Metric No. 2.6.1

Course Outcomes for All Programmes Offered by the Institution

Surendranath College
24/2 M. G Road, Kolkata-700009
West Bengal, India

Course outcomes

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Department of Botany

Course outcome of Botany Honours & General

Course Outcome of BOT-A-CC-1-1 (Phycology and Microbiology)

On completion of this course, the students will be able to:

1. Develop understanding on the concept of microbial nutrition
2. Classify viruses based on their characteristics and structures
3. Develop critical understanding of plant diseases and their remediation.
4. Examine the general characteristics of bacteria and their cell reproduction/ recombination
5. Increase the awareness and appreciation of human friendly viruses, bacteria, algae and their economic importance
6. Conduct experiments using skills appropriate to subdivisions
7. Understanding of Algal classes based on their characteristics and structures
8. Develop knowledge about the importance and adverse effect of algae

Course Outcome of BOT A CC-1-2 (Mycology & Plant Pathology)

On completion of this course, the students will be able to

1. Identify true fungi and demonstrate the principles and application of plant pathology in the control of plant disease.
2. Know about the life cycle of each group of Fungi.
3. Know about a few types of diseases.
4. Demonstrate skills in laboratory, field and glasshouse work related to mycology and plant pathology.
5. Develop an understanding of microbes, fungi and lichens and appreciate their adaptive strategies
6. Identify the common plant diseases according to geographical locations and device control measures
7. Identify the common mycorrhizal fungi and their association with higher plants.
8. Develop an understanding on ecological and economic importance of lichens.

Course Outcome of BOTA CC-2- 3 (Plant Anatomy)

On completion of this course, the students will be able to:

1. Develop an understanding of concepts and fundamentals of plant anatomy
2. Examine the internal anatomy of plant systems and organs
3. Develop critical understanding on the evolution of the concept of organization of shoot and root apex.
4. Analyze the composition of different parts of plants and their relationships
5. Compare the different types of anomaly observed in secondary growth of plant
6. Evaluate the adaptive and protective systems of plants

Course Outcome of BOT-A-CC-2-4 (Archaegoniate)

On completion of this course, the students will be able to:

1. Demonstrate an understanding of archegoniatae, Bryophytes, Pteridophytes and Gymnosperms

2. Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms
3. Understanding of plant evolution and their transition to land habitat.
4. Demonstrate proficiency in the experimental techniques and methods of appropriate analysis of Bryophytes, Pteridophytes, Gymnosperms

Course Outcome of BOT A CC -3-5 (Palaeobotany and Palynology)

On completion of this course, the students will be able to:

1. Develop knowledge and critical understanding of the geological time scale.
2. Develop understanding of different types of fossils, fossil nomenclature, fossil dating process and importance of fossil study.
3. To develop knowledge and understanding of the structure and geographical distribution of the fossil pteridophytes and its significance in evolution.
4. Develop knowledge and understanding of the structure and geographical distribution of the fossil gymnosperms and their significance in evolution
5. Develop critical understanding on the Indian Gondwana System.
6. Develop knowledge on structures of spores and pollens, different branches of Palynology and its applications.

Course Outcome of BOT A CC-3-6 (Reproductive biology of Angiosperms)

On completion of the course, students will:-

1. Be able to identify different morphological variations of the different floral parts- both primary and accessory, and inflorescences.
2. Be able to evaluate the different types of ovules and placentations in different types of plants.
3. Have the core knowledge of the developmental pathways of the formation of male and female gametophyte and the subsequent process of fertilization and embryo development post fertilization.
4. Be able to comprehend the identity of various reproductive parts of angiospermic plants and classify them accordingly.

Course Outcome of BOT A CC- 3-7 (Plant Systematics)

On completion of this course, the students will be able to:

1. Classify Plant systematics and recognize the importance of herbarium and Virtual herbarium
2. Evaluate the Important herbaria and botanical gardens
3. Interpret the rules of ICN in botanical nomenclature
4. Assess terms and concepts related to Phylogenetic Systematics
5. Generalize the characters of the families according to Bentham & Hooker's system of classification.

Course Outcome of BOT A CC-4-8 (Plant Geography, Ecology and Evolution)

On completion of this course students will be able :-

1. To gain knowledge about the fundamentals of ecology and get an idea about ecotone and microclimate.
2. To assess the different levels of community structure in an ecosystem and the different types of plant succession on different substrates.
3. To understand the importance of phytoremediation in nature to restore fertility of soil.
4. To develop a core understanding of the concept of biodiversity also the types of conservation strategies, like ex-situ and in-situ conservation.

5. To know about the distribution of Phytogeographical regions of India and Knowledge about the dominant flora.
6. To understand the importance of endemism and its type.
7. To get a brief idea on selection, speciation and coevolution
8. To know about the phylogenetic tree and simplified phylogeny of different plant groups

Course Outcome of BOT A CC- 4 -9 (Economic Botany)

On completion of this Course students will be able

1. To develop critical understanding on the evolution of new crops and importance of germplasm diversity
2. To know about the origin of cultivated crops and their domestication
3. To understand the core concepts of Economic Botany and relate with environment and communities
4. To increase the awareness and appreciate the diversity of plants and plant products used in our everyday life
5. To get an idea about cultivation of some important crops both theoretically and by field visit
6. To know about the morphology, processing, uses and health hazards of some drug yielding plants and other crops having economic importance

Course Outcome of BOT A CC-4-10 (Genetics)

On completion of the course, students will :-

1. Have a sound concept of the Mendelian genetics, laws of inheritance, along with the extensions of the inheritance ratios that exist.
2. Be able to differentiate between the types of linkages, and solve analytical problems related to gene mapping of three point test cross.
3. Have a vivid understanding of the types of numerical and structural aberrations of chromosomes, also the effects of physical and chemical mutagens.
4. Be able to analyse the various effects of pollutants or pesticides on dividing cells causing different chromosomal abnormalities.
5. Develop practical skill of pre-treatment and subsequent study of somatic chromosomal karyotype.

Course Outcomes of BOT A CC-5-11 (Cell and Molecular Biology)

On completion of the course, students will :-

1. Have an overall knowledge of Cell structure and function at molecular level.
2. Develop an idea about various concepts on the origin of life on earth, RNA world, how eukaryotes developed from prokaryotes, etc.
3. Be able to understand the detailed structure of nucleus, its components, how proteins and RNA molecules are transported selectively through the specialized pores present on nuclear envelope, molecular nature of nucleolus and its role in production of ribosomes.
4. Be able to relate how central dogma works for the cell and how it is regulated.
5. Have a vivid understanding of what is cell cycle and how cell cycle progression is regulated with preliminary ideas of apoptosis and cancer.
6. Develop knowledge on how recombinant DNA technology works, different types of restriction enzymes, vectors and markers used in the cloning process.
7. Have hands-on experience in studying cellular details with various cytogenetic and biochemical techniques.

Course Outcome of BOT-A-CC-5-12 (Biochemistry)

On completion of this course, the students will be able to:

1. Develop understanding on chemical bonding among molecules
2. Identify the concept that explains chemical composition and structure of cell wall and membrane
3. Classify the enzymes and explain mechanism of action and structure
4. Compare the structure and function of cells & explain the development of cells
5. Describe the relationship between the structure and function of biomolecules

Course Outcome of BOT-A-CC-6-13 (Plant Physiology)

On completion of this course, the students will be able to:

1. Understand Water relation of plants with respect to various physiological processes.
2. Explain chemical properties and deficiency symptoms in plants
3. Classify aerobic and anaerobic respiration
4. Develop understanding on structure and basic knowledge of different plant growth regulators and their physiological roles.
5. Develop knowledge on photomorphogenesis
6. Assess dormancy and germination in plants

Course Outcome of BOT-A-CC-6-14 (Plant Metabolism)

On completion of this course, the students will be able to:

1. Differentiate anabolic and catabolic pathways of metabolism
2. Develop detailed understanding on photosynthesis
3. Develop detailed understanding on respiration
4. Recognize the importance of Carbon assimilation in photorespiration
5. Explain the ATP-Synthesis
6. Interpret the Biological nitrogen fixation in metabolism
7. Develop critical understanding on signal transduction

Course Outcomes of BOT A SEC A-3-1 (Applied Phycology, Mycology and Microbiology)

On completion of the course, students will be able to

1. Develop and gain knowledge about the different biotechnological uses of algae
2. Know about the Industrial application of fungi.
3. Gain knowledge about the Pharmaceutical uses of fungi
4. Understand the role of microbes in agriculture and industrial products
5. Know about the use of microbes as biofertilizer, biopesticides and in mineral processing

Course Outcomes of BOT A SEC A-3-2 (Biofertilizers)

On the completion of this course, the students will be able to

1. Develop their understanding on the concept of bio-fertilizer
2. Identify the different forms of biofertilizers and their uses
3. Compose the Green manuring and organic fertilizers
4. Develop the integrated management for better crop production by using both nitrogenous and phosphate bio fertilizers and vesicular arbuscular mycorrhizal (VAM).
5. Interpret and explain the components, patterns, and processes of bacteria for growth in crop production

Course Outcomes of BOT A SEC B-4-3 (Plant Breeding)

On completion of the course, students will:-

1. Be able to gain knowledge on core concepts of plant breeding with its objectives and limitations of use.
2. Develop understanding of plant genetic resources and how they function.
3. Be able to classify the different modes of selection and techniques in various breeding programmes, including molecular breeding and their scope of usage in real time scenarios.
4. Have a panoramic idea on the genetic basis of heterosis, types of male sterility and effects of inbreeding

Course Outcome of BOT A SEC-B-4-4 (Mushroom Culture Technology)

On completion of this course, the students will be able to:

1. Recall various types and categories of mushrooms.
2. Demonstrate various types of mushroom cultivation technologies.
3. Examine various types of food technologies associated with the mushroom industry.
4. Value the economic factors associated with mushroom cultivation
5. Device new methods and strategies to contribute to mushroom production.
6. Know about the nutritional and medicinal values of mushrooms.

Course Outcome of BOT A DSE A -5-1(Biostatistics)

On completion of the course, students will

1. Gain a conceptual knowledge of all the statistical principles, their uses in various aspects of biological applications and its limitations too.
2. Develop understanding of the laws of probability and ways to implement them.
3. Develop the skill of calculating correlation coefficient values and F values from random samples.
4. Be able to determine the goodness of fit for a given population sample and infer regarding their inheritance nature,
5. Inculcate basic computing knowledge for statistical analysis of samples.

Course Outcome of BOT A DSE A-5-2 (Industrial and Environmental Microbiology)

On Completion of this Course students will be able

1. To get acquainted with broad theoretical and practical skills in Industrial and Environmental Microbiology.
2. To analyze the types of bioreactors and the process of fermentation
3. To understand the role of microbes in agriculture and industrial products
4. To develop skills on the bioremediation of contaminated soils
5. To examine the role of immobilized enzymes and microbial enzymes of industrial interest
6. To analyze microbiology of waste water and its implications

Course Outcome of BOT-A-DSE-A-6-3 (Medicinal and Ethnobotany)

On completion of this course, the students will be able to:

1. Understand the importance of Pharmacognosy in modern medicine
2. Know about the major pharmacological groups of plant drugs and their uses
3. Get an idea about indigenous medicinal sciences
4. Recognize the basic medicinal plants and propose new strategies to enhance their growth
5. Conceptualize ethnobotany as an interdisciplinary science

6. Categorize various ethnic communities of India and their environmental practices
7. Get acquainted with some major pharmacologically active constituents and application of natural products to various human ailments

Course Outcome of BOT-A-DSE-A-6-4 (Stress Biology)

On completion of this course, the students will be able to:

1. Understand the different environmental factors responsible for plant stress.
2. Know about stress sensing mechanism in plants
3. Understand the developmental and physiological mechanisms that protect plants against environmental stress
4. Evaluate the importance of production and scavenging mechanism of reactive oxygen species
5. Get an idea about systemic acquired resistance in plant

Course outcome of BOTA-DSE-B-5-5 (Plant Biotechnology)

On the completion of the course the students will be able to

1. Understand the core concepts and fundamentals of Plant tissue culture, plant biotechnology and genetic engineering
2. Develop their competency on different types of plant tissue culture techniques
3. Understand the enzymes and vectors used for recombinant DNA technology
4. Develop understanding of gene cloning and evaluate different methods of gene transfer
5. Critically analyze the major concerns and applications of transgenic technology

Course Outcome of BOT-A-DSE-B-5-6 (Horticultural Practices and Post-Harvest Technology)

On completion of this course, the students will be able to:

6. Understand the different classifications of horticultural crops, nursery management, and use of technology in horticulture.
7. Develop their competency on pre and post-harvest technology in horticultural crops
8. Examine the economic implications of cultivation of tropical and sub-tropical vegetable crop
9. Evaluate the importance of floriculture and contribution spices and condiments on economy
10. Reflect upon different Landscaping practices and garden design

Course Outcome of BOT-A-DSE-B-6-7 (Research Methodology)

On completion of this course, the students will be able to:

1. Understand the concept of research and different types of research in the context of biology
2. Develop laboratory experiment related skills.
3. Develop competence on data collection and process of scientific documentation
4. Analyze the ethical aspects of research
5. Evaluate the different methods of scientific writing and reporting

Course Outcome of BOT-A-DSE-A-6-8 (Natural resource management)

At the end of the course the students will be able to

1. Understand the concept of different natural resources and their utilization.
2. Critically analyze the sustainable utilization land, water, forest and energy resources.
3. Evaluate the management strategies of different natural resources.
4. Reflect upon the different national and international efforts in resource management and their conservation

BOTANY GENERAL

Course Outcome of BOTG-CC-1 (Plant Diversity- Phycology, Mycology, Phytopathology, bryophytes and Anatomy)

On completion of this course, the students will be able to:

1. Understand the fundamental concepts related to microbes, algae, fungi and Bryophytes
2. To know the role of algae in environment
3. Evaluate the significance of fungi and its different types.
4. Importance of lichen and mycorrhiza
5. Understand the fundamental concepts of plant anatomy. Analyze and recognize the different organs of plant and secondary growth
6. To gain knowledge about the different diseases in plants and their control.

Course Outcome of BOTG-CC-2 (Plant diversity II- Pteridophytes, Gymnosperms, Palaeobotany, Morphology and Taxonomy)

On completion of this course, the students will be able to:

1. Understand the fundamental concepts related to pteridophytes, gymnosperms, Palaeobotany, Morphology and Taxonomy.
2. Develop critical understanding on morphology, anatomy and reproduction of Pteridophytes and Gymnosperms
3. Understanding of plant evolution and their transition to land habitat.
4. Classify Plant systematics and recognize the importance of herbarium and Virtual herbarium
5. Evaluate the Important herbaria and botanical gardens
6. Interpret the rules of ICN in botanical nomenclature
7. Generalize the characters of the families according to Bentham & Hooker's system of classification

Course Outcome of BOTG- CC-3 (Cell Biology, Genetics and Microbiology)

On completion of this course, the students will be able to:

1. Have a sound knowledge of the molecular organisation of chromosome, along with the structure of nuclear envelope and nuclear pore.
2. Differentiate between the types of linkages of genes and also get an overview of the gene mapping concept.
3. Understand about the various numerical and structural aberrations of chromosomes, as well as the effects of certain physical and chemical mutagens.
4. Integrate the entire pathway of genetic flow through the concept of Central Dogma.
5. Assess the different principles of genetic code.
6. Classify viruses based on their characteristics and structures
7. Examine the general characteristics of bacteria and their cell reproduction/ recombination
8. Increase the awareness and appreciation of human friendly viruses, bacteria and their economic importance

Course Outcome of BOTG-CC-4 (Plant Physiology and Metabolism)

On completion of the course, students will be able to:

1. Understand the structure and function of protein
2. Understand the transport process in plants
3. Develop knowledge on transpiration and its significance

4. Develop knowledge on photosynthesis and its significance
5. Develop knowledge on respiration and its significance
6. Interpret the biological nitrogen fixation in metabolism
7. Develop understanding on structure and basic knowledge of different plant growth regulators and their physiological roles.
8. Develop knowledge on photoperiodism
9. Develop knowledge on senescence

Course Outcome of BOT-G-SEC-A-3/5-1 (Plant breeding and Biometry)

On completion of the course, students will be able to:-

1. Understand the core concepts of plant breeding with its objectives.
2. Develop understanding of plant hybridization techniques and concepts of heterosis.
3. Classify the different modes of selection and techniques in various breeding programmes, including role of mutation, polyploidy, distant hybridization and role of biotechnology in crop improvement.
4. Have a panoramic idea on the basics of biometry and test of significance for biostatistical analysis.

