENCE

SUBJECT	PAPER	OBJECTIVES	PROGRAM OUTCOMES
Computer fundamentals & Digital Logic	**Computer Science CC1 (CCF)**	To be able to understand Computer Fundamentals, Number System, Boolean Algebra, Combinational and Sequential circuits in detail. Also, Integrated circuits are taught (qualitative study only).	A Student with a B.Sc (H). in Computer Science after completion of the course will have the ability to demonstrate mastery of Computer Science in the core knowledge areas of Computer fundamentals & Digital Logic.
COURSE OUTCOMES	**YEAR: 2023-24**		
STUDENT NAME	**INDIRECT OUTCOME (%) (UNIVERSITY EXAMINATION)**		
Ajaitri Kar	70		
Nitish Kumar Prasad	54		
Pramodh Lal	28		
Rongon Pal	31		
Samparna Das	27		
Ashis Das	31		
Samadrita Dey	24		
Abhranil Mondal	36		
Suparna Baidya	36		

SUBJECT	PAPER	OBJECTIVES	PROGRAM OUTCOMES
Operating System	CMS-A-CC-3-7-TH	1. To impart the knowledge about different types of operating systems 2. To know about different functions of operating systems and to understand the configuration of different operating systems through case studies.	A Student with a B.Sc (H). in Computer Science after completion of the course will have the ability to demonstrate mastery of Computer Science in the core knowledge areas of Operating System.
Course OUtcome	Year: 2023-24		
Student Name	Direct Outcome % (Internal Assessment)	Indirect Outcome % (University Examination)	
Niladri Paul	95	72	
Suchitra Sarkar	85	38	
Chandan Paul	75	12	

SUBJECT	PAPER	OBJECTIVES	PROGRAM OUTCOMES
Data communication, Networking and Internet technology	**CMS-A-CC-4-8-TH**	1. 1. To develop an understanding of modern network architectures from a design and performance perspective. 2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs). 3. To provide an opportunity to do network programming.	A Student with a B.Sc (H). in Computer Science after completion of the course will have the ability to demonstrate mastery of Computer Science in the core knowledge areas of Data communication, Networking and Internet technology
COURSE OUTCOME	**YEAR: 2023-24**		
Student Name	Direct Outcome (Internal Assessment)	Indirect Outcome (University Examination)	
Niladri Paul	100	94	
Suchitra Sarkar	95	62	
Chandan Paul	85	42	

Department of Economics

Major-Minor-MDC(CCF)

Course Outcomes

2023-24

Subject	Semester/Paper	Objectives
Microeconomics (I)	**Sem 1** **DSCC1/MN1/CC1**	➢ To introduce the central idea of microeconomic analysis and decision-making. ➢ To familiarize students with the reality at the micro or individual level.
Introductory Statistics and Application (I)	**Sem 1** **SEC-1 (ECOM)**	➢ To inspire knowledge across different area in Statics and Actual Science. ➢ Understand the basic knowledge on data collection and various statistical elementary tools.
Economic Data Analysis and Report Writing	**Sem1** **SEC-1 (MECO-SEC)**	➢ It aims to equip students with the ability to collect, clean, analyse and interpret economic data using statistical methods ➢ It allows them to identify patterns and understand economic relationship and also draw meaningful conclusion to inform policy decisions on business strategies.
Elementary Economics	**Sem 1/Sem2/Sem3** **IDC-1**	➢ To understand the basic concept of economics, including how market organizes economic activity.
Macroeconomics (1)	**Sem 2** **DSCC-2/MN2/CC2**	➢ To understand the basic concepts of national income, savings, investment, balance of payment etc.
Introductory Statistics and Application (II)	**Sem 2** **SEC-2 (ECOM)**	➢ To inculcate research atmosphere among students by assigning projects.
Economic Data Analysis and Report Writing	**Sem2** **SEC-2 (MECO-SEC)**	➢ It aims to equip students with the ability to collect, clean, analyse and interpret economic data using statistical methods ➢ It allows them to identify patterns and understand economic relationship and also draw meaningful conclusion to inform policy decisions on business strategies.

Programme Outcomes

After completion of this course students will be able to

- Understand economic terms, methodologies, tools and analytical processes.
- Understand different economic theories and their applicability.
- Develop analytical skill to analyse different policies and able to pursue basic research work.
- Develop an awareness of various Career options and the choice for higher studies.
- Build up a Professional career as economists, teachers, researchers, financial advisors, economic planners, policy makers, business administrators, entrepreneurs etc.

COURSE DESCRIPTION OF ELECTRONICS GENERAL (ELTG)

(UNDER CBCS)

Paper	Course Description		Topic	Objective
1ST SEMESTER				
CC-1A	Core Course-1	Theory	Network Analysis and Analog Electronics	To acquaint students about different simple to medium complex analog electronic components and devices, their working principles along with advantages and disadvantages.
	Core Course-1	Practical	Network Analysis and Analog Electronics Lab	To develop skill among the students for preparing few simple to moderately complex circuits in their own hands by using those analog components and devices to visualize the proper functioning of them and also to identify any defect for preparing those circuits.
2nd SEMESTER				
CC-1B	Core Course-4	Theory	Linear and Digital Integrated Circuits	To familiar students about digital signals, Boolean Algebra, Boolean logic, different digital components and circuits and their operations, working principles etc.
	Core Course-4	Practical	Linear and Digital Integrated Circuits Lab	To develop proficiency between the students so that they can build different logical and other simple to complex digital circuits by using different digital components and IC chips as well as they can detect any fault while preparing those circuits
3rd SEMESTER				
CC-1C	Core Course-7	Theory	Communication Electronics	To aware students regarding both Analog and Digital Communication principles and techniques which are now used in different communication methods and also to familiar them about different digital and analog circuits used for preparing those systems.
	Core Course-7	Practical	Communication Electronics Lab	To visualize the nature, composition and noises of the communicated or modulated signals in both analog and digital modes of communication, to get familiar with different demodulation techniques and also to make the students accustomed to operate those systems.

Paper	Course Description		Topic	Objective
SEC –A-1	Skill Enhancement Course A1		Computational Physics	To improve computational skill among students so that they can be able to do educational or research projects by developing their own programmes with high level programming language and to express their findings with the help of scientific word processing software like LATEX and also to visualize the computational data with graphical analyzing software like GNUPlot.
SEC-A-2	Skill Enhancement Course A2		Renewable Energy and Energy Harvesting	To develop idea among the students about different kinds of renewable energy sources, their origins and how they can be collected from different natural sources or natural phenomenon and to enhance their skill regarding the techniques or instruments require for those purposes.
4th SEMESTER				
CC-1D	Core Course-10	Theory	Microprocessor and Microcontroller	To give students a clear view about the architecture and working principle of 8085 Microprocessor and 8051 Microcontroller so that they can be familiar with its operation and hence to do different programs with help of them to acquire a complete knowledge about its memory allocation, interrupts and interfacing.
	Core Course-10	Practical	Microprocessor and Microcontroller Lab	To develop a programming skill of low level programming language among the students so that they can be able to develop programs by using dynamic memory allocation, different interrupts and interfacing between PC or other devices.
SEC –B-1	Skill Enhancement Course B1		Electrical Circuits and Network Skills	In the core course students may acquire their knowledge about different electrical components and circuits required in different networks but in this SEC they can enhance their skill and acquaintance about the operations and working principles of those apparatuses as well as technical knowhow about electrical wiring.