Course Outcome of BOT-G-SEC-A-3/5-2 (Biofertilizers)

On the completion of this course, the students will be able to

1. Develop their understanding on the concept of bio-fertilizer
2. Identify the different forms of biofertilizers and their uses
3. Compose the Green manuring and organic fertilizers
4. Develop the integrated management for better crop production by using both nitrogenous and phosphate bio fertilizers and vesicular arbuscular mycorrhizal (VAM).
5. Interpret and explain the components, patterns, and processes of bacteria for growth in crop production

Course Outcome of BOT-G-SEC-B-4/6-3 (Plant Biotechnology)

On the completion of the course the students will be able to

1. Understand the core concepts and fundamentals of Plant tissue culture, plant biotechnology and genetic engineering.
2. Develop an idea on different types of plant tissue culture techniques
3. Gain knowledge about recombinant DNA technology and different enzymes and vectors used for the process.
4. Understand the idea of gene cloning technique.
5. Develop knowledge about the major achievements in crop biotechnology.

Course Outcome of BOT-G-SEC-B-4/6-4 (Mushroom culture technology)

On the completion of the course the students will be able to

1. Demonstrate various types of mushroom cultivation technologies.
1. Knowledge about the various types of food technologies associated with the mushroom industry.
2. Value the economic factors associated with mushroom cultivation
3. Device new methods and strategies to contribute to mushroom production.
4. Know about the nutritional and medicinal values of mushrooms.

DSE

1. Phytochemistry and Medicinal botany

On the completion of the course the students will be able to

1. Understand the history, scope of medicinal plants and importance of pharmacognosy in modern medicine
2. Know about the major pharmacological groups of plant drugs and their uses
3. Get a brief idea about indigenous medicinal sciences
4. Recognize the basic medicinal plants and propose new strategies to enhance their growth
5. Conceptualize ethnobotany as an interdisciplinary science
6. Get acquainted with organoleptic evaluation of crude drugs and folk medicine

2. Natural Resource Management

At the end of the course the students will be able to

1. Understand the concept of different natural resources and their utilization.
2. Critically analyze the sustainable utilization land, water, forest and energy resources.
3. Evaluate the management strategies of different natural resources.
4. Reflect upon the different national and international efforts in resource management and their conservation

3. Economic Botany

On completion of this course, the students will be able to:

1. Understand core concepts of Economic Botany and relate with environment, populations, communities, and ecosystems
2. Develop critical understanding on the evolution of concept of organization of apex new crops/varieties, importance of germplasm diversity, issues related to access and ownership
3. Develop a basic knowledge of taxonomic diversity and important families of useful plants
4. Increase the awareness and appreciation of plants & plant products encountered in everyday life
5. Appreciate the diversity of plants and the plant products in human use

4. Horticultural practices and post-harvest technology

On completion of this course, the students will be able to:

1. Understand the concept of different types of horticultural practices for value addition
2. Visualize the post-harvest problems likely to be confronted
3. Know the tricks of the trade and how to increase the longevity of the produce
4. Reflect upon different Landscaping practices and garden design

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Department of Chemistry

Course Outcomes B. Sc Chemistry

After completion of these courses students should be able to-

B. Sc. Chemistry Hons (SEM I)

CEMA-CC-1-1-TH: (Credits: Theory-04, Practicals-02)

CEMA-CC-1-2-TH: (Credits: Theory-04, Practicals-02)

Organic chemistry-1

Nomenclature of Organic Compounds

To make student understand different organic compounds with respect to the functional group and become eligible to call the name of the organic compounds scientifically

Basic Concepts in Organic Chemistry

Students become eligible to study the subject initially by understanding the basic things for chemical reactions i.e. Substrate and Reagents Types of reagents Electrophilic and Nucleophilic, Homolytic and heterolytic fission. Electron mobility Inductive effect etc. and also various types of theory which involved in organic reaction Valence Bond Theory, MO theory etc.

Stereochemistry and Reaction Mechanism I and II

To make student understand the basic knowledge over reaction mechanism of organic reaction like: addition, elimination and substitution reactions (definition and example); nature of bond cleavage and bond formation: homolytic and heterolytic bond fission, homogenic and heterogenic bond formation; curly arrow rules in representation of mechanistic steps; reagent type: electrophiles and nucleophiles and also reactive intermediates

Discuss kinetics, mechanism and stereochemistry of SN1 and SN2 reactions. Compare between E1 and E2 reactions. Understand the evidences, reactivity and mechanism of various elimination and substitution reactions

Inorganic chemistry-1

Periodic Table and Periodic Properties

To make student understand the modern periodic table which stand the backbone in understanding Chemistry and the periodic properties like ***Atomic and Ionic size Ionization Energy Electron Affinity Electro negativity*** and making student understand S Block elements in detail

Acid-Base reactions

This portion of the curriculum is the one part of acid base reaction. Discuss main concept on theory of Acid-Base like Arrhenius concept, theory of solvent system (in H_2O, NH_3, SO_2 and HF), Bronsted-Lowry's concept, relative strength of acids, Pauling's rules. Lux- Flood concept, Lewis concept, group characteristics of Lewis acids, solvent levelling and differentiating effects. Thermodynamic acidity parameters, Drago-Wayland equation. Superacid, Gas phase acidity and proton affinity; HSAB principle. Acid-base equilibria in aqueous solution (Proton transfer equilibria in water), pH, buffer. Acid-base neutralisation curves; indicator, choice of indicators.

Oxidation and reduction:

The loss of the metal in the industrial and non-industrial zones **across** the world is Billions of the economy due to rusting or corrosion of the metals due to chemical oxidation thus making student aware of definition of oxidation, Reduction, Oxidizing agent and reducing agents according to classical concept electronic concept, oxidation number concept. Rules for assigning oxidation number, balancing of redox reaction etc so that they could contribute in world economy development

Physical Chemistry-1

Explain the postulates of kinetic theory of gases and derive the kinetic gas equation

Describe Maxwell's distribution of molecular velocities

Discuss the deviation of real gases from ideal behaviour, derive van der Waals' equation of state, and explain its significance

Explain critical phenomena and determination of critical constants

Introduce general properties of liquid state

Describe in detail vapour pressure and surface tension and important applications
Explain viscosity and its measurement and also discuss how molar refraction measurements are useful in the structural elucidation
Students will be able to understand details on diffusion and viscosity

Laboratory Course – I
A) Inorganic Chemistry
Identification of Two acidic and Two basic radicals by Semi-micro qualitative analysis technique.(Including interfering radicals). (Any Six)
B) Organic Chemistry
Organic preparation, determination of boiling point
C) Physical Chemistry (Any Six)
Experiment in kinetics, viscometry, eudiometry, stalagmometry**,** phase rule

B. Sc. Chemistry Hons (SEM II)
CEMA-CC-2-3-TH: (Credits: Theory-04, Practicals-02)
CEMA-CC-2-4-TH: (Credits: Theory-04, Practicals-02)
Students will be able to understand following things after studying B. SC. HONS-SEM-II

Inorganic Chemistry-2
This paper includes following units which inculcates the better understanding of the inorganic chemistry and to have qualities of chemist
1. Chemical Bonding-I Ionic Bonding: Covalent bonding: Metallic bonding: Vander Waal's bonding: Hydrogen bonding
Chemical bonding-II Concept of hybridization: VSEPR Theory: Molecular Orbital Theory
2. Radioactivity Nuclear forces: Nuclear models (elementary idea):Nuclear Reactions: Radio chemical methods:

Organic Chemistry-2
This paper includes following units which inculcates the better understanding of the organic chemistry and to have qualities of chemist
1. Stereochemistry II Chirality arising out of stereoaxis: Concept of prostereoisomerism: Conformation:
2. Reaction Mechanism III Reaction thermodynamics: Tautomerism: Reaction kinetics:
3. Substitution and Elimination Reactions Free-radical substitution reaction: Nucleophilic substitution reactions: Elimination reactions:
Students will be able to understand following practical

1) Physical Chemistry: Lab
Experiment 1: Study of kinetics of decomposition of H_2O_2
Experiment 2: Study of kinetics of acid-catalyzed hydrolysis of methyl acetate
Experiment 3: Study of viscosity of unknown liquid (glycerol, sugar) with respect to water.
Experiment 4: Study of the variation of viscosity with the concentration of the solution
Experiment 5: Determination of solubility of sparingly soluble salt in water, in electrolyte with common ions and in neutral electrolyte (using common indicator)

2) Organic Chemistry: Lab

Determination of boiling point of common organic liquid compounds [ANY FIVE] nbutyl alcohol, cyclohexanol, ethyl methyl ketone, cyclohexanone, acetylacetone,isobutyl methyl ketone, isobutyl alcohol, acetonitrile, benzaldehyde and acetophenone. [Boiling points of the chosen organic compounds should preferably be within 180^{0}C].

B. Sc. Chemistry Hons (SEM III)

CEMA-CC-3-5-TH: (Credits: Theory-04, Practicals-02)

CEMA-CC-3-6-TH : (Credits: Theory-04, Practicals-02)

CEMA-CC-3-7-TH: (Credits: Theory-04, Practicals-02)

After completion of these courses students should be able to the following matters;

Physical Chemistry-3

Chemical Thermodynamics I: 1st law of Thermodynamics and Thermochemistry

Chemical Thermodynamics II: Second Law; Thermodynamic relations: Maxwell's relations; Gibbs-Helmholtz equation, Joule-Thomson experiment and its consequences; inversion temperature; Joule Thomsonn coefficient for a van der Waals gas; General heat capacity relations and Chemical Equilibrium

Electrochemistry: Conductance and transport number and Ionic equilibrium, Electromotive Force

Inorganic Chemistry-3

Enable the students to understand:-

Chemical periodicity, Chemistry of *s* and *p* Block Elements, Noble Gases and Inorganic Polymers and also Coordination Chemistry-I

Organic Chemistry-3

This course is very important for the student. This course gives student idea about the following units Chemistry of alkenes and alkynes, Carbonyl and Related Compounds and Organometallics

3) Organic Chemistry: Lab

Student should be able to identify the organic solid and liquid compound in practical course

Identification of a Pure Organic Compound

Solid compounds: oxalic acid, tartaric acid, citric acid, succinic acid, resorcinol, urea, glucose, cane sugar, benzoic acid and salicylic acid

Liquid Compounds: formic acid, acetic acid, methyl alcohol, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehyde, chloroform and nitrobenzene

Quantitative Estimations

1. Estimation of glycine by Sörensen’s formol method
2. Estimation of glucose by titration using Fehling’s solution
3. Estimation of sucrose by titration using Fehling’s solution
4. Estimation of aromatic amine (aniline) by bromination (Bromate-Bromide) method
5. Estimation of acetic acid in commercial vinegar
6. Estimation of urea (hypobromite method)
7. Estimation of saponification value of oil/fat/ester

B. Sc. Chemistry Hons (SEM IV)

CEMA-CC-4-8-TH: (Credits: Theory-04, Practicals-02)
CEMA-CC-4-9-TH: (Credits: Theory-04, Practicals-02)
CEMA-CC-4-10-TH: (Credits: Theory-04, Practicals-02)

After completion of these courses students should be able to the following matters and understand about the topics;

Organic Chemistry-4

Nitrogen compounds, Rearrangements, The Logic of Organic Synthesis, Organic Spectroscopy

Physical Chemistry -3

Colligative properties: Phase Equilibrium: Foundation of Quantum Mechanics Crystal Structure

Inorganic Chemistry-4

Coordination Chemistry-II, Chemistry of d- and f- block elements, Reaction Kinetics and Mechanism

Organic Practical-4

Student can perform and prepare a various experiments
Experiment 1: Kinetic study of inversion of cane sugar using a Polarimeter
(Preferably Digital)
Experiment 2: Study of Phase diagram of Phenol-Water system.
Experiment 3: Determination of partition coefficient for the distribution of I_2 between
water and CCl_4
Experiment 4: Determination of pH of unknown solution (buffer), by colour matching method
Experiment 5: pH-metric titration of acid (mono- and di-basic) against strong base
Experiment 6**:** pH-metric titration of a tribasic acid against strong base.

Inorganic Practical-4

Inorganic preparations

1. $[Cu(CH_3CN)_4]PF_6/ClO_4$; 2. *Cis* and *trans* $K[Cr(C_2O_4)_2(H_2O)_2]$; 3. Potassium diaquadioxalatochromate(III); 4. Tetraamminecarbonatocobalt (III) ion; 5. Potassium tris(oxalato)ferrate(III); 6. Tris-(ethylenediamine) nickel(II) chloride; 7. $[Mn(acac)_3]$ and $Fe(acac)_3$] (acac= acetylacetonate)

B. Sc. Chemistry Hons (SEM V)

CEMA-CC-5-11-TH: (Credits: Theory-04, Practicals-02)
CEMA-CC-5-12-TH: (Credits: Theory-04, Practicals-02)

After completion of these courses students should be able to the following matters and understand about the topics;

Physical Chemistry - 4

Quantum Chemistry II: Simple Harmonic Oscillator: Angular momentum: Hydrogen atom and hydrogen-like ions: LCAO

Statistical Thermodynamics; Numerical Analysis: Roots of Equation: Numerical methods for finding the roots of equations: Quadratic Formula, Iterative Methods (e.g., Newton Raphson Method). Least-Squares Fitting. Numerical Differentiation. Numerical Integration(Trapezoidal and Simpson's Rule)

Organic Chemistry– 5

Heterocyclic compounds are very interesting due to their distinct structure and the availability of this kind of heterocyclic structures in medicinal drugs. So the technique of synthesis of heterocyclic compounds is important in the synthesis of different drugs. This course gives the quantitative ideas about the synthesis, properties and uses of such heterocyclic compounds like pyrole, pyridine qunolene, thiophene, furan etc.

Pericyclic reactions are used in a vast way in nature and also by organic chemist. This course gives the student the theoretical basis of this kind of reaction and also helps them to find away to carry out these types of reaction.

Carbohydrates, starch etc. are different class of macromolecules consisting of preliminary units like glucose, mannose etc. Their structure are also a matter of constant study due to their uniqueness. The are available in different foods like potato and recently they are being used in medicinal sciences also. This course deals with determination of structure of these class of chemicals and also their preliminary units. Inter-conversion of one preliminary unit to other is also discussed here.

Biomolecules: Proteins are important kind of chemicals in biological bodies. The preliminary unit of proteins are amino acids. This course discussed the methods of synthesis of proteins. Also the conversion of one amino acid to other by protection and de-protection of different groups are also discussed here.

Computer Lab-1

After completion of these courses students should be able their knowledge about computer. To make student understand the basic knowledge over the following matters related computer

Computer programs (Using FORTRAN or C or C ++) based on numerical methods:

Organic Practical-4

Chromatographic Separations of a mixture containing 2/3 amino acids and dyes; Spectroscopic Analysis of Organic Compounds: 1. Assignment of labelled peaks in the 1H NMR spectra of the known organic compounds explaining the relative δ-values and splitting pattern. 2. Assignment of labelled peaks in the IR spectrum of the same compound explaining the relative frequencies of the absorptions (C-H, O-H, N-H, C-O, C-N, C-X, C=C, C=O, N=O, C≡C, C≡N stretching frequencies; characteristic bending vibrations are included)

B. Sc. Chemistry Hons (SEM VI)

CEMA-CC-6-13-TH: (Credits: Theory-04, Practicals-02)

CEMA-CC-6-14-TH: (Credits: Theory-04, Practicals-02)

Inorganic Chemistry-5

Theoretical Principles in Qualitative Analysis; Bioinorganic Chemistry, Organometallic Chemistry, Catalysis by Organometallic Compounds

Physical Chemistry-5

Molecular Spectroscopy

Interaction of electromagnetic radiation with molecules and various types of spectra; Rotation spectroscopy, Vibrational spectroscopy, Electronic Spectroscopy: Raman spectroscopy:

Photochemistry and Theory of reaction rate: Lambert-Beer's law: Rate of Photochemica, Collision theory of reaction rate (detailed treatment). Lindemann theory of unimolecular reaction; Outline of Transition State theory (classical treatment) . Primary Kinetic Salt Effect.

Surface phenomenon: In majority of the daily routine thing used for its surface utilization and therefore understanding the surface phenomenon's like Adsorption, mechanism of adsorption, factors affecting Adsorption, difference between adsorption and absorption types of adsorption is important etc. Dipole moment and polarizability:

Inorganic Practical-5

Qualitative semimicro analysis of mixtures containing not more than three radicals like Cation Radicals: Anion Radicals: Insoluble Materials:

Physical Chemistry: Lab

Experiment 1: Determination of surface tension of a liquid using Stalagmometer
Experiment 2: Determination of the indicator constant of an acid base indicator spectrophotometrically
Experiment 3: Verification of Beer and Lambert's Law for $KMnO_4$ and $K_2Cr_2O_7$ solution
Experiment 4: Study of kinetics of $K_2S_2O_8$ + KI reaction, spectrophotometrically
Experiment 5: Determination of pH of unknown buffer, spectrophotometrically
Experiment 6: Determination of CMC of a micelle from Surface Tension Measurement.

Students will be able to:

Discipline Specific Courses (DSE)

For Semester 5

Any One from The Following
Dse-A1: Molecular Modelling & Drug Design **(Credits: Theory-04, Practicals-02)**
Dse-A2: Applications of Computers in Chemistry **(Credits: Theory-04, Practicals-02)**
Any One from The Following
Dse-B1: Inorganic Materials of Industrial importance **(Credits: Theory-04, Practicals-02)**
Dse-B2: Novel Inorganic Solids **(Credits: Theory-04, Practicals-02)**

For Semester 6

Any One from The Following
Dse-A3: Green Chemistry and Chemistry of Natural Products **(Credits: Theory-04, Practicals-02)**
Dse-A4: Analytical Methods in Chemistry **(Credits: Theory-04, Practicals-02)**
Any One from The Following
Dse-B3: Polymer Chemistry **(Credits: Theory-04, Practicals-02)**
Dse-B4: Dissertation **(Credits: 06)**

Skill Enhancement Courses (SEC)

Sec-A for Semester 3 [Any One]

Sec 1 – Mathematics and Statistics for Chemists **(Credits: 2)**
Sec 2 – Analytical Clinical Biochemistry **(Credits: 2)**

Sec-B for Semester 4 [Any One]

Sec -3 – Pharmaceuticals Chemistry **(Credits: 2)**
Hands on Practical

1. Preparation of Aspirin and its analysis.
2. Preparation of magnesium bisilicate (Antacid).

Sec-4 - Pesticide Chemistry (Credits: 02)
Hands on Practical
1 To calculate acidity/alkalinity in given sample of pesticide formulations as per BIS specifications.
2 Preparation of simple organophosphates, phosphonates and thiophosphates

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

- To be able to independently design, implement, and report the results of a semester-long research project, with appropriate guidance from the instructor as needed;
- To demonstrate proficiency in literature searches and use of database resources as a tool for designing and implementing their semester-long project;
- To be able to independently execute synthetic and analytical experimental procedures found in the scientific literature in physical and inorganic chemistry safely and efficiently;
- To reinforce concepts previously learned in physical, analytical, and inorganic chemistry courses by applying them in a laboratory setting;
- To recognize potential shortcomings in a scientific procedure and develop alternate plans in the face of unsuccessful procedures; and
- To demonstrate the ability to present the results of a project, both in an oral presentation and in a written journal-style scientific paper.

Department of Computer Science

Course Specific Outcome

Computer Science Hons. Semester I:

CMS-A-CC-1-1-TH (Digital Logic) and CMS-A-CC-1-1-P (Digital Circuits):
After successfully completing this course, students will be able to:
CO1: Gain knowledge between different types of number systems, and their conversions.
CO2: Design various logic gates and simplify Boolean equations.
CO3: Design various flip flops, shift registers and determining outputs.
CO4: Design different types of counters.

CMS-A-CC-1-2-TH (Programming Fundamentals using C) and CMS-A-CC-1-2-P (Programming in C):
After successfully completing this course, students will be able to:
CO1: Students will prepare themselves to think about programming languages analytically. They will be able to separate syntax from semantics.
CO2: Students will be able to understand how language features work like Data types, control flow, Subroutines, Data abstraction etc. students will Learn new languages more quickly and Use standard vocabulary when discussing languages.

CO3: Students will develop a greater understanding of the issues involved in programming language design and implementation. Students will familiar with design issues of object – oriented and functional languages
CO4: Students will learn Functional, Logic Languages like Prolog, Lisp.
CO5: Students will know how to analyze semantic issues associated with function implementations, including variable binding, scoping rules, parameter passing.

Computer Science Hons. Semester II:

CMS-A-CC-2-3-TH (Data structure) and CMS-A-CC-2-3-P (Data structure using C)
After successfully completing this course, students will be able to:
CO1: Ability to analyze algorithms and algorithm correctness.
CO2: Ability to summarize searching and sorting techniques
CO3: Ability to describe stack, queue and linked list operation.
CO4: Ability to have knowledge of tree and graphs concepts.

CMS-A-CC-2-4-TH (Basic Electronic Devices and Circuits) and CMS-A-CC-2-4-P (Basic Electronic Devices and Circuits):
After successfully completing this course, students will be able to:
CO1: To study basics of semiconductor & devices and their applications in different areas.
CO2: To study different biasing techniques to operate transistor, FET, MOSFET and operational amplifier in different modes.
CO3: Analyze output in different operating modes of different semiconductor devices.
CO4: Compare design issues, advantages, disadvantages and limitations of basic electronics.

Computer Science Hons. Semester III:

CMS-A-CC-3-5-TH (Computer Organization & Architecture) and CMS-A-CC-3-5-P (Computer Organization Lab):
After successfully completing this course, students will be able to:
CO1: Demonstrate computer architecture concepts related to design of modern processors, memories and I/Os.
CO2: Analyze the performance of commercially available computers.
CO3: To develop logic for assembly language programming

CMS-A-CC-3-6-TH (Computational Mathematics) and CMS-A-CC-3-6-P (Computational Mathematics Lab):
After successfully completing this course, students will be able to:
CO1: To develop inductive and deductive skills in reasoning.
CO2: To understand the significance of central mathematical theorems and their applications
CO3: To appreciate the precision and breadth presented in mathematical theories.
CO4: To develop and foster abstract mathematical thinking.
CO5: To be able to reason and compute with mathematical structures, make a conjecture and prove it, generalize, analyze, and abstract a result.
CO6: To explore the consequences of a general mathematical result in concrete situations.

CMS-A-CC-3-7-TH (Operating Systems) and CMS-A-CC-3-7-P (Operating Systems Lab):
After successfully completing this course, students will be able to:
CO1: Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.
CO2: Analyze important algorithms eg. Process scheduling and memory management algorithms.
CO3: Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques.
CO4: Demonstrate the ability to perform OS tasks in Red Hat Linux Enterprise.

CMS-A-SEC-A-3-1-TH (Computer Graphics):
After successfully completing this course, students will be able to:
CO1: Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
CO2: Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
CO3: Use of geometric transformations on graphics objects and their application in composite form.
CO4: Extract scene with different clipping methods and its transformation to graphics display device.
CO5: Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.
CO6: Render projected objects to naturalize the scene in 2D view and use of illumination models for this.

CMS-A-SEC-A-3-2-TH (IoT (Internet of Things):
After successfully completing this course, students will be able to:
CO1: Students will understand the basic components of Network Programming
CO2: Students will understand how these components are used in different project on networks using client-server Technology.
CO3: Students will understand how to Transmit data over network.
CO4: Student will understand which is the best protocol for the Transmission of data which cause less failure on network.
CO5: Student will understand how to recover from the failure if any occurs on network.

Computer Science Hons. Semester IV:

CMS-A-CC-4-8-TH (Data communication, Networking and Internet technology) and CMS-A-CC-4-8-P (Computer Networking and Web Design Lab)
After successfully completing this course, students will be able to:
CO1: Students will understand the basic components of Networking.
CO2: Students will understand how these components are used in different project. CO3: Students will understand how to write research paper for innovative idea.
CO4: Cryptography technique knowledge for understanding various Algorithm for security. CO5: Internet Security protocol used for e-business and e-Banking security.

CMS-A-CC-4-9-TH (Introduction to Algorithms & its Application) and CMS-A-CC-4-9-P (Algorithms Lab)
After successfully completing this course, students will be able to:

CO1: Students will learn fundamental concepts of asymptotic notations of an algorithm, Space & Time Complexity, Searching & Sorting Algorithms, Divide and Conquer techniques.
CO2: Students will know various design and analysis techniques such as greedy algorithms, dynamic programming.
CO3: Student will understand the techniques used for designing of different graph algorithms.
CO4: Students will learn how to apply backtracking, branch and bound techniques for real time problems.
CO5: Students will know the concepts of P, NP and NP-Complete problems.

CMS-A-CC-4-10-TH (Microprocessor and its Applications) and CMS-A-CC-4-10-P (Programming with Microprocessor 8085)

After successfully completing this course, students will be able to:
CO1: Understand the taxonomy of microprocessors and knowledge of contemporary microprocessors.
CO2: Describe the architecture, bus structure and memory organization of 8085 as well as higher order microprocessors.
CO3: Explore techniques for interfacing I/O devices to the microprocessor 8085 including several specific standard I/O devices such as 8251 and 8255.
CO4: Demonstrate programming using the various addressing modes and instruction set of 8085 microprocessor.
CO5: Design structured, well commented, understandable assembly language programs to provide solutions to real world control problems

CMS-A-SEC-B-4-1-TH (Information Security)

After completing the course, students will able to:
CO1: Illustrate the concepts of Network Security and Compare Various Symmetric and Asymmetric Cryptographic methods used for Network Security.
CO2: Classify various Algorithms to be used at various TCP/IP Layers & to operate Digital Signature in Real World Situation
CO3: Summarize different Authentication Techniques & Describe programs like PGP & S/MIME
CO4: Implement IP Security Architecture &Transport Layer Security to identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks, and apply them to design and evaluate counter-measure tools
CO5: Implement Firewall design principles and identify various intrusion detection systems and be able to achieve highest system security

CMS-A-SEC-B-4-2-TH (E-Commerce)

After successfully completing this course, students will be able to:
CO1: Analyze the impact of E-commerce on business models and strategy.
CO2: Describe the major types of E-commerce.
CO3: Explain the process that should be followed in building an E-commerce presence.
CO4: Identify the key security threats in the E-commerce environment.
CO5: Describe how procurement and supply chains relate to B2B E-commerce.

Computer Science Hons. Semester V:

CMS-A-CC-5-11-TH (Database Management system, DBMS) and CMS-A-CC-5-11-P (RDBMS lab using My SQL & PHP)

After successfully completing this course, students will be able to:
CO1: Students will understand the basic concepts of Distributed Database.
CO2: Students will understand how these concepts are used in different project where the data is concern.
CO3: Students will understand how to store, manipulate and maintain the data if it is Distributed over multiple sites at time.
CO4: Student will understand which is the best as well feasible technique to store data into database.
CO5: Student will understand how to recover from the failure by using algorithms, if any occurs.

CMS-A-CC-5-12-TH (Object Oriented Programming, OOPs) and CMS-A-CC-5-12-P (OOPs Lab using JAVA)
After successfully completing this course, students will be able to:
CO1: Demonstrate the Conceptual model of UML and SDLC.
CO2: Define classes modeling techniques and instances modeling techniques.
CO3: Describe interaction diagrams and their modeling techniques.
CO4: Demonstrate activity diagram and their modeling techniques.
CO5: Demonstrate component and deployment diagram.

CMS-A-DSE-A-1-TH (Digital Image Processing) and CMS-A-DSE-A-1-P (Image processing Lab)
After successfully completing this course, students will be able to:
CO1: understand the need for image transforms different types of image transforms and their properties.
CO2: develop any image processing application.
CO3: understand the rapid advances in Machine vision.
CO4: learn different techniques employed for the enhancement of images.
CO5: learn different causes for image degradation and overview of image restoration techniques.
CO6: understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.
CO7: learn different feature extraction techniques for image analysis and recognition

CMS-A-DSE-A-2-TH (Data Mining & its Application) and CMS-A-DSE-A-2-P (Data Mining Lab)
After successfully completing this course, students will be able to:
CO1: Understand data mining principles and techniques: Introduce DM as a cutting-edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modelling, and identifying new trends and behaviours.
CO2: Building basic terminology.
CO3: Learning how to gather and analyze large sets of data to gain useful business understanding.
CO4: Learning how to produce a quantitative analysis report/memo with the necessary information to make decisions.
CO5: Describing and demonstrating basic data mining algorithms, methods, and tools
CO6: Identifying business applications of data mining
CO7: Overview of the developing areas - web mining, text mining, and ethical aspects of data mining.

CMS-A-DSE-B-1-TH (Operation Research (O.R)) and CMS-A-DSE-B-1-P (Operation Research (O.R) Lab):
After successfully completing this course, students will be able to:
CO1: understand the application of OR and frame a LP Problem with solution – graphical and through solver add in excel (software).

CO2: build and solve Transportation and Assignment problems using appropriate method.
CO3: design and solve simple models of CPM and queuing to improve decision making and develop critical thinking and objective analysis of decision problems.
CO4: solve simple problems of replacement and implement practical cases of decision making under different business environments.
CO5: take best course of action out of several alternative courses for the purpose of achieving objectives by applying game theory and sequencing models.

CMS-A-DSE-B-2-TH (Programming using Python) and CMS-A-DSE-B-2-P (Programming in Python Lab)
After successfully completing this course, students will be able to:
CO1: Define and demonstrate the use of built-in data structures "lists" and "dictionary".
CO2: Design and implement a program to solve a real-world problem.
CO3: Design and implement GUI application and how to handle exceptions and files.
CO4: Make database connectivity in python programming language.

Computer Science Hons. Semester VI:

CMS-A-CC-6-13-TH (Software Engineering)
After successfully completing this course, students will be able to:
CO1: Students will understand Software Engineering and basic testing Concepts.
CO2: Students will know skills that are required to ensure successful medium and large-scale software projects.
CO3: Learn to select and apply project management techniques for process modeling, planning, estimation, risk management.
CO4: Student will learn software verification.
CO5: Understand design and execution of system test cases.

CMS-A-CC-6-14-TH (Theory of Computation)
After successfully completing this course, students will be able to:
CO1: design Finite Automata machines for given problems;
CO2: analyze a given Finite Automata machine and find out its Language;
CO3: design Pushdown Automata machine for given CF language(s);
CO4: generate the strings/sentences of a given context-free languages using its grammar;
CO5: design Turing machines for given any computational problem.

CMS-A-CC-6-14-P (Project)
After successfully completing this course, students will be able to:
CO1: Acquire skills to develop the software project.
CO2: Understand the software development life cycle.

CMS-A-DSE-A-3-TH (Embedded Systems) and CMS-A-DSE-A-3-P (Embedded Systems Lab)
After successfully completing this course, students will be able to:
CO1: Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
CO2: Get familiarized with programming environment to develop embedded solutions.

CO3: Program ARM microcontroller to perform various tasks.
CO4: Understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices.

CMS-A-DSE-A-4-TH (Multimedia and its Application) and CMS-A-DSE-A-4-P (Multimedia and its Application Lab)

After successfully completing this course, students will be able to:
CO1: understand multimedia in respect to many applications, including business, schools, home, education, and virtual reality.
CO2: understand the hardware and software needed to create projects using creativity and organization to create them.
CO3: develop multimedia skills understanding the principal players of individual players in multimedia teams in developing projects.
CO3: work with all aspects of images.
CO4: work with all aspects of sound.
CO5: work with all aspects of video.
CO6: learn copyright laws associated with multimedia.
CO7: learn the cost involved in multimedia planning, designing, and producing.
CO8: learn ways to present their multimedia projects.

CMS-A-DSE-B-3-TH (Introduction to Computational Intelligence) and CMS-A-DSE-B-3-P (Computational Intelligence Lab):

After successfully completing this course, students:
CO1: will have an in-depth understanding of theories, methods, and algorithms in machine learning.
CO2: will be able to apply the most appropriate machine learning algorithms in various applications.
CO3: will be able to evaluate and contrast basic techniques and algorithms used in machine learning.
CO4: will be able to formulate specific algorithmic requirements for a given problem and propose an appropriate solution.
CO5: will be able to predict and judge the performance of a machine learning or a data mining method.
CO6: will be able to assess the nature of a problem at hand and determine whether a machine learning technique/algorithm can solve it efficiently enough.
CO7: will strengthen their ability to work with the original scientific literature.