SEC-B-2	Skill Enhancement Course B2		Technical Drawing	In previous syllabus there was no option for the general science stream students to know about technical drawing which is compulsory for engineering students. In this SEC option they can have an idea about technical drawings using different instruments and software like Auto CAD.
5th SEMESTER				
DSE-A-1	Discipline Specific Elective-1	Theory	DSE-A-1 Semiconductor Devices Fabrication	In core course, students can be familiar with operations and uses of different semiconductor devices but in this DSE they can know about different fabrication techniques which are used to prepare those semiconductor and memory devices and also they can be familiarized with Very Large Scale Integration (VLSI) processing and Micro Electromechanical Systems or MEMs devices.
	Discipline Specific Elective-1	Practical	DSE-A -1 Lab Semiconductor Devices Fabrication lab	To give practical experience to the students to operate few instruments required to develop or simulate small portion of such devices like p-n junction, thin film, ceramic etc. and to study their operations practically.
DSE-A-2	Discipline Specific Elective-1	Theory	DSE-A-2 Photonic Devices and Power Electronics	In this DSE students can have option to study about more advanced electronic devices like photodetectors, optoelectronic devices, power electronic devices like thyristors, SCR etc.
	Discipline Specific Elective-1	Practical	DSE-A -2 Lab Photonic Devices and Power Electronics lab	In different assignments students can study the operations of those devices.
6th SEMESTER				
DSE-B-1	Discipline Specific Elective-4	Theory	DSE-B-1 Electronic Instrumentation	In this DSE students can be acquaint with operations and functions of different electronic instruments which are used in different measurement like CRO, Signal Generator, Data acquisition systems including various biomedical instruments and measurements.

	Discipline Specific Elective-4	Practical	DSE-B-1Lab Electronic Instrumentation lab	In this course students can get hand on experience to operate different instruments and sensors for measurement of different kind of signals including biomedical, light and heat.
DSE-B-2	Discipline Specific Elective-4	Theory	DSE-B-2 Transmission line, Antenna and Radio wave Propagation	Student may opt this DSE to do more advance level of study regarding communication process and principles to know how the signal can transfer or propagate through different medium or how they can be received in different radio stations etc.
	Discipline Specific Elective-4	Practical	DSE-B-2 Lab Transmission line, Antenna and Radio wave Propagation lab	In this paper students may implement or simulate different aspects of waveguides, transmission lines or antenna theory.

PROGRAMME OUTCOME

After completion of this 3 years B.Sc. General Course students can have a thorough knowledge about different branches of Electronics including practical skill to develop and testing different hardware as well as software tools for implementation of different components or devices. Students can serve as technician in different Space or defense laboratories or in any R&D wings of manufacturing companies. They can also setup their own business to manufacture different electronics components and instruments. As graduate students they can also appear in different government service entrance examinations like IAS, WBCS, IPS, IRS etc. They can also join in school service. If anyone want to do higher study then they can join any professional courses like MBA,MCA, PGDM, PGDCM or any other technical courses like Mobile App Development, Machine Learning, Cloud Security, VLSI designing, circuit designing etc. offered by different technical institutes in India and abroad.

DEPARTMENT OF ENGLISH

Course Outcome (CBCS)

The English Honours course gives students the opportunity to obtain an in-depth knowledge of the History of British literature from the beginning to the latest times. Along with this, students get to study extensively British poetry, prose and drama. Literature outside Britain, such as American literature, African literature and Indian Writing in English are also studied by students. Texts in translation from Latin America and India also are taught.

Programme Outcome (CBCS) :-

The programme empowers students to be well-versed in both spoken and written English. The system of tutorials brings about continuous evaluation. Students are prepared to shine in myriad professions where knowledge of English is a necessity. SEC papers teach about writing minutes of meetings, sending emails etc which are necessary features of secretaryship.

English :-

Course Outcome (CCF)

The CCF course has been implemented only in 2 complete semesters with the third semester running. English Honours course gives students the opportunity to obtain an in-depth knowledge of the History of British literature from the beginning to the latest times. Along with this, students get to study extensively British poetry, prose and drama through canonical texts in the first, second and third semesters respectively. American literature is also there in Semester 3. Additional courses like IDC, CVAC and AEC empower students to be knowledgeable in subjects and areas apart from English literature.

Programme Outcome (CCF) :-

The programme empowers students to be well-versed in both spoken and written English. The system of tutorials brings about continuous evaluation. Students are prepared to shine in myriad professions where knowledge of English is a necessity. They also have knowledge of hitherto unknown but useful subjects like Indian Knowledge System, Constitution and Library Science. SEC papers teach about writing minutes of meetings, sending emails etc which are necessary features of secretaryship

Subject : GEOGRAPHY

Programme Outcome:

Geography is the study of the relationship between humans and their surroundings. The physical characteristics of the Earth's surface and the various human societies that inhabit it are of interest to geographers. They also look at how the natural environment and human culture interact, as well as how humans can be affected by those areas. The study of geography aims to comprehend the locations of objects, their causes, and their evolution and change across time.

Choice Based Credit System (CBCS):

The undergraduate geography curriculum is now reframed as a choice-based credit system, mostly based on the model syllabus created by the West Bengal State Council of Higher Education, in accordance with recent directions from the University Grants Commission. This new curriculum's primary goal is to provide students with a comprehensive understanding of the discipline by giving equal weight to geography's fundamental ideas and methods. The two primary branches of geography—physical and human—are given equal weight in the syllabus. The syllabus's main objective is to help students land a job at the conclusion of their undergraduate studies. Particularly in the honors level, sufficient attention is given to applied parts of geography, such as new mapping techniques and field-based data gathering, in keeping with this and the evolving character of the topic. The curriculum places a strong emphasis on developing the fundamentals of the subject so that no one has to pursue further education in pursuit of a job or professional engagement.

RESULTS OF LEARNING: The goal of this curriculum is to teach undergraduates the fundamentals of geography as a spatial science and prepare them for careers in mapping, surveying, development and planning, and geospatial analysis.

Curriculum & Credit Framework for Undergraduate Courses in Geography under National Education Policy of 2020

To help students become familiar with identifying and analyzing different aspects of geography and geographical processes and phenomena. To enhance students' ability to learn the fundamentals of conducting fieldwork. To assist pupils in learning how to create maps. To assist students in learning the art and science of data collection, processing, and interpretation. To introduce the students to the latest technologies in GIS science, GNSS, remote sensing, and geographic information systems (GIS).

RESULTS OF LEARNING:

The goal of this curriculum is to teach undergraduates the fundamentals of geography as a spatial science and prepare them for careers in mapping, surveying, development and planning, and geospatial analysis.

Skill-Based Outcome: Students are gaining practical experience in applied geography through two SEC papers, such as Computer Basics—Computer Applications and Field Work. Additionally, they gather waypoints using GPS equipment, which are then used to precisely map any location.

MDC: Students can learn about and get an understanding of physical geography topics, procedures, and techniques. This course may spark students' interest in geography. Students can become acquainted with the fundamental ideas, language, and concepts of geography.

Learning Outcomes: Students may use their understanding of physical geography concepts to explain the origins and effects of natural hazards and offer solutions for sustainable development. In order to reflect on topics pertaining to nature, they will use their understanding and analysis of physical settings.

Professional Skill Development: The knowledge gained will help with future geography coursework. This acquired knowledge will undoubtedly give the students the fundamentals of skill development that will position them for success in the workplace in the near future.

The primary objective of geomatics and spatial analysis is to give students the information and abilities they need to apprehend the map-making process and familiarize them with the latest technological advancements in map making.

● The students will be able to read and coordinate different sheets for mosaic creation, as well as apply the methods and concepts of map making and designing for map creation.