CMS-A-DSE-B-4-TH (Advance Java) and CMS-A-DSE-B-4-P (Advance Java Lab)

After successfully completing this course, students will be able to:
CO1: Write Java application programs using OOP principles and proper program structuring.
CO2: Develop Java program using packages, inheritance and interface.
CO3: Create Multithreaded programs.
CO4: Write Java programs to implement error handling techniques using exception handling and develop programs using class and inputs from keyboard.
CO5: Develop graphical User Interface using AWT.
CO6: Demonstrate event handling mechanism.

M. Sc in Computer Science Semester I:

CSM101 (Advances in Computer Architecture):

After successfully completing this course, students will be able to:

CO1: Demonstrate concepts of parallelism in hardware/software.

CO2: Discuss memory organization and mapping techniques.

CO3: Describe architectural features of advanced processors.

CO4: Interpret performance of different pipelined processors.

CO5: Explain data flow in arithmetic algorithms

CO6: Development of software to solve computationally intensive problems.

CSM102 (Advances in Database Management System) and CSM105P (Module 2: Database Management System):

After successfully completing this course, students will be able to:

CO1: Design, develop and implement a mid-scale relational database for an application domain using a commercial-grade RDBMS

CO2: Identify and resolve physical database design and implementation issues

CO3: Use the persistence framework of a chosen language to perform Object Relational Mapping

CO4: Research, analyse and use emerging technologies such as Big Data, NoSQL, On-Line Analytical Processing (OLAP) and Data Warehouses

CO5: Have hands-on experience with a number of contemporary information management systems

CO6: Explore a research aspect of advanced databases

CSM103 (Advances in Data Structure) and CSM105P (Module 1: Data Structure):

After successfully completing this course, students will be able to:

CO1: Design and analyze programming problem statements.

CO2: Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.

CO3: Understand the necessary mathematical abstraction to solve problems.

CO4: Come up with analysis of efficiency and proofs of correctness

CO5: Comprehend and select algorithm design approaches in a problem specific manner.

CSM104 (Data Communication):

After successfully completing this course, students will be able to:

CO1: Understand the rudiments of how computers communicate.

CO2: Be familiar with the architecture of a number of different networks.

CO3: Understand the principles of protocol layering.

CO4: Be familiar with modern communication systems.

CO5: Understand the basic aspects of packet-based protocol design and implementation.

M. Sc Computer Science Semester II:

CSM201 (Computer Networks):

After successfully completing this course, students will be able to:

CO1: Describe the general principles of data communication.

CO2: Describe how computer networks are organized with the concept of layered approach.

CO3: Describe how signals are used to transfer data between nodes.

CO4: Describe how packets in the Internet are delivered.

CO5: Analyze the contents in a given data link layer packet, based on the layer concept.

CO6: Design logical sub-address blocks with a given address block.

CO7: Decide routing entries given a simple example of network topology
CO8: Describe what classless addressing scheme is.
CO9: Describe how routing protocols work.

CSM202 (Design and Analysis of Algorithms):

After successfully completing this course, students will be able to:
CO1: Argue the correctness of algorithms using inductive proofs and invariants.
CO2: Analyze worst-case running times of algorithms using asymptotic analysis.
CO3: Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
CO4: Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
CO5: Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
CO6: Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.
CO7: Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization. Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs.
CO8: Analyze randomized algorithms. Employ indicator random variables and linearity of expectation to perform the analyses. Recite analyses of algorithms that employ this method of analysis.
CO9: Explain what amortized running time is and what it is good for. Describe the different methods of amortized analysis (aggregate analysis, accounting, potential method). Perform amortized analysis.
CO10: Explain what competitive analysis is and to which situations it applies. Perform competitive analysis.
CO11: Compare between different data structures. Pick an appropriate data structure for a design situation.

CSM203 (Object Oriented Systems) and CSM205P (Module 1: Object oriented Programming):

After successfully completing this course, students will be able to:
CO1: Use the syntax and semantics of java programming language and basic concepts of OOP.
CO2: Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
CO3: Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
CO4: Design event driven GUI and web related applications which mimic the real word scenarios.

CSM204 (Software Engineering) and CSM205P (Module 2: Software Engineering Lab):

After successfully completing this course, students will be able to:
CO1: Students will be able to decompose the given project in various phases of a lifecycle.
CO2: Students will be able to choose appropriate process model depending on the user requirements.

CO3: Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
CO4: Students will be able to know various processes used in all the phases of the product.
CO5: Students can apply the knowledge, techniques, and skills in the development of a software product.

M.Sc Computer Science Semester III:

CSM301 (Introduction to Soft Computing) and CSM305P (Module 1: Soft Computing Lab) :

After successfully completing this course, students will be able to:
CO1: Describe human intelligence and AI
CO2: Explain how intelligent system works.
CO3: Apply basics of Fuzzy logic and neural networks.
CO4: Discuss the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
CO5: Relate with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems
CO6: Describe with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations
CO7: Develop some familiarity with current research problems and research methods in Soft Computing Techniques.

CSM302 (Advances in Operating System) and CSM305P (Module 2: Operating System Lab) :

After successfully completing this course, students will be able to:
CO1: Developing low-level operating system code.
CO2: Understanding the performance and design trade-offs in complex software systems
CO3: Understanding and be capable of developing OS code inside a variety of OS environments, including monolithic, microkernels, and virtual machines, including device drivers.
CO4: Developing benchmarks and use of profiling tools to evaluate the performance of operating systems and application stacks.
CO5: Understanding and of evaluating research published in the field of operating systems at a level commensurate with their experience.

CSM303 (CBCS A: Theory of Computation)

After successfully completing this course, students will be able to:
CO1: discuss key notions of computation, such as algorithm, computability, decidability, reducibility, and complexity, through problem solving.
CO2: explain the models of computation, including formal languages, grammars and automata, and their connections.
CO3: state and explain the Church-Turing thesis and its significance.
CO4: analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.
CO5: solve computational problems regarding their computability and complexity and prove the basic results of the theory of computation.

CSM304 (CBCS B: Cryptography & Network Security)

After successfully completing this course, students will be able to:
CO1: Provide security of the data over the network.
CO2: Do research in the emerging areas of cryptography and network security.

CO3: Implement various networking protocols.
CO4: Protect any network from the threats in the world.
CSM306P (Project Work- Minor)
CO1: A fully engaged student shall be able to get exposure to undertake a short research project.
CO2: Able to communicate and demonstrate the learning through structured thesis and oral presentation

M. Sc Computer Science Semester IV:
CSM401(01) (Elective I- Cloud Computing)
After successfully completing this course, students will be able to:
CO1: Understand the fundamental principles of distributed computing.
CO2: Understand how the distributed computing environments known as Grids can be built from lower level services.
CO3: Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing.
CO4: Analyze the performance of Cloud Computing.
CO5: Understand the concept of Cloud Security.
CO6: Learn the Concept of Cloud Infrastructure Model.

CSM401(02) (Elective I- Wireless Sensor Network)
After successfully completing this course, students will be able to:
CO1: Design a wireless sensor network for given sensor data using microcontroller, transceiver, middleware and operating system.
CO2: Evaluate the performance of schedule based and random Medium Access Control protocols for power consumption, fairness, channel utilization and control packet overhead.
CO3: Evaluate the performance of Geographic routing protocols for power consumption, scalability and latency parameters.
CO4: Evaluate the performance of transport control protocols for congestion detection and avoidance, reliability and control packet overhead parameters.

CSM401(03) (Elective I- VLSI Design)
After successfully completing this course, students will be able to:
CO1: Identify the various IC fabrication methods.
CO2: Express the Layout of simple MOS circuit using Lambda based design rules.
CO3: Apply the Lambda based design rules for subsystem design
CO4: Differentiate various FPGA architectures.
CO5: Design an application using Verilog HDL.

CSM401(04) (Elective I- Compiler Design)
After successfully completing this course, students will be able to:
CO1: Specify and analyse the lexical, syntactic and semantic structures of advanced language features
CO2: Separate the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation
CO3: Write a scanner, parser, and semantic analyser without the aid of automatic generators
CO4: Turn fully processed source code for a novel language into machine code for a novel computer
CO5: Describe techniques for intermediate code and machine code optimisation
CO6: Design the structures and support required for compiling advanced language features.

CSM401(05) (Elective I- Embedded System)
After successfully completing this course, students will be able to:
CO1: Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
CO2: Get familiarized with programming environment to develop embedded solutions.
CO3: Program ARM microcontroller to perform various tasks.
CO4: Understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices.

CSM402(01) (Elective II- Introduction to Data Science)
After successfully completing this course, students will be able to:
CO1: Students will develop relevant programming abilities.
CO2: Students will demonstrate proficiency with statistical analysis of data.
CO3: Students will develop the ability to build and assess data-based models.
CO4: Students will execute statistical analyses with professional statistical software.
CO5: Students will demonstrate skill in data management.
CO6: Students will apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

CSM402(02) (Elective II- Image Processing)
After successfully completing this course, students will be able to:
CO1: understand the need for image transforms different types of image transforms and their properties.
CO2: develop any image processing application.
CO3: understand the rapid advances in Machine vision.
CO4: learn different techniques employed for the enhancement of images.
CO5: learn different causes for image degradation and overview of image restoration techniques.
CO6: understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.
CO7: learn different feature extraction techniques for image analysis and recognition

CSM402(03) (Elective II- Internet Technology)
After successfully completing this course, students will be able to:
CO1: Analyze a web page and identify its elements and attributes.
CO2: Create web pages using XHTML and Cascading Style Sheets.
CO3: Build dynamic web pages using JavaScript (Client-side programming).
CO4: Create XML documents and Schemas.

CSM402(04) (Elective II- Introduction to Data Mining)
After successfully completing this course, students will be able to:
CO1: Understand data mining principles and techniques: Introduce DM as a cutting-edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modelling, and identifying new trends and behaviours.
CO2: Building basic terminology.
CO3: Learning how to gather and analyze large sets of data to gain useful business understanding.
CO4: Learning how to produce a quantitative analysis report/memo with the necessary information to make decisions.

CO5: Describing and demonstrating basic data mining algorithms, methods, and tools
CO6: Identifying business applications of data mining
CO7: Overview of the developing areas – web mining, text mining, and ethical aspects of data mining.

CSM402(05) (Elective II- Statistics for Computer Science)
After successfully completing this course, students will be able to:
CO1: Distinguish types of studies and their limitations and strengths,
CO2: Describe a data set including both categorical and quantitative variables to support or refute a statement,
CO3: Apply laws of probability to concrete problems,
CO4: Perform statistical inference in several circumstances and interpret the results in an applied context,
CO5: Use mathematical tools, including calculus and linear algebra, to study probability and mathematical statistics and in the description and development of statistical procedures,
CO6: Use a statistical software package for computations with data,
CO7: Use a computer for the purpose of simulation in probability and statistical inference, and
CO8: Communicate concepts in probability and statistics using both technical and non-technical language.

CSM403P (Seminar)
After successfully completing this course, students will be able to:
CO1: Participation in dialogue in a way that enables the students to experience and reflect upon their own thinking as it is expressed in communication with others.
CO2: Examination from newspapers, magazines, articles and books, the web, and other instances of contemporary expression so as to discern genuine thinking from the spurious.
CO3: Thinking for themselves, and the development of confidence in their own thinking.
CO4: The recognition that much, if not most, of what passes for thinking actually prevents thinking and substitutes for its other things such as force, rhetoric, propaganda, etc.
CO5: The discovery of those elements which militate against thinking.
CO6: The cultivation of a deeper understanding of the world.

CSM404P (Grand Viva-voce)
After successfully completing this course, students will be able to:
CO1: Demonstrate knowledge in the program domain.
CO2: Present his views cogently and precisely.
CO3: Exhibit professional etiquette suitable for career progression

CSM405P (Project Work- Major)
After successfully completing this course, students will be able to:
CO1: develop plans with relevant people to achieve the project's goals
CO2: break work down into tasks and determine handover procedures
CO3: identify links and dependencies, and schedule to achieve deliverables
CO4: estimate and cost the human and physical resources required, and make plans to obtain the necessary resources
CO5: allocate roles with clear lines of responsibility and accountability.

Department of Economics

Course Outcome: B.Sc. Economics Honours

Sl No	Name of the Course	Semester	Course Code	Credit	Marks in the Course	Course outcome
1	Introductory Microeconomics	1	ECO-A-CC-1-1	6	100	Develops skills of flexibility, problem solving ability and analysis of microeconomic economic issues
2	Mathematical Methods for Economics-I	1	ECO-A-CC-1-2	6	100	This paper helps the students to grasp the basics of mathematics underlying economic theories
3	Introductory Macroeconomics	2	ECO-A-CC-2-3	6	100	Emphasizes on analysis of macroeconomic issues with its subsequent impact on policy making.
4	Mathematical Methods for Economics-II	2	ECO-A-CC-2-4	6	100	This paper helps the students to grasp the hardcore of mathematics underlying economic theories
5	Intermediate Microeconomics-I	3	ECO-A-CC-3-5	6	100	Provides a sound training in microeconomic theory to formally analyse the behaviour of individual agents. Mathematical tools are used to facilitate understanding of the basic concepts.
6	Intermediate Macroeconomics-I	3	ECO-A-CC-3-6	6	100	Helps to develop the skills of an economist, equipping you to understand how firms interact with the overall economic environment, government policies and effects
7	Statistics for Economics	3	ECO-A-CC-3-7	6	100	Helps to develop the statistical skills of an economist and introduce the students to data interpretation.
8	Skill Enhancement Course-I (A Group) 1. Data Analysis /	3	ECO-A-SEC-3 A1/A2	2	100	1. Helps to develop skills for both primary and secondary data collection and understanding the Government databases. To familiarize participants

	2. Development [A-Group of SEC consists of two courses. Students will have to select any one of the two]					with Statistical packages such as STATA/R/SPSS/EXCEL 2. These courses relates to every aspect of rural economy, the policy decisions adopted by governments and the development goals achieved
9	Intermediate Microeconomics II	4	ECO-A-CC-4-8	6	100	Provides a complete training in Microeconomic theory to formally analyse the behaviour of different market agents agents. Also helps develop understanding of social choice / behavior with optimal allocations and general equilibrium
10	Intermediate Macroeconomics-II	4	ECO-A-CC-4-9	6	100	Helps to equip the economist with the dynamics of the overall economic environment and how government policy affects the economy and how financial systems operate.
11	Introductory Econometrics	4	ECO-A-CC-4-10	6	100	Provides a theoretical introduction to the basic analytical skills of data handling and analysis required at academic, financial, business and government research and findings.
12	Skill Enhancement Course-II (B Group) 1. Research Methodology [Theory] / 2. Managerial Economics [B-Group of SEC consists of two courses.	4	ECO-A-SEC-4-2B1/B2	2	100	To familiarize participants with basics of research and the research process, to enable the participants in conducting research work and formulating research synopsis and report. To impart knowledge for enabling students to develop analytics skills and meaningful interpretation to the data sets so as to solve the Research / business problem.

	Students will have to select any one of the two]					
13	International Economics	5	(ECO-A-CC-5-11	6	100	Providing the outline to intricacies of trade theories and policies and thus enabling the students to acquire proper analytical ability about international business transactions including government/international policies.
14	Indian Economy	5	ECO-A-CC-5-12-	6	100	It highlights major policy debates and evaluates their empirical evidence and impacts on Indian economy
15	Discipline Specific Elective (DSE) Courses: 1. DSE-A(1) Applied Econometrics (AE) / Economic History of India (1857-1947) (EHI) 2. DSE- B(1) Comparative Economic Development (1850- 1950) (CED) /Financial Economics (FE) Students have to take one out of two courses from : DSE-A(1) (A1.1 or A1.2)	5	1. ECO-A-DSE-5-A(1.1) / ECO-A-DSE-5-A(1.2) 2. ECO-A-DSE-5-B(1.1) / ECO-A-DSE-5-B(1.2)	6+ 6	100+100	1. Enables an in-depth analysis of the data handling methods applied to econometric theories/ Informs the students about the historical evolution of the Indian economy during the pre-independence period. Helps understand the development and exploitations of the Indian Economy 2. Understanding evolution of the early development theories and policies adopted in process in developing economies like the then Soviet Union, China, countries of Latin America and Africa. Essential for economists for better understanding of policy changes / Better exposure to classical finance models underpinning modern finance. Understanding the role played by time, uncertainty, information and inflation in

	and one of the courses from DSE-B(1) (B1.1 or B1.2)					evaluating financial instruments; understanding the role of asymmetric information in various financial markets. understand how contractual incompleteness can impact corporate financial decisions.
16	Public Economics	6	ECO-A-CC-6-13	6	100	Introduces the students to the functioning of the government finances and revenue with broader relevant policies
17	Development Economics	6	ECO-A-CC-6-14	6	100	Links institutions and agents of development by discussing the role of the state in economic development; relates to the aspect of lives, from the decisions we make as individuals to the policies possibly to be adopted by governments with related factors of production available in the economy
18	Two Discipline Specific Elective (DSE) Courses: DSE-A (2) Money and Financial Markets (MFM) Or Issues in Indian Economy (IIE) and DSE-B(2) Environmental Economics (EE)	6	1. ECO-A-DSE-5-A(2.1) / ECO-A-DSE-5-A(2.2) 2. ECO-A-DSE-5-B(2.1) / ECO-A-DSE-5-B(2.2)	6 +6	100+100	1. Understanding the different components of a financial system and their role, the recent developments in the Indian financial system, understanding the institutions, instruments, participants and operation of the money market. / Informs the students about issues of the Indian economy related to growth and structure of the Indian economy with importance of Agriculture, Industry and Service sectors.

	Or Issues in Development Economics (IDE) Students have to take one out of two courses from : DSE-A(2) (A2.1 or A2.2) and One out of two courses from: DSE-B(2) (B2.1 or B2.2)					1. Understanding the environment and linkages with the economy; welfare effects of externalities, understanding of environmental problems, international issues with evaluation and implementation of policy decisions/ Extensive analysis of demography and development, study of factor markets and credit markets, environment, sustainable development and globalization: analysis, effects and implementation of policies

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Department of Geography

Geography is the study of places and the relationships between people and their environments. Geographers explore both the physical properties of Earth's surface and the human societies spread across it. They also examine how human culture interacts with the natural environment and the way those locations and places can have an impact on people. Geography seeks to understand where things are found, why they are there, and how they develop and change over time. The study of the diverse environments, places, and spaces of Earth's surface and their interactions. It seeks to answer the questions of why things are as they are where they are. The modern academic discipline of geography is rooted in ancient practice, concerned with the characteristics of places, in particular their natural environments and peoples, as well as the relations between the two.

Choice Based Credit System (CBCS): Syllabus in Geography

INTRODUCTION: In compliance with recent directives from the University Grants Commission, the undergraduate syllabus for Geography is reframed into Choice Based Credit System largely following the model syllabus prepared by the West Bengal State Council of Higher Education. The main objective of this new curriculum is to give the students a holistic understanding of the subject, putting equal weightage to the core content and techniques used in Geography. The syllabus tries to give equal importance to the two main branches of Geography: Physical and Human. The principal goal of the syllabus is to enable the students to secure a job at the end of the undergraduate programme. Keeping this in mind and in tune with the changing nature of Geography, adequate emphasis is rendered on applied aspects of the subject such as emerging techniques of mapping and field-based data generation, especially in the honours course. The

syllabus emphasises on development of basic skills of the subject, so that everyone need not go for higher studies in search of professional engagement or employment.

LEARNING OUTCOMES: This syllabus is designed to impart basic knowledge on geography as spatial science and train the undergraduates to secure employment in the sectors of geospatial analysis, development and planning, mapping and surveying.

Honours Course: Core Subjects

GEO-A-CC-1-01-TH/P – Geotectonic and Geomorphology
GEO-A-CC-1-02-TH/P – Cartographic Techniques
GEO-A-CC-2-03-TH/P – Human Geography
GEO-A-CC-2-04-TH/P – Cartograms, Thematic Mapping and Surveying
GEO-A-CC-3-05-TH/P – Climatology
GEO-A-CC-3-06-TH/P – Hydrology and Oceanography
GEO-A-CC-3-07-TH/P – Statistical Methods in Geography
GEO-A-CC-4-08-TH/P – Economic Geography
GEO-A-CC-4-09-TH/P – Regional Planning and Development
GEO-A-CC-4-10-TH/P – Soil and Biogeography
GEO-A-CC-5-11-TH/P – Research Methodology and Fieldwork
GEO-A-CC-5-12-TH/P – Remote Sensing, GIS and GNSS
GEO-A-CC-6-13-TH/P – Evolution of Geographical Thought
GEO-A-CC-6-14-TH/P – Disaster Management

Honours Course: Choices for Four Discipline Specific Electives

GEO-A-DSE-A-5-01-TH/P – Fluvial Geomorphology
GEO-A-DSE-A-5-02-TH/P – Climate Change: Vulnerability and Adaptations **(selected by the department)**
GEO-A-DSE-A-5-03-TH/P – Environmental Issues in Geography
GEO-A-DSE-A-5-04-TH/P – Resource Geography
GEO-A-DSE-B-6-05-TH/P – Cultural and Settlement Geography
GEO-A-DSE-B-6-06-TH/P – Social Geography
GEO-A-DSE-B-6-07-TH/P – Urban Geography
GEO-B-DSE-B-6-08-TH/P – Geography of India

1.1 Honours Course: Choices for Two Skill Enhancement Courses

GEO-A-SEC-A-3-01-TH – Coastal Management
GEO-A-SEC-A-3-02-TH – Tourism Management
GEO-A-SEC-B-4-03-TH – Rural Development
GEO-A-SEC-B-4-04-TH – Sustainable Development

COURSE OUTCOMES

[Honours]

The course outcomes of the different papers offered are presented below. After completion of the course the student will be able to:

Course Code	Course Title	Credits	Course Outcomes
CC-1-01-TH+P	Geotectonics and Geomorphology	4+2=6	• Understand the theories and fundamental concepts of Geotectonic and Geomorphology. Understand earth's tectonic and structural evolution. Gain knowledge about earth's interior. Develop an idea about the concept of plate tectonics, and resultant landforms. • Acquire knowledge about types of folds and faults and earthquakes, volcanoes and associated landforms. • Understanding crustal mobility and tectonics; with special emphasis on their role in landform development. • Overview and critical appraisal of landform development models. • Ability to record temperature, pressure, humidity and rainfall • Develop the skills of identification of features and correlation between them. • Do field surveys using appropriate techniques. • Identification of rocks and minerals.
CC-1-02 TH+P	Cartographic Techniques	4+2=6	• Understand and prepare different kinds of maps. • Recognize basic themes of map making. • Development of observation skills.
CC-2-03 TH+P	Human Geography	4+2=6	• Gain knowledge about major themes of human Geography. • Acquire knowledge on the history and evolution of humans. • Understand the approaches and processes of Human Geography as well as the diverse patterns of habitat and adaptations. • Develop an idea about space and society
CC-2-04 TH+P	Thematic Mapping and Surveying	4+2=6	• Comprehend the concept of scales and representation of data through cartograms. • Interpret geological and weather maps. • Learn the usages of survey instruments. • Brings direct interaction of different types of surveying

			instruments like Dumpy level and Theodolite with environment. • Develop an idea about different types of thematic mapping techniques.
CC3-SEC 1TH	Coastal Management	2	● Learning scope to know about coast, coastal differences ● Can know about a variety of coasts, elements, and components of coastal materials.
CC-3-05 TH+P	Climatology	4+2=6	• Understand the elements of weather and climate, different atmospheric phenomena and climate change. • Learn to associate climate with other environmental and human issues. Approaches to climate classification. • To analyze the dynamics of the Earth's atmosphere and global climate. Assessing the role of man in global climate change. • Prepare various climatic maps and charts and interpret them. • Learn to use various meteorological instruments. • Learn the interaction between the atmosphere and the earth's surface. Understand the importance of the atmospheric pressure and winds. • Understand how atmospheric moisture works.
CC-3-06 TH+P	Hydrology and Oceanography	4+2=6	• Analyse the concepts of Hydrology and Oceanography • Emphasizing the significance of groundwater quality and its circulation • Evaluate the role of the global hydrological cycle. • Studying the behavior and characteristics of the global oceans. • Realize the importance of water conservation. • Identify marine resources and characteristics of ocean waters. • Interpret hydrological and rainfall dispersion graphs and diagrams.

CC-3-07 TH+P	Statistical Methods in Geography	4+2=6	• e Learn the significance of statistics in geography. Understand the importance of use of data in geography • Recognize the importance and application of Statistics in Geography • Interpret statistical data for a holistic understanding of geographical phenomena. Know about different types of sampling. • Develop an idea about theoretical distribution. • Learn to use tabulation of data. Gain knowledge about association and correlation.
CC-4-08 TH+P	Economic Geography	4+2=6	• Understand the concept of economic activity, factors affecting the location of economic activity. Gain knowledge about different types of Economic activities • Assess the significance of Economic Geography, the concept of economic man and theories of choice. • Analyze the factors of location of agriculture and industries. • Understand the evolution of varied types of economic activities. • Map and interpret data on production, economic indices, transport network and flows.
CC-4-09 TH+P	Regional Planning and Development	4+2=6	• Understand and identify regions as an integral part of geographical study. • Appreciate the varied aspects of development and regional disparity, in order to formulate measures of balanced development. • Analyzing the concept of regions and regionalization. • Studying typical physiographic, planning, arid and biotic regions of India. Understanding the detailed geography of India. • Gain knowledge about definition of region, evolution and types of regional planning. Develop an idea about choice of a region for planning. • Build an idea about theories and models for regional planning. Know about measuring development indicators. • They can know about delineation of formal regions by weighted index method and also delineation of functional regions by breaking point analysis. • Gain knowledge about measuring inequality by Location Quotient, and also measuring regional disparity by Sopher Index

CC-4-10 TH+P	Soil and Biogeography	4+2=6	• Have knowledge about the character and profile of different soil types. • Understand the impact of man as an active agent of soil transformation, erosion and degradation. • Recognize land capability and classify it. • Explaining the Pedological and Edaphological Approaches to Soil Studies - Processes of soil formation, types of soil, and principles of soil and land classification; and management. • Understand the varied ecosystems and classify them. • Recognize the significance of biogeochemical cycles and biodiversity. • Comprehend the devastating impact of deforestation. • Identify soil types and derive their pH.
CC-4- SEC 2 TH	Rural Development	2	• Rural Development: Concept, basic elements, measures of level of rural development • Paradigms of rural development: Gandhian approach to rural development Lewis model of economic development, 'big push' theory of development, Myrdal's model of 'spread and backwash effects • Area based approach to rural development: Drought prone area programmes, PMGSY, SJSY, MNREGA, Jan Dhan Yojana • Rural Governance: Panchayati Raj System and rural development policies and Programmes in India
CC-5-11 TH+P	Research Methodology and Fieldwork	4+2=6	• Have expertise in identification of area of study, methodology, quantitative and quantitative analysis, and conclusions to be drawn about the area – fundamental to geographical research. • Handle logistics and other emergencies on field. • Develop skills in photography, mapping and video Recording Conducting field excursions and preparation of field report on research on problem in different areas of India
CC-5-12 TH+P	Remote Sensing, GIS and GNSS	4+2=6	Have knowledge of the principles of remote sensing, sensor resolutions and image referencing schemes. • Interpret satellite imagery and understand the preparation of false color composites from them. • Training in the use of Geographic Information System(GIS) software for contemporary mapping skills. • Perceive the evolution of the philosophy of

CC-6-13 TH+P	Evolution of Geographical Thought	4+2=6	Geography. • Appreciate the contribution of the thinkers in Geography. • Give powerpoint presentations on different schools of geographical thought. • Discussing the evolution of geographical thought from ancient to modern times. • Establishing relationship of Geography with other disciplines and man-environment relationships. • Analyzing modern and contemporary principles of Empiricism, Positivism, Structuralism, Human and Behavioral Approaches in Geography
CC-6-14 TH+P	Hazard Management	4+2=6	• Understand the nature of hazards and disasters. • Assess risk, perception and vulnerability with respect to hazards. • Prepare hazard zonation maps. • Assessing the nature, impact and management of major natural and man-made hazards affecting the Indian subcontinent.

COURSE OUTCOMES
[DISCIPLINE SPECIFIC ELECTIVES]

Course Code	Course Title	Credits	Course Outcomes
GEO-A DSE-A-5-02- TH+P	Climate Change: Vulnerability and Adaptations	4+2=6	• Understand climate change with reference to the geological time scale • Assess the Origin Greenhouse gases and global warming • Global climatic assessment and Impact of climate change: Agriculture and water; flora and fauna; human health and morbidity • Learn Global initiatives to climate change mitigation: Kyoto Protocol, carbon trading, clean development mechanism, COP, climate fund. • Analysis of trends of temperatures •Analyze the rainfall variability of about three decades of climatic regions of India. • Understand Climate change vulnerability assessment and adaptive strategies with particular reference to South Asia • Analyse Role of urban local bodies, panchayats and educational institutions on climate change mitigation: Awareness and action programmes

			• Develop concepts and skills regarding mitigation measures concerning climatic hazards.
GEO-A DSE-A-5-04 T+P	Resource Geography	4+2=6	• Understand the concept and classification of resources • Understand the approaches to resource utilization • Appreciate the significance of resources • Assess the pressure on resources • Analyze the problems of resource depletion with special reference to forests, water and fossil fuels • Understand the concept of Sustainable Resource development • Understand the distribution, utilization, problems and management of metallic and non-metallic mineral resources • Analyze the contemporary energy crisis and assess the future scenario • Understand the concept of Limits to Growth, resource sharing and sustainable use of resources • Develop the skill of mapping forest cover from satellite images • Develop the skill of mapping water bodies from satellite images • Analyze the decadal changes in state-wise production of coal and iron ore
GEO-A DSE-B-6-05-T+P	Cultural and Settlement Geography	4+2=6	• Understand the scope and content of cultural geography • Trace the development of cultural geography in relation to allied disciplines • Understand the concept of cultural hearth and realm, cultural diffusion, diffusion of religion • Develop an understanding of cultural segregation and cultural diversity, technology and development • Learn about the various races and racial groups of the world • Identify the cultural regions of India •Acquire knowledge about Rural settlements- Definition, nature and characteristics • Analyze the morphology of rural settlements • Learn the rural house types, census categories of rural settlements and idea of social segregation • Learn the census definition and categories of urban settlements • Analyze the urban morphology models of Burgess, Hoyt, Harris and Ullman • Differentiate between city-region and conurbation • Analyze the functional classification of cities

			• Develop the skill of mapping language distribution of India • Learn to plot proportional squares to illustrate housing distribution • Acquire the skill of identifying rural settlement types from topographical sheet • Understand Social Area Analysis of a city based on Shevky and Bell
GEO-A-DSE-B-6-07-T+P	Urban Geography	4+2=6	• Temporal analysis of urban growth using census data • Trace the origin of urban places over time and analyze the factors, stages and characteristics of these places • Analyze the theories of urban evolution and growth, Hierarchy of urban settlements • Understand the various aspects of urban place : location, site and situation; Rank-size rule and Law of primate city • Understand the concept of urban hierarchies • Understand the patterns of urbanization in developed and developing countries • Understand the ecological processes of urban growth; urban fringe; city-region • Analyze the models on city structure • Identify and analyze the problems of housing, slums and civic amenities • Understand the patterns and trends of urbanization in India • Assess the policies on urbanization in post-liberalized India • Study the changing land use of Delhi, Kolkata and Chandigarh • Learn the technique to plot Rank-Size Rule and establish a hierarchy of urban settlements • Assess state-wise variation and trends of urbanization • Learn to analyze census data to measure urban growth • Develop a skill to prepare urban land use map from satellite images