● The pupils will be able to form an understanding of various thematic mapping approaches. They will gain knowledge about the principles of remote sensing, sensor resolutions, and image referencing schemes. They will also learn how to use various surveying instruments, such as the Dumpy level, Total station, GPS, and Theodolite, and interact directly with the environment.

It will assist with understanding how to create false color composites from satellite imagery and how to interpret it.
There will be instruction on how to use the Geographic Information System (GIS) software to develop modern mapping abilities.

In order to comprehend topographical and cultural differences on the Earth's surface, it will learn to analyze and interpret remotely sensed satellite images and aerial photographs.

Geography (Major) Skill Enhancement Course (SEC) Code: GEOG 1051: COMPUTER BASICS AND COMPUTER APPLICATIONS

In addition to monitoring desertification, flooding, drought, and changes in landforms, remote sensing techniques have become a useful tool for the systematic survey, analysis, and improved management of natural resources (land, soil, water, forests, and mountains).

● Satellite remote sensors can be important sources of data on the effects of human behavior within the biosphere, allowing the establishment of the spatial scale and extent of the direct interaction of humans with the global land cover.

● Remote sensing is also helpful in oceanography, tracking ocean circulation, temperature, and wave heights to better understand ocean resources.

● Remote sensing aids in the acquisition of information about the Earth.

● It is crucial for hazard assessment, land degradation monitoring, and conservation.

Department of Philosophy
(General Course)
Course Outcomes and Programme outcome

COURSE CODE & SUBJECT	OUTCOME OF THE COURSE
SEMESTER I	
PHIG CC1 Indian epistemology and Metaphysics Carvaka, Nyaya, Vaisesika and Advaita Vedanta.	The course is designed to provide complete knowledge of Indian concept of knowledge- a discussion on its origin, multidimensional usage or application definitely enriches students of philosophy. While going through the different Systems of ancient Indian philosophy they can get in touch with atleast some of the invaluable treasures of ancient India.
SEMESTER II	
PHIG CC2 Western Epistemology and Metaphysics. Outcome of the course	Students will get acquainted with the Western concept of the origin of knowledge depicted in the views of eminent Western philosophers like Locke, Berkeley, Hume, Descartes, Spinoza and Leibnitz. CC1 and CC2 clubbed together is an attempt to provide the students of philosophy with a comprehensive view of knowledge. The inclusion of these courses is a humble attempt to satisfy the inquisitive human mind's insatiable thirst for knowledge to a great extent.
SEMESTER III	
PHIG CC3 Western Logic	It starts with the basic distinction between a sentence and a proposition and with a view to build up a strong sense of reasoning; it gradually makes the students familiar with topics like categorical syllogism, Venn diagram method of testing validity, construction of truth-tables for testing the validity of arguments and statement forms. This course helps the students improve their logical skill which

	in turn will help them a lot while appearing in different competitive exams like UPSC, WBCS, etc.
SEMESTER IV	
PHIG CC4 Philosophy of Mind	Though Psychology itself has been treated as an independent subject yet the inclusion of Psychology or Philosophy of Mind in the course gives the students of philosophy a basic knowledge of human mind. Human mind is the locus of sensation, perception, consciousness, memory, etc. Knowledge of the human mind given in a nutshell will definitely create inquisitiveness among the students to explore more about it. So they can pursue further studies on Psychology and become professional psychologists or counselors in the near future.
SEMESTER V	
PHIG - DSE A Ethics - Indian and Western	From ancient Carvaka and Buddhist ethics, Hedonistic theories of Bentham and Mill, Kant's Moral Theory to Modern theories of Punishment - the domain of ethics has been unfolded to the students keeping in view, making them aware of what to do (good or right) or what not to do (bad or wrong) . In other words, this course intends to develop strong sense of moral values among the students.
SEMESTER V	
PHIG - DSE Applied ethics and philosophy of Religion DSE - A – Course - DSE - B – Course -	This course is mainly designed to impart the knowledge concerned with Ethical Theories. The students will learn and understand to deals with the practical application of these theories. Arguments for the existence of God have also been taken into consideration in this course. Not only belief in God but the other side of the coin i.e. disbelief in God, too, has been discussed in the Sociological theory of Durkheim, Freudian theory and Carvaka theory. Students can put forward their own ideas about the topic and have much scope to express them in this area.

	So this course is really thought provoking and contributes a lot to improve the ability of critical thinking of the students in the long run.
PHIG - SEC - A Course Skill Enhancement Elective	Students will be able to understand the Logical reasoning and application- logical reasoning and its application, both from Indian and Western perspective which has been effectively covered in this course. This course will undoubtedly enhance the skill of rational thinking.
PHIG - SEC – B Course Man and Environment	We are aware that our environment is getting polluted everyday. The food we eat, the air we breathe everything is full of pollutants which damages the sanctity of mother earth. Here the damaging factor is none other than human beings who are not concerned about the fact that if we go on destroying greenery, pollute the water of rivers, etc. then ecological balance would be in danger and the Earth would not be worth living for generations to come. But if we through the Upanisadic world view or Tagore's understand of nature, it becomes clear to us that from time immemorial Nature or Environment has been looked upon with awe. Different theses regarding the importance of Man in relation to Nature as well as the importance of Nature in itself or in other words, the intrinsic value of Nature- all this have been explained elaborately with a view to make the students attribute some value to Nature not only for their own interest but for the sake of Nature as well.

Programme Outcome

1. The general group students cannot have admission to regular post graduate classes but they may pursue advance courses in different open universities for their post graduate studies.
2. They will have further scope to sit for state and central sponsored examinations.
3. Students can appear in state level civil service examinations, students have a good chance to compete for such examinations.
4. Moreover, this course will also help them for school teaching from primary level to secondary stage.
5. They can go for journalism, can be an author to a book or work in a publishing house, write articles in newspapers and magazines.
6. They can be part of various organizations where the skill of communication, group discussions and various ideas related to the topics covered in this course may be discussed.
7. They can become motivational speakers and counselors.

Department of Political Science

Course Outcomes and Programme Outcomes

Course Outcomes:

(Honours course)

CC-1: Understanding Political Theory: Concept.

CC-2: Understanding Political Theory: Approaches and Debates.

In these two papers students are enriched about the base of politics. Here they are analysed about the major concepts, approaches, debates regarding political theory. Basically the key concepts of political theory is the main focus and various approaches and debates are discussed here like state, sovereignty, power ,authority, law, liberty, equality etc. and normative, empirical, marxian approach etc. are also discussed.

CC-3: Constitutional Government in India.

CC-4: Politics in India : Structure and Processes.

In these two papers it is mainly discussed about the constitution of India and the political system in India. Here it is critically analysed about the the constitutional forms and structure and their efficiency which started from the Constituent Assembly. In the one hand it is discussed the Executive, Legislature, Judiciary system in India on the other hand party system, electoral process,various social movement in India etc.

** This knowledge helps the students to get the administrative job under the Govt. of West Bengal as well as under the Govt. of India after qualifying the the competitive examination like IAS, IFS, Staff Selection, WBCS, Miscellaneous etc.

CC-5: Indian Political Thought-I

CC-8: Indian Political Thought-II

In these two papers the political thought of India is discussed in detailed from ancient period to pre-independence period. Here it is mainly focussed on kautilya (ancient period) , Barani, Abul Fazal (mediaval period) and Rammohan Roy, Bankim Chandra Chattapadhya, Vivekananda(modern perid). Besides M.N. Roy, Narendra Dev, Rammonohar Lohia, Jayprakash Narayan, Sayed Ahamed Khan, Iqbql , Neheru, Savarkar, Jinnah, Jyotiba Phule, Ambedkar, Pandit Ramabi etc. are also discussed here which will enrich the students'thinking about the Indian political thought.