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Department of Microbiology

B.Sc. Microbiology Honours

Semester One Course Structure

SL No	Name of the course	Semester	Course code	Credit	Marks in the course	Course outcome
1	Introduction to microbiology and microbial diversity	1	MCB-A-CC-1-1-TH	4	70	To understand What Is Microbiology? and Why Is It Important? To understand the range of different kinds of unicellular organisms, bacteria, archaea, protists, algae and fungi.
	Study the principle and applications of important instruments, Preparation of culture media for bacterial cultivation, Sterilization of medium using Autoclave and assessment for sterility, Sterilization of glassware using Hot Air Oven and assessment for sterility, Sterilization of heat sensitive material by membrane filtration and assessment for sterility, Demonstration of the presence of microflora in the environment by exposing nutrient agar plates to air.	1	MCB-A-CC-1-1-P	2	30	To have a basic overview of good laboratory practices of Microbiology, To understand the basic working principle of different instruments used in Microbiology, To identify different microorganisms by their morphology from their slides, To have an idea of microbial culture media preparation.
3	Bacteriology	1	MCB-A-CC-1-2-TH	4	70	To have an idea of different bacterial external and internal structures of

						bacteria, To understand the characteristic and different nutritional requirement of bacterial growth, To understand the working principle different types of microscope and techniques of bacterial classification
4	Preparation of different media, Simple staining Negative staining Gram's staining Acid fast staining-permanent slide only. Capsule staining Endospore staining. Isolation of pure cultures of bacteria by streaking method. Preservation of bacterial cultures by various techniques	1	MCB-A-CC-1-2-P	2	30	To understand different staining techniques to see different bacterial structures, To have an idea of preparation bacterial culture media, To have an idea of isolation of pure culture of bacteria
5	Biochemistry	2	MCB-A-CC-2-3-TH	4	70	To understand thermodynamic principle governing living system, To have an idea of different types of biomolecules present inside a cell
6	Qualitative/Quantitative tests for carbohydrates, reducing sugars, non-reducing sugars Qualitative/Quantitative tests for lipids and proteins, Properties of water, Concept of pH and buffers, preparation of buffers and Numerical problems to explain the concepts, Study of protein	2	MCB-A-CC-2-3-P	2	30	To have an idea of identifying different types of biomolecules, To understand the enzyme kinetics, To have an idea of preparation of buffer

	secondary and tertiary structures with the help of models Study of enzyme kinetics – calculation of Vmax , Km, Kcat values Study effect of temperature, pH and Heavy metals on enzyme activity Estimation of any one vitamin					
7	Cell Biology	2	MCB-A-CC-2-4-TH	4	70	To have an idea of different organelles structure of eukaryotic cell, cell signalling, protein transport, cell cycle and death
8	Study a representative plant and animal cell by microscopy, Study of the structure of cell organelles through electron micrographs, Cytochemical staining of DNA – Feulgen, Demonstration of the presence of mitochondria in striated muscle cells/ cheek epithelial cell using vital stain Janus Green B, Study of polyploidy in Onion root tip by colchicine treatment,Identification and study of cancer cells by photomicrographs, Study of different stages of Mitosis,	2	MCB-A-CC-2-4-P	2	30	To understand plant and animal cell structures by microscopy, To have an idea of DNA staining, To understand the staining procedure to visualize mitochondria by mi croscopy
9	VIROLOGY	3	MCB-A-CC-3-5-TH	4	70	

10	Study of the structure of important animal viruses (rhabdo, influenza, paramyxo hepatitis B and retroviruses) using electron micrographs Study of the structure of important plant viruses (caulimo, Gemini, tobacco ring spot, cucumber mosaic and alpha-alpha mosaic viruses) using electron micrographs Study of the structure of important bacterial viruses (ϕX 174, T4, λ) using electron micrograph. Isolation and enumeration of bacteriophages (PFU) from water/sewage sample using double agar layer technique	3	MCB-A-CC-3-5-P	2	30	To gain knowledge of the different types of virus with pictures.
11	Microbial Physiology and Metabolism	3	MCB-A-CC-3-6-TH	4	70	
12	Study and plot the growth curve of E. coli by turbidometric and standard plate count methods, Calculations of generation time and specific growth rate of bacteria from the graph plotted with the given data, Effect of temperature on growth of E. coli, Effect of pH on growth of E. coli, Effect of carbon and nitrogen sources on growth of E.coli, Effect of salt on growth of E. coli,	3	MCB-A-CC-3-6-P	2	30	To gather the knowledge about different stages of growth curve of *E.coli*. Students learn to calculate generation time. How temperature, pH, carbon nitrogen source and salt effect the growth curve of *E.coli*. To gain brief idea of alcoholic fermentation , thermal death time and decimal reduction time of *E.coli*

	Demonstration of alcoholic fermentation, Demonstration of the thermal death time and decimal reduction time of E. coli.,					
13	Molecular Biology	3	MCB-A-CC-3-7-TH TOTAL	4	70	
14	Study of different types of DNA and RNA using micrographs and model / schematic representations Study of semi-conservative replication of DNA through micrographs / schematic representations 3. Isolation of genomic DNA from E. coli 4. Estimation of salmon sperm / calf thymus DNA using colorimeter (diphenylamine reagent) or UV spectrophotometer (A260 measurement) 5. Estimation of RNA using colorimeter (orcinol reagent) or UV spectrophotometer (A260 measurement) 6. Resolution and visualization of DNA by Agarose Gel Electrophoresis. Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS-PAGE).	3	MCB-A-CC-3-7-P	2	30	To gain knowledge about DNA and RNA , semiconservative replication To know the procedure of isolation of genomic DNA from *E.coli* Estimation of Calf thymus DNA. To gain knowledge about estimation of RNA by orcinol reagent For visualization of DNA by Agarose Gel Electrophoresis. To learn about process of visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS-PAGE).

15	Microbial Genetics	4	MCB-A-CC-4-8-TH	4	70	
16	Preparation of Master and Replica Plates Study the effect of chemical (HNO2) and physical (UV) mutagens on bacterial cells Study survival curve of bacteria after exposure to ultraviolet (UV) light Isolation of Plasmid DNA from E.coli Study different conformations of plasmid DNA through Agaraose gel electrophoresis. Demonstration of Bacterial Conjugation Demonstration of bacterial transformation and transduction Demonstration of AMES test	4	MCB-A-CC-4-8-P	2	30	To know about preparation of Master and Replica Plates. To understand the effect of chemical (HNO2) and physical (UV) mutagens on bacterial cells To learn the process of Isolation of Plasmid DNA from *E.coli* To study different conformations of plasmid DNA through Agaraose gel electrophoresis.
17	Environmental Microbiology	4	MCB-A-CC-4-9-TH	4	70	
18	Analysis of soil - pH, moisture content, water holding capacity, percolation, capillary action. Isolation of microbes (bacteria & fungi) from soil (28ºC & 45ºC). Isolation of microbes (bacteria & fungi) from rhizosphere and rhizoplane. Assessment of microbiological quality of water. Determination of BOD of waste water sample. Study the presence of microbial activity by detecting (qualitatively) enzymes	4	MCB-A-CC-4-9-P	2	30	A brief idea of analysis of soil are gained Learning of process of isolation microbes (bacteria & fungi) from soil (28ºC & 45ºC). Learning of Assessment of microbiological quality of water. Knowledge about determination of BOD of waste water sample. Learning about presence of microbial activity by detecting (qualitatively) enzymes (dehydrogenase, amylase, urease) in soil.

	(dehydrogenase, amylase, urease) in soil. Isolation of Rhizobium from root nodules.					
19	Recombinant DNATechnology	4	MCB-A-CC-4-10-TH	4	70	
20	Preparation of competent cells for transformation Demonstration of Bacterial Transformation and calculation of transformation efficiency. Digestion of DNA using restriction enzymes and analysis by agarose gel electrophoresis Ligation of DNA fragments Cloning of DNA insert and Blue white screening of recombinants. Interpretation of sequencing gel electropherograms Designing of primers for DNA amplification Amplification of DNA by PCR Demonstration of Southern blotting	4	MCB-A-CC-4-10-P	2		Gain the knowledge of Preparation of competent cells for transformation Learning of calculating transformation efficiency
	CC-11: Food and Dairy Microbiology **Unit 1: Foods as a substrate for microorganisms:** Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, natural flora and source of contamination of foods in general.	5	MCB-A-CC-5-11-TH	4	70	Brief idea on Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, natural flora and source of contamination of foods and microbial spoilage of Foods 3. Detailed study on **Principles and methods of food preservation**

	Unit 2: Microbial spoilage of various foods : Principles, Spoilage of vegetables, fruits, meat, eggs, milk and butter, bread, canned Foods **Unit 3: Principles and methods of food preservation :** Principles, physical methods of food preservation: temperature (low, high, canning, drying), irradiation, hydrostatic pressure, high voltage pulse, microwave processing and aseptic packaging, chemical methods of food preservation: salt, sugar, organic acids, SO2, nitrite and nitrates, ethylene oxide, antibiotics and bacteriocins **Unit 4: Fermented foods:** Dairy starter cultures, fermented dairy products: yogurt, acidophilus milk, kumiss, kefir, dahi and cheese, other fermented foods: dosa, sauerkraut, soy sauce and tampeh, Probiotics: Health benefits, types of microorganisms used, probiotic foods available in market. **Unit 5: Food borne diseases (causative agents, foods involved, symptoms and preventive measures):**					**4.** What are the fermented foods. A brief idea on Probiotics: Health benefits, types of microorganisms used, probiotic foods available in market. **Gaining idea on Causative agents, foods involved, symptoms and preventive measures)** Detailed study of Food infections by the different microrganisms 7. Study on Food sanitation and control. Brief knowledge on HACCP, Indices of food sanitary quality and sanitizers.

	Food intoxications: *Staphylococcus aureus*, *Clostridium botulinum* and mycotoxins; Food infections: *Bacillus cereus*, *Vibrio parahaemolyticus*, *Escherichia coli*, Salmonellosis, Shigellosis, *Yersinia enterocolitica*, *Listeria monocytogenes* and *Campylobacter jejuni* **Unit 6: Food sanitation and control:** HACCP, Indices of food sanitary quality and sanitizers. **Unit 7: Cultural and rapid detection methods of food borne pathogens in foods and introduction to predictive microbiology.**					
	C-11: Food and Dairy Microbiology (Practical) 1**.** MBRT of milk samples and their standard plate count. 2. Alkaline phosphatase test to check the efficiency of pasteurization of milk. 3. Isolation of any food borne bacteria from food products. 4. Isolation of spoilage microorganisms from spoiled vegetables/fruits. 5.Isolation of spoilage microorganisms from bread.	5	MCB-A-CC-5-11-P	2	30	1. Learning of determination of different milk qualities. 2. Learning about the procedure of Alkaline phosphatase test to check the efficiency of pasteurization of milk Knowledge about 4. the process of isolation of spoilage microorganisms from spoiled vegetables/fruits.5.Isolation of spoilage microorganisms from bread. 6. learning about the preparation of Yogurt/Dahi.

	6.Preparation of Yogurt/Dahi					
	CC-12: Industrial Microbiology (Theory) : **Unit 1 : Introduction to industrial microbiology:** Brief history and developments in industrial microbiology **Unit 2 : Isolation of industrially important microbial strains and fermentation media :** Sources of industrially important microbes and methods for their isolation, preservation and maintenance of industrial strains, strain improvement, Crude and synthetic media; molasses, corn-steep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates **Unit 3 : Types of fermentation processes, bio-reactors and measurement of fermentation parameters:** Types of fermentation processes - Solid-state and liquid-state (stationary and submerged) fermentations; batch, fed-batch (eg. baker's yeast) and continuous fermentations Components of a typical bio-reactor,	5	MCB-A-CC-5-12-TH	4	70	Unit 1:Knowledge about the history and development. Unit 2: Brief knowledge about Isolation of industrially important microbial strains and fermentation media Unit 3: Detailed study about types of fermentation processes, bio-reactors and measurement of fermentation parameters Unit 3: What is down stream processing? Brief idea on different steps of downstream processing. Detailed study on Citric acid, ethanol, penicillin, glutamic acid, Vitamin B12, enzymes.

	Types of bioreactors- Laboratory, pilot- scale and production fermenters, constantly stirred tank and air-lift fermenters, Measurement and control of fermentation parameters - pH, temperature, dissolved oxygen, foaming and aeration **Unit 4 : Down-stream processing :** Cell disruption, filtration, centrifugation, solvent extraction, precipitation, lyophilization and spray drying **Unit 5 : Microbial production of industrial products (microorganisms involved, media, fermentation conditions, downstream processing and uses) :** Citric acid, ethanol, penicillin, glutamic acid, Vitamin B12 Enzymes (amylase, protease, lipase) Wine, beer **Unit 6 : Enzyme immobilization :** Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes					What is enzyme immobilization ? The advantages and disadvantage of this procedures?/ What is the application of enzyme immobilization?

	(glucose isomerase and penicillin acylase)					
	CC-12: INDUSTRIAL MICROBIOLOGY (PRACTICAL) : 1. Study different parts of fermenter 2. Microbial fermentations for the production and estimation (qualitative and quantitative) of: a. Enzymes: Amylase and Protease b. Amino acid: Glutamic acid c. Organic acid: Citric acid d. Alcohol: Ethanol 3. A visit to any educational institute/ industry to see an industrial fermenter, and other downstream processing operations	5	MCB-A-CC-5-12-P	2	30	Learning about 3. Study different parts of fermenter 4. Microbial fermentations for the production and estimation (qualitative and quantitative) of: e. Enzymes: Amylase and Protease f. Amino aStudy different parts of fermenter g. Microbial fermentations for the production and estimation (qualitative and quantitative) of: h. Enzymes: Amylase and Protease i. Amino acid: Glutamic acid j. Organic acid: Citric acid k. Alcohol: Ethanolcid: Glutamic acid l. Organic acid: Citric acid m. Alcohol: Ethanol
	DSE-A: 1. MICROBIAL BIOTECHNOLOGY (THEORY) : **Unit 1 : Microbial Biotechnology and its Applications :** Microbial biotechnology: Scope and its applications in human therapeutics, agriculture (Biofertilizers, PGPR, Mycorrhizae),	5	MCB-A-DSE-A-5-1-TH	4	70	To understand the basic application of microbiology with industrial importance. Use of microbes in solving real life crises are emphasized with examples from the food and pharmaceutical industry.

	environmental, and food technology. Use of prokaryotic and eukaryotic microorganisms in biotechnological applications Genetically engineered microbes for industrial application: Bacteria and yeast **Unit 2 : Therapeutic and Industrial Biotechnology :** Recombinant microbial production processes in pharmaceutical industries - Streptokinase, recombinant vaccines (Hepatitis B vaccine) Microbial polysaccharides and polyesters, Microbial production of bio-pesticides, bioplastics Microbial biosensors **Unit 3 : Applications of Microbes in Biotransformations :** Microbial based transformation of steroids and sterols Bio-catalytic processes and their industrial applications: Production of high fructose syrup and production of cocoa butter substitute **Unit 4 : Microbial Products and their Recovery :** Microbial product purification: filtration, ion exchange & affinity chromatography techniques Immobilization methods and their application: Whole cell immobilization					Similarly the therapeutic application of microbial products are assessed in this section. This section is directed towards understanding the application of microbes in several industrial applications. The section is also directed towards detailed understanding of industrial production and purification of several products from microbial origin. This section is purely dedicated towards discussion of products for bioenergy generation and mechanistic studies. The RNAi technology is solely directed for studies related to gene silencing and various applications in therapeutics.

	Unit 5 : Microbes for Bio-energy and Environment : Bio-ethanol and bio-diesel production: commercial production from lignocellulosic waste and algal biomass, Biogas production: Methane and hydrogen production using microbial culture. Microorganisms in bioremediation: Degradation of xenobiotics, mineral recovery, removal of heavy metals from aqueous effluents **Unit 6 : RNAi :** RNAi and its applications in silencing genes, drug resistance, therapeutics and host pathogen interactions **Unit 7 : Intellectual Property Rights :** Patents, Copyrights, Trademarks					IP rights and by-laws for patent filing and copyright are discussed in detail.
	DSE-A: 1. MICROBIAL BIOTECHNOLOGY (PRACTICAL) : 1. Study yeast cell immobilization in calcium alginate gels 2. Study enzyme immobilization by sodium alginate method 3. Pigment production from fungi (*Trichoderma* / *Aspergillus* / *Penicillium*) 4. Isolation of xylanase or lipase producing bacteria	5	MCB-A-DSE-A-5-1-P	2	30	The section is directed towards understanding processes involving the immobilization of cells and its application strategies especially for enzyme technology.

	5. Study of algal Single Cell Proteins					
	DSE-B:1. INHERITANCE BIOLOGY (THEORY) : **Unit 1 : Introduction to Genetics :** Historical developments Model organisms in genetic analyses and experimentation: *Escherichia coli*, *Saccharomycescerevisiae*, *Neurospora crassa*, *Caenorhabditis elegans* *Drosophila melanogaster*, *Arabidopsis thaliana* **Unit 2 : Mendelian Principles :** Mendel's Laws: Dominance, segregation, independent assortment, deviation from Mendelian inheritance, Rediscovery of Mendel's principles, Chromosome theory of inheritance: Allele, multiple alleles, pseudoallele, complementation tests, Extensions of Mendelian genetics: Allelic interactions, concept of dominance, recessiveness, Incomplete dominance and co-dominance, Multiple alleles, Epistasis, penetrance and expressivity **Unit 3 : Linkage and Crossing over :** Linkage and recombination of genes, Cytological	5	MCB-A-DSE-B-5-1-TH	4	70	Theoretical discussion of model organisms for their contribution in understanding complex biology, gene expression and industrial application. The section was discussed in connection to mendelian genetics and understanding the laws of inheritance. The major mechanisms of linkage and recombination are discussed in this section. The section is to gain knowledge on interesting aspects of extra nuclear inheritance and origin of life. Here again the details of chromosomal organisation and intricate details of nuclear ultrastructure are discussed.

	basis of crossing over, Crossing over at four-strand stage, Molecular mechanism of crossing over, mapping **Unit 4 : Extra- Chromosomal Inheritance** Rules of extra nuclear inheritance, Organelle heredity - Chloroplast mutations in *Chlamydomonas*, mitochondrial, mutations in *Saccharomyces*, Maternal effects – Shell coiling in *Limnaeaperegra* Infectious heredity - Kappa particles in *Paramecium* **Unit 5 : Characteristics of Chromosomes :** Structural organization of chromosomes - centromeres, telomeres and repetitive DNA, Packaging DNA molecules into chromosomes, Concept of euchromatin and heterochromatin, Normal and abnormal karyotypes of human chromosomes, Chromosome banding, Giant chromosomes: Polytene and lampbrush chromosomes, Variations in chromosome structure: Deletion, duplication, inversion and translocation, Variation in chromosomal number and structural abnormalities - Klinefelter syndrome, Turner syndrome, Down syndrome					The section is designed to discuss how the recombination event takes place in cell. The rest of the units are again aligned to discuss the further details of human genetics and how to quantify genetic inheritance in the light of evolution.

	Unit 6 : Recombination: Homologous and non-homologous recombination, including transposition, site-specific recombination **Unit 7 : Human genetics :** Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders. **Unit 8 : Quantitative genetics :** Polygenic inheritance, heritability and its measurements, QTL mapping.					
	DSE-B:1. INHERITANCE BIOLOGY (PRACTICAL): 1. Mendelian deviations in dihybrid crosses 2. Studying Barr Body with the temporary mount of human cheek cells 3. Studying *Rhoeo* translocation with the help of photographs 4. Karyotyping with the help of photographs 5. Chi-Square Analysis 6. Study of polytene chromosomes using temporary mounts of salivary glands of *Chiromonas /Drosophila* larvae 7. Study of pedigree analysis 8. Analysis of a representative quantitative trait	5	MCB-A-DSE-B-5-1-P	2	30	

	CC-13: IMMUNOLOGY (THEORY) : **Unit 1 : Introduction** : Concept of Innate and Adaptive immunity; Contributions of following scientists to the development of field of immunology - Edward Jenner, Karl Landsteiner, Robert Koch, Paul Ehrlich, Elie Metchnikoff, Peter Medawar, MacFarlane Burnet, Neils K Jerne, Rodney Porter and Susumu Tonegawa **Unit 2 : Immune Cells and Organs :** Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; and Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen, GALT, MALT, CALT **Unit 3 : Antigens :** Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Haptens; Epitopes (T & B cell epitopes); T-dependent and T-independent antigens; Adjuvants **Unit 4 : Antibodies** : Structure, Types, Functions and Properties of antibodies; Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic); VDJ rearrangements; Monoclonal and Chimeric antibodies **Unit 5 : Major Histocompatibility**	6	MCB-A-CC-6-13-TH	4	70	The paper is solely designed to inculcate knowledge on the host pathogen interaction and immunology in the light of major discoveries in last century. The unit is directed towards first hand knowledge on different types of immune cells and its origin, function. The unit on antigen attempts to highlight the structure and function of antigenic peptides and its properties. Here, again interesting details are furnished in terms of how the antibodies are produced, how the variants are attributed to their distinctive functionality. Major Histocompatibility and its role in antigen presentation. The role of complement system in defence against bacterial infections are discussed here. This section majorly focuses on topics in connections to immune responses and the mechanism of immune reactions in host.

	Complex : Organization of MHC locus (Mice & Human); Structure and Functions of MHC I & II molecules; Antigen processing and presentation (Cytosolic and Endocytic pathways) **Unit 6 : Complement System :** Components of the Complement system; Activation pathways (Classical, Alternative and Lectin pathways); Biological consequences of complement Activation **Unit 7 : Generation of Immune Response :** Primary and Secondary Immune Response; Generation of Humoral Immune Response (Plasma and Memory cells); Generation of Cell Mediated Immune Response (Self MHC restriction, T cell activation, Co-stimulatory signals); Killing Mechanisms by CTL and NK cells, Introduction to tolerance **Unit 8 : Immunological Disorders and Tumor Immunity :** Types of Autoimmunity and Hypersensitivity with examples; Immunodeficiencies- Animal models (Nude and SCID mice), SCID, DiGeorge syndrome, Chediak- Higashi syndrome, Leukocyte adhesion deficiency, CGD; Types of tumors, tumor Antigens, causes and therapy for cancers.					The section leads to intervention in the immune reaction in tumor cells and the corresponding immune responses in hosts. The unit is directed towards general overview of immunological techniques commonly practised in hospitals and diagnostic labs.

	Unit 9 : Immunological Techniques : Principles of Precipitation, Agglutination, Immunodiffusion, Immuno electrophoresis, ELISA, ELISPOT, Western blotting, Immuno fluoresence, Flow cytometry, Immunoelectron microscopy.					
	CC-13: IMMUNOLOGY (PRACTICAL) : 1. Identification of human blood groups. 2. Perform Total Leukocyte Count of the given blood sample. 3. Perform Differential Leukocyte Count of the given blood sample. 4. Separate serum from the blood sample (demonstration). 5. Perform immunodiffusion by Ouchterlony method. 6. Perform DOT ELISA. 7. Perform immune electrophoresis.	6	MCB-A-CC-6-13-P	2	30	Immunology practicals are addressed to perform the general tests for immune response, its principle, procedure and result interpretations are discussed to attain technical skills.
	CC-14 : MEDICAL MICROBIOLOGY (THEORY) : **Unit 1 : Normal microflora of the human body and host pathogen interaction :** Normal microflora of the human body: Importance of normal	6	MCB-A-CC-6-14-TH	4	70	The theory section pertaining to medical microbiology would help the students to gain further insight on host pathogen relationship, disease progression, mechanism for pathogenesis, lab diagnosis,

	microflora, normal microflora of skin, throat, gastrointestinal tract, urogenital tract Host pathogen interaction: Definitions - Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxigenicity, Carriers and their types, Opportunistic infections, Nosocomial infections. Transmission of infection, Pathophysiologic effects of LPS **Unit 2 : Sample collection, transport and diagnosis :** Collection, transport and culturing of clinical samples, principles of different diagnostic tests (ELISA, Immunofluorescence, Agglutination based tests, Complement fixation, PCR, DNA probes) **Unit 3: Bacterial diseases :** List of diseases of various organ systems and their causative agents. The following diseases in detail with Symptoms, mode of transmission, prophylaxis and control Respiratory Diseases: *Streptococcus pyogenes, Haemophilus influenzae, Mycobacterium tuberculosis* Gastrointestinal Diseases: *Escherichia coli, Salmonella typhi, Vibrio cholerae, Helicobacter pylori* Others: *Staphylococcus aureus, Bacillus*					epidemiological concepts and possible treatment options. The first unit would provide students with concepts of normal flora. The second unit would allow them to understand several techniques for sample collections from patients. The third unit would provide them detailed insight on pathogenesis of several clinically relevant disease, their symptoms, disease progression and related topics. The unit 4 would elaborate them with typical examples viral diseases and mechanistic pathways of infection, epidemiological interventions. The syllabus for unit 5 totally depicts parasitic infection and attributes towards its control measures. The syllabus for unit 5 totally depicts fungal infection and attributes towards its control measures.

	anthracis, Clostridium tetani, Treponema pallidum,Clostridium difficie **Unit 4: Viral diseases :** List of diseases of various organ systems and their causative agents. The following diseases in detail with Symptoms, mode of transmission, prophylaxis and control Polio, Herpes, Hepatitis, Rabies, Dengue, AIDS, Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis **Unit 5: Protozoan diseases** List of diseases of various organ systems and their causative agents. The following diseases in detail with Symptoms, mode of transmission, prophylaxis and control Malaria, Kala-azar **Unit 6: Fungal diseases:** Brief description of each of the following types of mycoses and one representative disease to be studied with respect to transmission, symptoms and prevention Cutaneous mycoses: Tinea pedis (Athlete's foot) Systemic mycoses: Histoplasmosis Opportunistic mycoses: Candidiasis **Unit 7 Antimicrobial agents: General characteristics and mode of action :**					Finally the last unit of the paper would help them to gain knowledge and valuable information of chemotherapeutic drugs, its mechanism of action. All antibiotics, antiviral and antiparasitic drugs are discussed in detail.

	Antibacterial agents: Five modes of action with one example each: Inhibitor of nucleic acid synthesis; Inhibitor of cell wall synthesis; Inhibitor of cell membrane function; Inhibitor of protein synthesis; Inhibitor of metabolism Antifungal agents: Mechanism of action of Amphotericin B, Glvin Antiviral agents: Mechanism of action of Amantadine, Acyclovir, Azidothymidine Antibiotic resistance, MDR, XDR, MRSA, NDM-1					
	CC-14 : MEDICAL MICROBIOLOGY (PRACTICAL) : 1. 75Identify bacteria (any three of *E. coli, Salmonella, Pseudomonas, Staphylococcus, Bacillus*) using laboratory strains on the basis of cultural, morphological and biochemical characteristics: IMViC, TSI, nitrate reduction, urease production and catalase tests 2. Study of composition and use of important differential media for identification of bacteria: EMB Agar, McConkey agar, Mannitol salt agar, Deoxycholate citrate agar, TCBS	6	MCB-A-CC-6-14-P	2		D The practical knowledge on medical microbiology would include identification and characterization of medically relevant pathogens, various tests are studied to characterize them. 8. Study of composition and use of important differential media for identification of bacteria: 3. Study of bacterial flora of skin

	3. Study of bacterial flora of skin by swab method 4. Perform c 5. Determination of minimal inhibitory concentration (MIC) of an antibiotic. 6. Study symptoms of the diseases with the help of photographs: Polio, anthrax, herpes, chicken pox, HPV warts, AIDS (candidiasis), dermatomycoses (ring worms) 7. Study of various stages of malarial parasite in RBCs using permanent mounts.					9. Study on antibacterial sensitivity by Kirby-Bauer method and MIC determination are discussed and performed also.(to understand minimum amount of antibitic are used to individual against the pathogens Study symptoms of the diseases with the help of photographs: 10. Study of various stages of malarial parasite in RBCs using permanent mounts.

	DSE-A: 3. PLANT PATHOLOGY (THEORY) : **Unit 1 : Introduction and History of plant pathology** Concept of plant disease- definitions of disease, disease cycle & pathogenicity, symptoms associated with microbial plant diseases, types of plant pathogens, economic losses and social impact of plant diseases. Significant landmarks in the field of plant pathology- Contributions of Anton DeBary, Millardet, Burrill, E. Smith, Adolph Mayer, Ivanowski, Diener, Stakman, H.H. Flor, Van Der Plank, molecular Koch's postulates. Contributions of eminent Indian plant pathologists **Unit 2 : Stages in development of a disease :** Infection, invasion, colonization, dissemination of pathogens and perennation. **Unit 3: Plant disease epidemiology :** Concepts of monocyclic, polycyclic and polyetic diseases, disease triangle & disease pyramid, forecasting of plant diseases and its relevance in Indian context. **Unit 4: Host Pathogen Interaction:**	6	MCB-A-DSE-A-6-3-TH	4	70	This section of the syllabus discuss about plant disease and disease cycle & pathogenicity, symptoms associated with microbial plant diseases, types of plant pathogens, economic losses and social impact of plant diseases. Significant landmarks in the field of plant pathology. Unit 2 : This unit discuss about different stages in d development of a disease. 3.Section gives brief idea on plant disease epidemiology.. 4. This section state about *Microbial Pathogenicity* Virulence factors of pathogen *in plant.*

	A. *Microbial Pathogenicity* Virulence factors of pathogens: enzymes, toxins (host specific and non specific) growth regulators, virulence factors in viruses *Microbial Pathogenicity* Virulence factors of pathogens: enzymes, toxins (host specific and non specific) growth regulators, virulence factors in viruses v*Microbial Pathogenicity* Virulence factors of pathogens: enzymes, toxins (host specific and non specific) growth regulators, virulence factors in viruses (replicase, coat protein, silencing suppressors) in disease development. Effects of pathogens on host physiological processes (photosynthesis, respiration, cell membrane permeability, translocation of water and nutrients, plant growth and reproduction). B. *Genetics of Plant Diseases:* Concept of resistance (R) gene and avirulence (avr) gene; gene for gene hypothesis, types of plant resistance: true resistance– horizontal & vertical, apparent resistance. C. *Defense Mechanisms in Plants* Concepts of constitutive defense mechanisms in plants,					B. Knowledge of genetical background ofv plant disease are discussed here. C. Here defense mechanisms in plants are discussed *Unit 5: By which practuices* plant diseases controlled are discussed here.

	inducible structural defenses (histological-cork layer, abscission layer, tyloses, gums), inducible biochemical defenses [hypersensitive response (HR), systemic acquired resistance (SAR), phytoalexins, pathogenesis related (PR) proteins, plantibodies, phenolics, quinones, oxidative bursts]. **Unit 5 : Control of Plant Diseases :** Principles & practices involved in the management of plant diseases by different methods, *viz*. regulatory - quarantine, crop certification, avoidance of pathogen, use of pathogen free propagative material cultural - host eradication, crop rotation, sanitation, polyethylene traps and mulches chemical - protectants and systemic fungicides, antibiotics, resistance of pathogens to chemicals. biological - suppressive soils, antagonistic microbes-bacteria and fungi, trap plants genetic engineering of disease resistant plants-with plant derived genes and pathogen derived genes **Unit 6: Specific Plant diseases**: Study of some important plant diseases giving emphasis on its					6. Study of important plant diseases are discussed here.

	etiological agent, symptoms, epidemiology and control A. Important diseases caused by fungi, White rust of crucifers - *Albugo candida,* Downy mildew of onion - *Peronospora destructor,* Late blight of potato - *Phytophthora infestans* Powdery mildew of wheat - *Erysiphe graminis* Ergot of rye - *Claviceps purpurea* Black stem rust of wheat - *Puccinia graministritici* Loose smut of wheat - *Ustilago nuda* Wilt of tomato - *Fusarium oxysporum*f.sp. *lycopersici* Red rot of sugarcane - *Colletotrichum falcatum* Early blight of potato - *Alternaria solani* B. Important diseases caused by phytopathogenic bacteria: Angular leaf spot of cotton, bacterial leaf blight of rice, crown galls, bacterial cankers of citrus C. Important diseases caused by phytoplasmas: Aster yellow, citrus stubborn D. Important diseases caused by viruses: Papaya ring spot, tomato yellow leaf curl, banana bunchy top, rice tungro E. Importantdiseases caused by viroids: Potato spindle tuber, coconut cadangcadang					

	DSE-A: 3. PLANT PATHOLOGY (PRACTICAL) : 1. Demonstration of Koch's postulates in fungal, bacterial and viral plant pathogens. 2. Study of important diseases of crop plants by cutting sections of infected plant material - *Albugo,Puccinia,Ustilago,Fusarium, Colletotrichum.*	6	MCB-A-DSE-A-6-3-P	2	30	1. Demonstration of Koch's postulates in fungal, bacterial and viral plant pathogens. .2. Study of important diseases of crop plants by cutting sections of infected plant material
	DSE-B: 3. INSTRUMENTATION AND BIOTECHNIQUES (THEORY) : **Unit 1 : Microscopy :** Brightfield and darkfield microscopy, Fluorescence Microscopy, Phase contrast Microscopy, Confocal Microscopy, Electron Microscopy (Scanning and Transmission Electron Microscopy) and Micrometry **Unit 2 : Chromatography:** Principles and applications of paper chromatography (including Descending and 2-D), Thin layer chromatography. Column packing and fraction collection. Gel filtration chromatography, ion-exchange chromatography and affinity	6	MCB-A-DSE-B-6-3-TH	4	70	1. Detailed study on different types microscopes are discussed here. 2. Principles and applications of paper chromatography Students learn here Column packing and fraction collection. 3. Here basic concepts,principle and applications of different types of electrophoresis are learnt by students. 4. This section state that Principle and use of study of absorption spectra of biomolecules.