CC-6: Comparative Government and politics.

In this paper it is comparatively analysed among U.K, U.S.A, P.R.C, Franch, Russia and Bangladesh regarding government and political scenario. Besides rights of the citizen of U.K, U.S.A, and P.R.C are also analysed which helps the students to know the internal political situation of these states.

CC-7: Perspective of the International Relations.

CC-9: Global Politics since 1945.

In these two papers International politics is discussed. Here the major theories of Internatinal Relations as Realism, Depedency, World System Theory are discussed and emergent issues are also discussed. Indian foreign policy and relation with PRC and USA are analysed. Besides Cold war, Regionalism, some Regional organization as ASEAN,OPEC, SAFTA, SAARC, BRICS, are discussed, India and her neighbours and UNO in detailed are explained here also.

** With this knowledge students can work under the External Affairs Department of India as an International Relations Expert,and as a Reporter of news paper.

CC-10; Western Political Thought and Theory-I

CC-11: Western Political Thought and Theory-II

In these two papers western political thought is taught, basically focussed on Greek political thought, Roman political thought, Thought of Machiavelly, Bodin, Hobbes, Locke, Rousseau are discussed. Besides Bentham, Hegel, T.H. Green are also explained by which the students are very much enriched about western political thought.

CC-12: Political Sociology.

In this paper students are well known about the social base of politics, various types of political culture, the way of socialization and verious media of socialization. They are analysed about the role of Caste, Tribe, Class, Gender in politics and the importance of politics are also analysed.

** With this expertise, students can work under various NGOs, who work for social development and sometimes they can work as pshychological counsellor for the under privileleged community.

CC-13: Public Administration : Concepts and Perspectives.

CC-14: Administration and public Policy in India.

In these two papers students are taught about the administrative system, administrative theories and its importance in politics. Various major concepts are discussed here. Besides Indian administrative system, policy making system, district administration are also discussed.

** This subject knowledge helps the students to qulify many competitive examination specially for the administrative job under State Government as well as Central Government.

DSEC-A(1): Gender and Politics.

In this paper students are taught about the issue of gender in politics, patriarcy,feminism, etc. and various women's movements in India, violence against women etc. This knowledge helps the students to be practical and it will break the dogmatic concept about the women in society.

** With this subject knowledge students can involve themselves to many NGOs, who work for women's empowerment and struggle against domestic violence.

DSE-B(1): Indian Foreign Policy in Globalizing world.

In this paper it is discussed about the foreign policy making and its importance, specially in the period of globalization. In this global scenario it is very important to maintain the relation with others country mainly big powers and neighbour countries.

DSE-A(4): Understanding Global Politics.

In this paper the world politics is analysed in different way where the ideas of world is discussed in detailed and the state system with sovereign power are focussed. Besides the world economy, world culture and identity are also described here. The most important concept 'civil society' and its relevance is mentioned.

DSE-B(4): Human Rights in Comparative perspective.

In this paper it is compared between India-USA and India –South Africa in the context of Human Rights. Understanding and Institulization of Human Rights are be mostly focused in this paper. Besides comparative analysis between India and Pakistan on the question of gender and violence, comparative analysis between Australia and India regarding Adivasis/Aborginals and land question are discussed clearly.

** Students can work under Human Rights commission of Central as well as States, and they can also do the social awarness programme under any NGOs.

SEC-A(1): Democratic Awarness through Legal Literacy.

In this paper some basic legal questions are analysed by which the students are well informed about the legal procedure. They are taught what is FIR, Arrest, Bail, Search, Seizure,etc. and

what have to be done when they will loss something. Consumer Rights, RTI, Cyber-crimes,etc. are also analysed.

** Students can take a role of a legal expert and do many awarness programme under any Govt. project or NGOs.

SEC-B(1): Legilative Practices and Procedures.

In this paper it is discussed the Parliamentary Procedure, the Power and Privileges of MPs, MLAs etc. They are taught the structure of Local Self Government b (Urban and Rural both). Besides it is discussed how a bill becomes a law, how many committees are there in legislature and how they function etc.

** This knowledge helps the students to qulify many competitive examination and able to get a Govt. job.

(GENERAL COURSE)

CC-1: Introduction to Political Theory.

In this paper some basic concept in politics like Law,Right,Liberty,Equality,Nationalism, Internationalism are discussed, different approaches regarding Political Science and different theories of State like Normative, Behavioural, Post behavioural, Marxist,Feminist approaches etc.and Contract theory,Idealist theory, Liberal theory, Gandhian theory etc. are taught. Besides political parties, interest groups and their functions, roles are also analysed.

CC-2: Comparative Government and Politcs.

In this paper it is compared to different politcal system like Liberal democratic, Authoritarian etc. and different forms of political system like Unitary, Federal, Parliamentary, Presidential etc. It is also compared among UK, USA, PRC regarding government and politics. Besides the features of the constitutions of Bengladesh, France, Switzerland are mentioned here.

CC-3: Government and Politics in India.

In this paper it is discussed in detailed the government and politics in India, the framing of the constitution, the Preamble, Fundamental Rights, Directive Principles etc. The Executive, The Legilature, The Judiciary are explained and Local Government, Election Commission, Party system, and varities social, political movement are also analysed.

** The students can be successful in competitive examinations like WBCS, PSC Miscellaneous etc. and able to get a Govt. job.

CC-4: International Relations.

In this paper international politics are discussed. Here many theories in International Relations, Cold war, India's foreign policy etc. are also analysed.

** The students can be expert on International Relations and do job under External Affairs Department of India or as a reporter of any social media.

DSE-1(A): Public Administration.

In this paper Public Administration and its major concepts are discussed as Hierarchy, Unity of Command, Span of control, Authority, Centralization,Decentralization, Line and Staff,etc. Some major approaches like New Public Administration, Comparative Public Administration, Development Administration, etc. are also discussed. Besides Bureaucracy, Public Policy and some major programe as MGNREGA, Sarva Siksha Abhiyan, National Rural Health Mission are analysed.

** This knowledge helps the students to qualify competitive examination like IAS, WBCS, Staff Selection Examination etc. They can also do various project work under taken by Govt. of West Bengal as well as Govt. of India.

DSEC-2(B): Human Rights: Theory and Indian Context.

In this paper human rights, its history and evolution,UDHR etc. are discussed. Besides Human Right Commission in India(National level and State level) , relation between Constitutional rights and Human rights in India are also analysed clearly.

** This paper helps the students to be a social worker and involve themselves under many projects under taken by the State as well as Central Govt. and do many social awarness programme under NGOs.

SEC-A(1): Legal Litercy & SEC-A(2): Understanding Legal System.

In these two papers Indian Penal Code and its history, some major legal issues, Personal laws, Human Rights Law etc.are taught. The students are known about the basic legal system which they can apply in their daily life.

** The students can work as a legal expert under NGOs and can do LLB degree for professional practice in court

SEC-B(1): Elementary Dimensions of Research & SEC-B(2): Basic Research Method.

In these two papers research methodology are taught by which the students are able to involve themselves in research activities. Here the basic ideas like variables, proposition, hypothesis, research design, research report writing etc. are discussed. Besides data collection, sampling, data analysis etc.are also taught.

** The students can do any research work for any special project under Govt. or NGOs.

Programme Outcomes:

Political Science is one of the best subject in Humanities. After completing the BA degree with Political Science, the students have many opportunities in future. There are many career options as—

1. Civil Service is the most popular option through out the India. The students of political science can prepare for Civil Service.
2. The students of political Science are able to analyse and understand various isseues in our society, therefore, they can work in social media as reporters and Editors.
3. Political Science is taught in almost all schools and colleges, so the students of political science can go for teaching as their career options.
4. The students of political Science can work in NGOs and government outreach programmes. They can also complete master's degree in social Work after BA.
5. The students of Political Science can apply for internship at various organizations including UNO as a political Scientist.
6. The students of Plotical Science can work as a lawyer after completing the degree LLB. Here this subject knowledge helps them to do so.

Unit Of Environmental studies

Course outcome and Programme outcome (CBCS)

Subject: AECC 2 (ENVIRONMENTAL STUDIES)

Objective:Students will get a clear idea about

1)Multidisciplinary nature of environmental studies;

2 Ecology and Ecosystems

3)Natural Resources

4)Biodiversity and Conservation

5)Environmental Pollution

6)Environmental Policies and Practices

7)Human Communities and the Environment

8)Practical application

Course outcome and Programme outcome (CCF)- Semester1

Objective:Students will get familier with the following topic:

.

1)Multidisciplinary nature of environmental studies

2)Ecology and Ecosystems

3)Concept of renewable and non-renewable resources

4)Biodiversity and Conservation

5)Environmental Pollution

Course outcome and Programme outcome (CCF)- Semester2

Students will be benefitted by acquiring knowledge about:

1)Environmental Education

2)Rules and regulations of environment

3)Human Communities and the Environment

4)Disaster Awareness

5)Role of environmental education in protecting environment

Programme outcome (CBCS) semester 2

Studying Environmental Sciences (ENVS) can lead to a variety of positive outcomes, both personally and professionally. Here are some key benefits and potential career paths associated with this field of study:

<u>Understanding and Awareness</u>

1. Environmental Consciousness: Gain a deeper understanding of ecological processes, environmental issues, and sustainability practices.

2. Critical Thinking: Develop skills in critical analysis and problem-solving related to environmental challenges.

2. Fieldwork and Practical Experience: Engage in hands-on activities such as field studies, experiments, and projects, enhancing practical skills**.**

Career Opportunities

1. Environmental Consultant: Advise organizations on compliance with environmental regulations and sustainability practices.

2. Conservation Scientist: Work to protect and manage natural resources and habitats.

3. Environmental Educator: Teach others about environmental issues and promote sustainable practices.

4. Policy Analyst: Contribute to the development of environmental policies and regulations.

5. Sustainability Manager: Help businesses implement sustainable practices and reduce their environmental impact.

Overall, studying Environmental Sciences can be a fulfilling path that offers the chance to make a meaningful difference in the world while providing a range of career opportunities across various sectors.

Programme outcome (CCF) semester 1 and 2

The program outcomes of studying Environmental studies generally encompass a variety of competencies that students are expected to develop throughout their education. Here are some common outcomes you might expect from a degree in Environmentalstuies:

Knowledge and Understanding

1. Scientific Principles: Understand the fundamental scientific principles that govern environmental systems, including ecology, geology, chemistry, and biology.

2. Environmental Issues: Gain insight into contemporary environmental challenges such as climate change, resource depletion, pollution, and biodiversity loss.

Problem-Solving Abilities

1. Critical Thinking: Apply critical thinking to evaluate environmental problems and develop effective solutions.

2. Interdisciplinary Approach: Integrate knowledge from various fields (e.g., social sciences, economics, policy) to address complex environmental issues.

Communication Skills

The program outcomes of studying Environmental Stuies learn to communicate complex environmental information clearly to diverse audiences through written reports, presentations, and informal outreach.

2. Advocacy Skills: Develop the ability to advocate for sustainable practices and environmental justice in various contexts.

Ethical and Societal Considerations

1. Ethical Awareness: Understand the ethical implications of environmental decisions and the role of scientists and policymakers in addressing equity and justice in environmental matters.

2. Global Perspective: Appreciate the interconnectedness of environmental issues on a global scale and the importance of international cooperation for sustainable development.

These outcomes prepare graduates for various careers in sectors like government, non-profit organizations, private industry, and academia, equipping them to make meaningful contributions to environmental stewardship and sustainability initiatives.

Netaji Nagar Day College

Department of Zoology

Course Outcomes for B.Sc, Zoology (General) (CBCS System)

(With effect from the session: 2018 – 2019)

SEM I General Course ZOOG

CC1: Animal diversity

- The course emphasized on the basic understanding of animal classification along with the general characteristic features ranging from protozoa to mammal.
- Distinction of all phylum /classes features of animal kingdom can be achieved by learning this course area with some sample model organisms of different phylum.

SEM II General Course ZOOG

CC2: Comparative anatomy and Developmental Biology

- To understand overall comparative composition and function of different organ systems of animal physiology can be gathered from this course part.

SEM III General Course ZOOG

CC3: Physiology and Biochemistry

- The mechanism of action through various system in animals' body can be attained from this section like digestive system, respiratory system, cardiovascular, nervous and renal system.
- Also, knowledge of macromolecules such as carbohydrates, protein and fat, their types and significance and metabolism can be gathered. Enzymes classification and factors affecting the enzyme activity is also covered under this area of course.

SEC A 1: Apiculture

- Students could acquire knowledge on Biology, rearing, diseases, and economic importance of bees and also their enemies. They also learnt about the entrepreneurship in Apiculture.

SEM IV General Course ZOOG

CC4: Genetics and Evolutionary Biology: (SEM IV)

- Theories of classical genetics, genetic variation through linkage and crossing over, chromosomal aberrations and sex determination etc is understandable by this section.
- Theories of evolution, process of evolutionary changes and speciation is also covered hereby in this course area.

SEC B 2: Aquarium Fish Keeping

- Students could acquire knowledge on Aquarium fish keeping through the knowledge of Biology of aquarium fishes where fresh water and marine water fishes are taught in detail.
- Food, feeding of fishes, live fish transportation, maintenance of aquarium are the knowledges

they could acquire in detail.

SEM V General Course ZOOG

DSE A1: Applied Zoology

- Students will acquire knowledge on overview of parasitism, morphology, life cycle, and economic/medical importance of certain protozoan, helminthic nematode, arthropod and vertebrate parasites causing direct or indirect harm to mankind.
- Theoretical knowledge about the methods and practice of animal husbandry, poultry farming and fish technology.
- Students will gain practical knowledge through visiting a poultry farm or fishery.

DSE A2: Aquatic biology

- Students will acquire knowledge about different aquatic ecosystems.
- Students will learn about different ecological parameters of aquatic ecosystems.
- Students will gain knowledge about saline water ecosystems their compositions.
- They will learn about different mechanisms of management of aquatic resources.

SEC A 3: Sericulture

Students could acquire knowledge on Biology, rearing and economic importance of silkworm and their diseases. They also learnt about the entrepreneurship in silk industry.

SEM VI General Course ZOOG

DSEB1: Biology of insects

Students will gain knowledge about morphology, feeding habits of insects.

Students will understand the concept of vectors and will learn how some insects play role as vectors of certain diseases and prevention measures of those diseases.

DSEB2: Ecology and Wildlife Biology

Students will understand the concept of ecosystem and factors of ecosystem.

Students will understand about the concept of population and population attributes such as life tables, fecundity tables, survivorship curves, population regulations, growth curves.

Students will learn about the concept of community, structure of ecosystem and function of ecosystem.

Students will gain knowledge about conservation of different wild animals.

Students will come to know about different equipment used in wildlife studies and processes used in identification of wild animals.

Students will learn different processes used to study of an aquatic ecosystem.

SEC B 4: Medical Diagnosis

Students learnt about different methods used for analysis of blood and urine, and also certain biochemical and microbiological methods used for medical diagnosis. They acquired knowledge about some common non-infectious and infectious diseases.

Program Outcome for B.Sc Zoology (General)

- Knowledge on animal diversity and basic classification system can be gathered by this programme along with various features of different ecosystems.
- Economic zoology focuses on various parts, like: sericulture, apiculture, aquaculture for creating idea about the different dimensions zoology from where entrepreneurship concept can be developed.
- On the other hand, Industrial microbiology, recombinant DNA technology and medicine and diagnostic techniques helps to build career opportunities
- The concept of Ecology will enable the students to have an idea about the various pollutions in the ecosystem that are disturbing the balance of nature. The concept of sustainable development teaches the students to learn the optimum uses of the non-renewable resources of the earth and to apply methodologies for the use of renewable resources in the survival of mankind.
- The study of different ecosystems, including marine, forest, aquatic, wetlands, etc., gives students a better understanding of the diversity of ecosystems and their differences and interrelationships. The study provides an idea of the flora and fauna community of that ecosystem and the endemic species of the respective ecosystem.

- Visits to national parks or sanctuaries or biosphere reserves help students learn various conservation techniques, both in-situ and ex-situ, for animals and plants. This forest study will help students understand the importance of forests and their resources. This study provides an understanding of the status of various animals in their ecosystem and the need for conservation of threatened or endangered species.

Department of Zoology

❖ Outline Course Structure under CCF for Zoology, C.U.

PART I; SEM I

Subject Code	Name of Paper	Theory	Practical
CC 1	Cell Biology	75	25
SEC-1	Applied Entomology	75	25
IDC	Animal Science	50	25

PART I; SEM II

CC 2	Biochemistry	75	25
SEC-2	Aquaculture	75	25
IDC	Animal Science	50	25

❖ Course Title: ZOOM CC-1 Cell Biology

Course Outcome: Upon completion of this course, students will be able to:

1. Describe the structure and function of the plasma membrane, including its role in cell signaling, transport, and cell-cell interactions.
2. Identify and explain the functions of cytoplasmic organelles, including mitochondria, endoplasmic reticulum, Golgi apparatus, lysosomes, and peroxisomes, and their roles in cellular processes such as metabolism, protein synthesis, and degradation.
3. Explain the composition and functions of the cytoskeleton, including microtubules, microfilaments, and intermediate filaments, and their roles in cell shape, movement, and division.
4. Describe the structure and function of the nucleus, including the nuclear envelope, chromatin, and nucleolus, and its role in gene expression and cell regulation.
5. Explain the principles of cell signaling, including signal transduction pathways, second messengers, and gene regulation, and how cells respond to internal and external stimuli.
6. Demonstrate an understanding of tools and techniques in cell biology, including microscopy, cell culture, and molecular biology techniques, and their applications in research and medicine.

Skills and Competencies that student will attain upon successful completion of this course:

- Analyse and interpret scientific data related to cell biology
- Apply knowledge of cell biology to real-world problems and scenarios
- Design and propose experiments to investigate cellular processes
- Communicate complex scientific concepts effectively through written and oral presentations

❖ Course Title: ZOOM CC-2 Biochemistry

Course Outcome: Upon completion of this course, students will be able to:

1. Describe the structure and function of various kinds of monosaccharides like aldose and ketose carbohydrates, disaccharides, polysaccharides; they will be acquainted with isomerism of monosaccharides (D and L, optical isomers, furanose and pyranose, α and β anomers, epimers) as well as reducing and non-reducing sugars. They will also know physiological importance of monosaccharide, disaccharides and polysaccharides.
2. Identify structure, classification, general and electrochemical properties of α-amino acids; essential and non-essential amino acids; structures of protein: primary, secondary, tertiary and quaternary) of protein, classification of proteins.
3. Explain the saturated and unsaturated fatty acids, essential and non -essential fatty acids, structure and formation of triglyceride.
4. Describe the cofactors and coenzymes, effect of temperature, pH, substrate concentration, enzyme concentration on enzyme action, isozymes and proenzyme, mechanism of enzyme action (Lock and key model, Induced fit model), enzyme kinetics, also learn the process of derivation of Michaelis-Menten equation with its significance, Lineweaver-Burk plot and its significance. enzyme inhibition – competitive, non- competitive, allosteric / feedback and its effect on Vmax and Km.
5. Describe and explain glycolysis, citric acid cycle, pentose phosphate pathway, gluconeogenesis from lactate and glycerate, glycogenesis and glycogenolysis along with the name of the enzymes and their significance.
6. Explain protein metabolism like transamination, deamination and their types as well as pathways with name of enzymes and significance. They also learn the fate of C-skeleton of glucogenic and ketogenic amino acids.
7. Describe lipid metabolism such as β-oxidation of fatty acids like palmitic acid (saturated), linoleic acid (unsaturated) including fatty acid biosynthesis pathway.
8. Explain nucleic acid metabolism such as degradation of purine; purine salvage pathway and significance.
9. Gather fundamental knowledge on free radicals and antioxidants and can also describe concepts of free radicals and antioxidants along with examples.

Skills and Competencies that student will attain upon successful completion of this course:

- ❖ Describe, analyze and interpret scientific data related to Biochemistry.
- ❖ Apply knowledge of Biochemistry to real-world problems and situations.
- ❖ Design and propose experiments to investigate biochemical processes.

- ❖ Communicate complex scientific concepts related to Biochemistry effectively through written and oral presentations

❖ Course Title: ZOOM SEC-1 Applied Entomology

Course Outcome: Upon completion of this course, students will be able to:

1. The unit 1 comprising of Basic entomology has been incorporated to encourage students to gain interest in knowing the structural adaptability of insects to cope up their interacting environment. After completing this unit, they will be able to identify and characterize insects having agricultural, medical, sericultural and apicultural importance.
2. The unit 2, entitled 'Medical entomology' comprises of description of insect and related arthropod creatures having medical importance. The students will acquaint with the biology and ecology of various insect vectors in relation to certain vector borne diseases like malaria, filaria, dengue etc. and also will be able to know about how these diseases can be prevented/controlled. They will further enhance their knowledge about how forensic science could utilize insects and related arthropods in the estimation of time of death of human/animal cadavers needed by legal authorities to solve unnatural death.
3. In the Unit 3 (Agricultural Entomology), students will gain knowledge about the insect pests of crops with special reference to pest dynamics, nature of damage and their management process so that crop yield can be increased to meet human demand.
4. The Unit 4 or Sericulure deals with insects directly involved in the production of Silk, the queen of threads. The students will get vivid knowledge about the biology of silk producing moths, their commercial rearing, cocoon harvesting, silk reeling and the marketing of silk. They will explore the huge potentiality of the sericulture used to uplift Indian rural economy. Students will also be able to identify the SWOC of this cottage industry.
5. In the Unit 5 (Apiculture) students will gain knowledge about the biology of Honey bees, scientific rearing of such beautiful insect creatures, their enemies & management of such enemies, scientific production and uses of honey.
6. After completing the practical unit, students will be able to handle insects and will get hands on training through their visit to places of having applied entomological interest.

❖ Course Title: ZOOM SEC-2 Aquaculture

Course Outcome: Upon completion of this course, students will be able to:

1. The course on basic fish biology in aquaculture typically aims to provide students with an understanding of fish anatomy, physiology, and behaviour, as well as how these aspects influence aquaculture practices.

2. Students will gain knowledge of the principles and practices of sustainability in aquaculture, including resource management, waste reduction, and the use of renewable resources. Students will also explore emerging technologies and innovative practices in sustainable aquaculture, and assess their potential impact on the future of the industry.

3. Students will gain insight into the latest technological innovations in aquaculture, such as advanced breeding techniques, genetic modification, and automation. They will learn how to apply recent advancements in aquaculture practices, including novel feeding strategies, disease management techniques, and water quality monitoring systems. They will explore emerging trends and future directions in aquaculture research and technology, and assess their potential to shape the industry.

4. Students will gain knowledge of common and emerging diseases affecting finfish in aquaculture, including their aetiology, epidemiology, and impact on fish health and production.

5. Students will develop hands-on skills in operating and managing various aquaculture systems, including pond, tank, and recirculating systems. Students will gain hands-on experience and knowledge in advanced breeding techniques for shrimp and prawns, including selective breeding, hatchery management, and larval rearing. Students will perform economic evaluations of breeding and pearl culture operations, including cost management, profitability analysis, and market trends.

The Program Specific Outcomes (PSOs) of this course might include:

1. Students will be equipped to apply sustainable aquaculture practices, including resource conservation, waste management, and minimizing environmental impact, in line with best practices and regulatory standards.

2. Students will integrate knowledge from related disciplines, such as environmental science, marine biology, and biotechnology, to address complex challenges in aquaculture and contribute to interdisciplinary solutions.

3. Students will be able to conduct research and apply innovative technologies in aquaculture, including advancements in nutrition, health management, and system design, to enhance productivity and sustainability.

❖ Course title: IDC-1: Animal Biology

Course Outcome: Upon completion of this course, students will be able to:

Unit 1: Animal Diversity

1. Unit 1(Animal Diversity) comprises of diversity of animals.
2. Students will understand the fundamental theories of living world and capability of developing ideas based on them.
3. Students will be motivated for research studies in Zoology and related fields.
4. Provide knowledge of a wide range of scientific techniques and application of methods/tools in related fields
5. Understanding animal diversity is fundamental to appreciating the myriad forms and functions that life has taken on our planet
6. Knowledge gained on the concept of maintenance systems in non-chordates and chordate groups.
7. Collaboration of structure and function, functional basis of body structures and Organ systems, relationships of the Chordates with such other animal groups/Phyla

Unit 2: Genetics

1. Knowledge gained on the fundamental genetic principles, from inheritance patterns to molecular mechanisms, Gene concept, genome organization

Unit 3: Biodiversity and Wildlife

1. Knowledge gained on wildlife, the ecological roles of animals, conservation challenges, and the impact of human activities on animal populations, the threats responsible for decimation of Biodiversity and Wildlife.
2. How to tackle issues of sustainable development and conservation of Biodiversity and Wildlife.
3. Conservation of Wildlife.

Unit 4: Insect Vectors

1. Knowledge gained on insect vectors, explored in detail for their roles in disease transmission and ecological balance.
2. Understanding their biology and behaviors that is crucial for effective pest management and disease control
3. The vital role of insect vectors in animal biology and behavior of vectors, their interactions with pathogens, and the implications for disease transmission, providing critical insights into the dynamics of infectious diseases.

Unit 5: Laboratory techniques and Instrumentation

1. Knowledge gained on laboratory techniques and instrumentation form the backbone of modern biological research.
2. This section covers essential methodologies, from microscopy to molecular biology tools,

Netaji Nagar Day College

DEPARTMENT OF MATHEMATICS

Programme Outcome Of Mathematics Honours Course (UNDER CBCS)

PO-1: This course endeavors to acquaint students with the concepts of various papers of mathematics as well as to involve them in critical thinking and scientific analysis.

PO-2: Providing essential foundation in the gross field of Pure and Applied Mathematics for students will help them to develop the ability to apply quantitative tools and techniques for solving various mathematical problems.

PO-3: The deep grasp acquired by the students after completing the course helps them to opt for any interdisciplinary field of science and technology for higher studies and to establish themselves accordingly.

PO-4: This course enables the students to develop a critical approach towards their subject of study and to apply their power of thinking in solving mathematical problems and consequently prepares them to embrace research area.

PO-5: Learning basic programming language makes the students proficient and gives an additional advantage of acquiring software skill in the world of software technology.

PO-6: Upon completion of the study, students will have competence to apply Mathematical Modelling to solve any real-life problems and this itself is conductive to great career opportunities in numerous fields.

Programme Outcome Of B.Sc Generic Elective Courses (Under CBCS):

PO-1: This course in Mathematics provides a strong foundation for Basic Sciences and Mathematics as well as helps student to identify, formulate and create mathematical ideas effectively.

PO-2: Understanding and critically analyzing the fundamental concepts in Mathematics are very useful in assisting students apply theoretical knowledge for solving various real-life problems.

PO-3: The basic knowledge of various branches of Mathematics that includes algebra, calculus, geometry makes it possible for the students to develop critical thinking skills and to pursue higher studies in any interdisciplinary field

of science.

PO-4: Utilizing the computational techniques and the basic knowledge in programming language, students will be able to build up a successful career in their future.

PO-5: Students are expected to have developed the capability of quantitative reasoning skill which will help them to enhance their employability for different types of jobs.

Course Outcome of Mathematics (Honours) Under CBCS

SEMESTER	COURSE CODE	COURSE NAME	COURSE OUTCOMES
1st Sem	CC1	Calculus, Geometry & Vector Analysis	* This course is designed to provide students with skills to compute limits, derivatives and integrals of a function and to use applications of vector algebra in real life. * The knowledge of geometry will enable students to solve tangents, normal, chords of a conic in 2D and will provide the concept of 3D to solve 3D related problems. * Students will be able to solve various problems of vector analysis which is applicable to various branches of Mathematics and Physics.
	CC2	Algebra	*The knowledge of algebra helps to develop students' critical thinking skills that includes problem solving, logic, patterns and reasoning. *Students will be able to understand the concept of relation, mapping, number theory, matrix and determinants.
2nd Sem	CC3	Real Analysis	*The students will go through the concept of sequence, convergence of a sequence and its important theorems. *From this course, students will learn the fundamental properties of the real numbers that underpin the formal development of real analysis.

	CC4	Group Theory-I	*In this course students will be able to understand the concept of cyclic group, finite group, permutation group, co-set and its applications along with Lagrange's theorem and Fermat's theorem. *They will have the capability to gain knowledge of the concept of normal subgroup, quotient group, Cayley's Theorem, and First, Second, Third isomorphism theorems.
3rd Sem	CC5	Theory of Real Functions	•Students will learn limit, continuity, uniform continuity, differentiability of a function at a point. •Students will also acquire the concept of maxima minima of a function in an interval.
	CC6	Ring Theory & Linear Algebra-I	• This course aims to give students the basic knowledge of rings, subrings, fields, ring homomorphism, isomorphisim and related theorems. • This portion plays a key role in the higher study of linear algebra in which tudents will learn to compute eigenvalues and eigenvectors. They will also learn the Cayley-Hamilton theorem and its use.
	CC7	ODE & Multivariate Calculus-I	• This course provides the visualization and manipulation of ODEs in numerical and symbolic form. • Students will be able to understand the concepts of existence and uniqueness of solutions. •Multivariate calculus has useful applications on various branches of Mathematics and Physics.
	SEC-A	C Programming Language	•Students can have a good grasp of C language and they will be able to develop logics which helps them to create programs and its applications. •Students will obtain the basic concept of foundation of computer, different generation, hardware and software, algorithm, flowchart.

4th Sem	CC8	Riemann Integration & Series of Functions	• This course offers students the proper idea to learn Riemann integration of bounded real valued functions, integrability of sum, scalar multiple, product, quotient of Riemann integrable functions. •Students will acquire knowledge of sequence of functions, point of convergence, uniform convergence, power series.
	CC9	PDE & Multivariate Calculus-II	•In this course students will learn the skill for solving problems of certain
			types of linear and non-linear partial differential equations. * They will also acquire knowledge of certain types of second order partial differential equations and their applications in Mathematical Physics. •Students will get an idea for solving problems on multiple integral and centre of gravity, surface and volume of revolution, vector calculus and their applications in Mathematical Physics.
	CC10	Mechanics	•Students will get an overview of Analytical Statics related to coplanar forces, friction, virtual work, forces in three dimension, stable and unstable equilibrium and centre of gravity. •They will be able to learn rectilinear and planar motion of a particle in both cartesian and polar system, simple harmonic motion, central orbit, motion under inverse square law and planetary motion. • Students will also have the capability to solve problems on system of many particles, collision of elastic bodies, work-power-energy.
	SEC-B	Scientific computing with Sage Math & R	•This course introduces the theory of Scientific Computing which enables students to install and read data files in R/SageMath. •Students will acquire basic knowledge and skill in numerical and symbolic computations using mathematical functions.

5th Sem	CC11	Probability & Statistics	•This course provides the idea of probability theory helping the students to calculate probabilities using conditional probability, rule of total probability and Bayes' theorem. •They will be able to explain the concept of random variable, probability distributions.
	CC12	Group theory-II & Linear Algebra-II	•From the course of Group Theory, students will get an idea of automorphisms, direct product and results related to finite abelian groups such as converse of Lagrange's theorem, Cauchy's theorem. •They will also learn about vector spaces that will allow them to appreciate Linear Algebra as a tool for learning Geometry of higher dimensional spaces through the language of Algebra. •They will also be able to solve problems related to matrix theory up to orthogonalization. •Students will learn Euclidian Space which will help them to understand the mathematical theory behind the Linear Programming problems.
	DSE-A(1)	Bio Mathematics	•Students can have an enhanced knowledge and understanding of mathematical modeling and statistical methods in the analysis of biological systems. •Students will acquire knowledge of application of dynamical systems and mathematical modelling of biological problems •They will learn the behavior of discrete and continuous population and their behaviors, which are studied by applying the different tools of linear and non-linear system of ODE and PDE.

	DSE-B(1)	Linear Programming and Game Theory	•This course discusses the theory of basic feasible solutions and their properties, convex sets based on the knowledge of linear algebra studied in previous semesters. •They will have the skills in the solution of a Linear Programming Problem by Simplex Method. They will also acquire knowledge on duality, transportation problem, assignment problem and travelling salesman problem. •Students will obtain some knowledge on the basic theory of game problems and their solution by different methods which has many applications in Economics.
6^{th} Sem	CC13	Metric Space & Complex Analysis	•Students will be able to identify curves and regions in the complex plane defined by simple expressions, basic properties of complex integration, analytic functions and to develop the ability to compute such integrals. •This course will make a foundational concept of metric spaces and its important properties, i.e., convergence sequence, Cauchy sequence, completeness property, Cantor's intersection theorem, continuous mapping, uniform continuity, sequential compactness, Heine-Borel theorem in $\mathbb{R}$, connectedness etc.
	CC14	Numerical Methods	•Students will go through the concepts in Numerical Analysis and acquire theoretical knowledge that will lay the foundation for solving problems via computer programming. •Students will obtain the basic skill for solving problems via computer programming related to various numerical methods on interpolation, numerical differentiation and integration, differential equations and finding roots of an equation.
	CC14 Practical	Numerical Methods Practical	•From this course students will be able to compute the values of any mathematical task with the help of the numerical methods like interpolation, differentiation, integration and they will also be able to find the solution of linear and nonlinear equations with the help of computer software programming.

	DSE-A(2)	Differential Geometry	•This course is an introductory course in Tensors, Riemannian space and Einstein space. • Students will be able to learn the theory of space curves and surface.
	DSE-B(2)	Point Set Topology	•This course describes the concept of topological spaces, basis and sub- •basis for a topology, continuity of a function in topological space, finite product topology, homeomorphism, isometry and metric invariants. •Equip the students with the concept of separation axioms of topological spaces, connected and compactness in topological spaces.

COURSE OUTCOME OF MATHEMATICS (GENERAL) UNDER CBCS

SEMESTER	COURSE CODE	COURSE NAME	COURSE OUTCOMES
1st Sem	CC1/GE1	Algebra-I, Differential Calculus-I, Differential Equation-I, Coordinate Geometry	•From this course, students will acquire the concept of complex number, polynomial and matrix theory. •They will be able to learn real number, limit, continuity and differentiability of a real valued function and partial derivatives. • Students will obtain the knowledge of ordinary differential equation and the existence and uniqueness of solution of ODE. •This portion helps the students in solving the problems on pair of straight lines, classification of conics and reduction of their standard forms, tangents, normal, chords of a conic in two-dimensional and three dimensional analytical geometry.
2nd Sem	CC2 / GE2	Differential Calculus-II, Differential Equation-II, Vector Algebra, Discrete Math.	•Students will be able to learn about convergence and divergence of infinite series of constant terms, mean value theorem, application of principle of maxima and minima for a function in single variable in geometrical and physical problems. •They will also learn about solution of linear homogeneous and non-homogeneous equations with constant coefficients. •Students will acquire knowledge on vector operations and its applications.
3rd Sem	CC3 / GE3	Integral Calculus, Numerical Methods, Linear Programming	•Students will be able to comprehend the concept of improper integration, Beta and Gamma functions, convergence of improper integration and its applications. •They will learn the concept of numerical methods, interpolation, differentiation, integration and numerical solution of transcendental equations. •Students will obtain the knowledge on linear programming and basic idea of linear algebra, different methods of LPP.
	SEC-A	C Programming Language	•From this course students will acquire knowledge on foundation of computer,
			Different generation, hardware and software, algorithm, flowchart. •Students will be able to solve various problems with C-programming which may/may not be solved analytically. .

4th Sem	CC4 / GE4	Algebra-II, Computer Science & Programming Probability & Statistics	•From this course, students will acquire knowledge on groups, rings, fields, vector space over a field, eigenvalues & eigenvectors etc. •The main objective of the programming language is to provide the students the basic concept of computer generations and computer anatomy, number systems, concepts on different programming languages and algorithms & flow charts. •Students will be able to learn the rule of probability , Bayes' Theorem and to calculate probabilities using conditional probability. •They will also be able to explain the concept of random variable, the probability distributions and to analyze statistical data.
	SEC-B	Mathematical Logic	•After completion of the course students are expected to be able to analyze logical propositions via truth tables.
5th Sem	SEC-A	Object Oriented Programming in C++	•Students will be able to demonstrate an understanding of algorithms in the problem-solving process, to identify the necessary properties of good problem-solving techniques and to create and analyze algorithms for solving simple problems.
	DSE-A	Graph Theory	•This course describes the theory of graphs, pseudographs, complete graphs, isomorphisim of graphs. •Students will learn the concept of path and circuit and related theorems. •Students will be able to know about the Kuratowski's graphs.
6th Sem	SEC-B	Boolean Algebra	•This course offers students to learn how to use truth tables and laws of identity, distributive, commutative and domination. •Equip the students with the skill to compute sum of products and product of sum expansions and convert boolean expressions to logic gates and vice-versa.
	DSE-B	Advanced Calculus	•Students will be able to know about the concept of uniform convergence and point wise convergence of sequence and series of functions.
			•Students will learn about power series and Fourier series and its properties. *They will get the idea of Laplace Transform and their properties which can be used to solve ODE.