	chromatography, GLC, HPLC. **Unit 3 : Electrophoresis :** Principle and applications of native polyacrylamide gel electrophoresis, SDS-polyacrylamide gel electrophoresis, 2D gel electrophoresis, Isoelectric focusing, Zymogram preparation and Agarose gel electrophoresis. **Unit 4 Spectrophotometry** Principle and use of study of absorption spectra of biomolecules. Analysis of biomolecules using UV and visible range. Colorimetry and turbidometry. **Unit 5 : Centrifugation :** Preparative and analytical centrifugation, fixed angle and swinging bucket rotors. RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation and ultracentrifugation.					Analysis of biomolecules using UV and visible range. Colorimetry and turbidometry. 5. Basic concepts and knowledge of different types of centrifugations.
	DSE-B: **3. INSTRUMENTATION AND BIOTECHNIQUES (PRACTICAL) :** 1. Study of fluorescent micrographs to visualize bacterial cells. 2. Ray diagrams of phase contrast microscopy and	6	MCB-A-DSE-B-6-3-P	2	30	1.Here basic concepts of fluorescent micrograph are discussed. 2.Ray diagrams of phase contrast and Electron Microscopy are studied., .3. Separation of mixtures by paper thin layer chromatography are studied here. 4. Column packing in any form of column

	Electron microscopy. 3. Separation of mixtures by paper / thin layer chromatography. 4. Demonstration of column packing in any form of column chromatography. 5. Separation of protein mixtures by any form of chromatography. 6. Separation of protein mixtures by Polyacrylamide Gel Electrophoresis (PAGE). 7. Determination of λmax for an unknown sample and calculation of extinction coefficient. 8. Separation of components of a given mixture using a laboratory scale centrifuge. 9. Understanding density gradient centrifugation with the help of pictures					chromatography are demonstrated here. 5. Separation of protein mixtures by any form of chromatography are taughat here. 6. Another approach for separation of protein mixtures by polyacrylamide gel electrophoresis are taught and demonstrated 7. Knowledge of determination of λmax for an unknown sample and calculation of extinction coefficient.are discussed here. 8. Separation of components of a given mixture using a laboratory scale centrifuge.are taught here 9. Basic concepts of density gradient centrifugation are cleared with the help of pictures.

Department of Molecular Biology

Course Specific Outcomes	
Course	**Outcomes**
Cell Biology - Principles and Techniques	The students will come to know the fundamentals of the modes of operation of a cell. They will also be acquainted with the various techniques through which these processes are studied.
Basics of biomolecules	Chemical structure, organization and functions of the important bio molecules will be catered to the students
Concepts of Molecular Biology	The basic framework of Molecular biology will be elaborated. The "Central Dogma" of how the genetic information is passed on from parents to the offspring will be discussed.
Biophysical Techniques	Students will learn to handle sophisticated instruments used in biology
Radiation Biology	Students will learn fundamentals of radioactivity and therapeutic use of radioisotopes.
Biostatistics	Students will learn to use statistical techniques, tools and methods to analyse and validate biological data
Recombinant DNA Technology	Students will be acquainted with the tools and technologies of manipulating DNA to create recombinant molecules of DNA and protein.
Clinical Biochemistry	Biochemistry of diseases and diagnostics will be catered to the students

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Department of Mathematics

Course Outcomes of B. Sc Mathematics Honours

Semester	**Course**	**Course Outcome**
Semester-1	CC1 (Unit-1: Calculus, Unit-2: Geometry, Unit-3: Vector Analysis)	Unit-1: Knowledge of derivatives of a function of real variables and its application to determine the curvature of a curve, concavity, convexity, tangent-normal and its properties. It also gives insight in tracking a curve and finding many of its properties. Concept of asymptotes of a polynomial curve and the idea of envelope to a family of curves are included there. Unit-2: Unit-3: After completing this unit the students will be able to

		• define scalar and vector triple products and understand their geometrical significance and apply these to various problems of geometry and mechanics • solve vector equations using the definition of products of two and three vectors • understand vector functions and vector valued functions and the concept of calculus extended to such functions • find limit, continuity, derivative and integration of such functions
	CC-2 Algebra	Unit-1: Knowledge about complex numbers and some functions like exponential functions, logarithmic functions, hyperbolic functions of complex variables. Students can apply De Moivre's theorem to find the sum of a trigonometric series and to solve some problems of real functions. This topic gives the detailed idea to solve cubic, biquadratic and some special type of higher order polynomial equations. Unit-2 : This also gives the fundamental ideas of sets, relations, mappings. This unit also gives the preliminary ideas of number theory. It will be very helpful for those students who will read number theory in higher study. Unit-3: After completing this unit the students will be able to • define rank and inverse of a matrix and characterize invertible matrices • understand row reduction of matrices and define row echelon matrices • apply the method of row-reduction to find inverse of square matrices and solution of linear systems of equations that arises in different applications of science and engineering
Semester-II	CC3 (Real Analysis)	Idea of real numbers and its properties. Idea of countability of sets and examples of countable and uncountable sets. Concept of bounded and unbounded sets in R. Students will learn about order completeness axiom, Archimedean property of R and Density property of rational and Irrational numbers in R. Concept of Neighbourhood of a point, Interior point, limit point and isolated point of a set and sequence of real numbers. Idea of open sets, closed sets and their properties. Bolzano Weierstrass theorem for set and sequence, Sandwich rule, Nested interval theorem for sequence of closed bounded intervals. Cauchy general principle of convergence, Cauchy's first and second limit theorems and their applications. Concept of convergence, absolute convergence, conditional convergence and non-convergence of infinite series of real numbers.Tests for convergence appling comparison test, ratio test, Cauchy's n-th root test, Kummer's test and Gauss test and Leibniz test.

	CC-4 (Group Theory -I)	Knowledge of group theory and its simple properties. Students can apply group theory to solve some special problems in elementary number theory like Fermat's Theorem, Wilson's Theorem and so on. Students can gain deep knowledge of group theory by learning symmetric group, dihedral group, group of congruence classes modulo some positive integer etc. The ideas of cyclic groups, quotient groups, normal subgroups, homomorphism, isomorphism and related theorems.
Semester-III	CC-5 (Theory of Real Functions)	Concept of limit and continuity of a function at a point. Sequential criterion for limit and continuity of a function. Continuity of a function on a set and important properties such as neighbourhood properties, boundedness properties, intermediate value theorem of continuous functions. Discontinuity of functions and two kinds of discontinuity of bounded functions. The property that a monotone function can have at most countably many points of discontinuity and the property that a monotone bijective function from an interval to an interval is continuous and its inverse is also continuous. Uniform continuity of a function on a set. Theorems such as 'Functions continuous on a closed and bounded interval are uniformly continuous' and 'A necessary and sufficient condition under which a continuous function on a bounded open interval I will be uniformly continuous on I'. Lipschitz condition and the condition is a sufficient condition for uniform continuity.
	CC-6 Ring Theory & Linear Algebra-I)	Unit-1: Knowledge of rings, integral domains, fields, ideals and classifications of ideals. Students can acquire the knowledge to generalise the homomorphism theorems, isomorphism theorems, correspondence theorems and one-one correspondence between the sets of ideals and the set of congruences in rings. Unit-2 : After completing this unit the students will be able to • define vector spaces, subspaces and quotient spaces and understand the algebra and geometry of such spaces • understand the concept of linear span and linear independence of vectors and its use in the definition of basis and dimension of vector spaces • understand the concept of linear transformation and its algebra and find the matrices of linear transformation • calculate the rank and nullity of a linear operator • define isomorphism of two vector spaces and understand the theorems related to isomorphism • understand characteristic equation of a square matrix and the Cayley-Hamilton theorem associated to it and apply this theorem to find the inverse of a square matrix • define eigen-values and eigen-vectors of a square matrix and use in to solve related problems

	CC-7 Ordinary Differential Equation and Multivariate Calculus)	In this course , students learn about the concepts of forming differential equations in case of geometric and mechanical problems. Also the idea of solving higher order linear differential equations using special techniques such as variation of parameters , integrating factors are being taught. Special non-linear differential equations , such as clairaut's form and singular solution are being taught also. Solving simultaneous differential equations of two variables using algebraic techniques are also taught. Idea of critical points in case of planar autonomous systems is included which gives the important idea of phase space. Power series solution for nth order linear differential equation is also included. Students get an elaborate idea and concepts of ordinary differential equations so that they can apply it to advanced topics such as mechanics, modelling, and many other branches of higher mathematics. In calculus of several variables the concept of function of more than one independent variable are being taught. The idea of simultaneous limit , iterated limits and partial derivatives are also being taught in this course. Concepts of finding extreme values for the function of two and three variables are also being taught. Students get these ideas useful in various advanced topics of analysis and algebra.
	SEC-A (C- Programming)	Students learn about the constants, variables, loops, library functions, user defined functions, arrays used in c program. Preliminary ideas for writing a c program have been developed by this course.
Semester-IV	CC-8 (Riemann Integration and Series of Functions)	The Riemann integration gives students the ideas to find the areas of curves. Students can recognize whether a function is integrable or not. Students also learn about a zero set and its relation with integrability of a function. They can develop the ideas of improper integrations and they learn how to find the values of improper integral and gain the idea to test a function whether it is convergence or not. Learning some special functions such as Beta-function, Gamma-functions. Students can find the values of some complicated integrals easily using these functions. Also this core course helps students to generalise the sequence and series in a broad area.
	CC-9 (Partial Differential Equation & Multivariate Calculus-II)	Unit-1: After completing this unit the students will be able to • understand the concept and theory of linear and non-linear partial differential equations of first order, and different methods of solving such equations e.g., Lagrange's method and Charpit's method • derive different second order PDE's e.g., heat equation, wave equation and Laplace equation • classify second order linear PDE's and reduce them to canonical forms

		• understand the Cauchy problem of PDE's and the related theory and learn the method of separation of variables to solve vibration and heat conduction problems. Unit-2: In multivariate calculus II , students get the idea of double and triple integral as well as the very important concept of differentiation under the sign of integral with parametric values. Also the concept of line integral and Stokes Theorem, Green's Theorem, Gauss-Divergence Theorem are included here. Students get these ideas useful in various branches like advanced mechanics, astro-physics and quantum mechanics.
	CC-10 (Mechanics)	This course of mechanics gives the idea of coplanar forces, force system in space, equilibrium in the presence of sliding friction force, virtual work, stability of equilibrium, kinematics of a particle, Newton laws of motion and law of gravitation, dynamics of a particle, planar motion & three dimensional motion of a particle and dynamics of many particles system. This course is useful in various branches of Applied Mathematics like advanced mechanics, fluid mechanics, astro-physics, quantum mechanics, etc.
	SEC-B1 (Mathematical logic)	
	SEC-B2 (Sage-Math)	SageMath is a computer algebra system (CAS) with features covering many aspects of mathematics, including algebra, combinatorics, graph theory, numerical analysis, number theory, calculus and statistics. The goal of this course is to introduce students to the fundamental commands and structure of SageMath. The course covers the basic syntax and semantics of SageMath including basic data types, variables, control structures and functions or similar concepts, and visualization of results and processed data graphically.
Semester-V	CC-11 (Probability & Statistics)	Unit-1: After completing this unit the students will be able to • learn the concepts of random experiment, σ-field, probability space and the axioms of probability • define conditional probability, understand Bayes theorem and use it to solve real life problems. • understand the concepts of discrete and continuous random variables and distribution functions of one variable, the concepts of probability mass and density function together with important and common examples of such functions

		• understand the concepts of mathematical expectation and characteristic function of random variables and the common characteristics associated with it Unit-2: After completing this unit the students will be able to • understand the extension of the concepts of Unit-I to many variables, especially to two random variables • understand the concepts of covariance, correlation coefficient, marginal and conditional distributions and also the concepts of regression lines and curves of two variables Unit-3: After completing this unit the students will be able to • understand the Markov and Chebyshev's inequality and the concept of convergence of a sequence of random variables in probabilistic sense • understand the weak and strong law of large numbers and the central limit theorem for independent and identically distributed random variables with finite variance Unit-4 & 5: In statistics, students learn about three central tendencies, mean, median mode, standard deviation, skewness, kurtosis. Also they get the idea of sampling techniques, different sampling distributions such as normal distribution chi-square distribution and t-distribution. They also learn about estimation techniques and the theory of testing hypotheses. The notion of critical regions using Neyman-Pearson lemma is also taught. This helps students to apply in various real life situations.
	CC-12 (Group Theory II and Linear Algebra)	To gain the knowledge of automorphism, automorphism groups, cyclic groups, factor groups and its applications to automorphism groups, external direct products, internal direct products and fundamental theorem of finite abelian groups. Students can check whether a finite group has a subgroup corresponding to any divisor of the order of the group. In linear algebra of this core course students can gain the knowledge of inner products, norms, Gram-schmidt orthogonalization process, orthogonal complement, bessel's inequality, linear operator, dual space, dual basis and transpose of a linear transformation. They can also learn how to diagonalise a symmetric matrix, how to test for critical points of a function of several variables. How to find eigenspace, eigenvalues of a linear operator.
	DSE-A 1 (Group Theory and Ring Theory)	Knowledge of group action and its application to group theory, generalisation of Caley's theorem, index theorem, class equation. Gain the knowledge to determine all possible subgroups of a group of given order and to check whether a group of finite order can have a subgroup corresponding to each divisor of the order of the group. Students can also learn about principal ideal domain, principal ideal

		ring, prime element, irreducible element, gcd etc. They can also learn about FD,UFD, PID and their inter-relations and how to embed a ring.
	DSE-A1 ()	
	DSE-B(1) (Linear Programming & Game Theory	Unit-1: Unit-2: Unit-3: After completing this unit the students will be able to • understand the theory of duality in LPP and construct the dual problem from the primal problem and vice-versa • understand the relation between dual and primal problems and the relation between their optimal solutions and learn to determine the optimal solutions of the primal problem from the simplex table for the dual problem and vice-versa Unit-4: After completing this unit the students will be able to • understand the optimization problems popularly known as Transportation problems, Assignment problems and Travelling Salesman problems and learn the methods of solving these problems and use it to work out such problems for optimal solutions • understand the concepts of game theory - especially two-person zero sum games, which may be either deterministic or probabilistic in nature. • find the saddle points for rectangular games with pure strategies and the corresponding value of the games • learn the various methods of solving rectangular games with mixed strategies and the fundamental theorem of rectangular games with the concept of inter-relation between the theory of games and LPP
	DSE-B1 ()	
Semester-VI	CC-13 (Metric Space and Complex Analysis)	
	CC-14 (Numerical Methods with Numerical Methods Lab (Practical))	There are three stages of numerical course , polynomial interpolation for both equal difference tabular data as well as unequal difference table using divided difference and lagrange formula , solving simultaneous equations with two variable using different determinant & matrix as well as solving non-linear equations using different iterative methods such as Newton-Raphson method is also included in this course. Solving differential equations using Picard's method , Euler's method as well as numerical integration using computer programmes are included in this course. Students learn these extremely

		useful techniques to employ in different fields of applied mathematics as well as in real life.
	DSEA2(Point Set Topology)	Basic idea of topological spaces, basis, subbasis for a topological space. Students learn topology as a generalisation of real analysis. Gain the knowledge about separation axioms, connected spaces, compact spaces. They can also learn Hein-Borel Theorem in Rn , the concept of compactness in a metric space, sequential compactness of a metric space.
	DSE-A(2) (Mathematical Modelling)	Unit-1: After completing this unit the students will be able to • find the power series solution of Legendre's equation and series solution of Bessel's equation and learn all necessary properties of Legendre and Bessel functions together with the reduction formulae • understand the concepts of Laplace transform and inverse transform with sufficient examples and apply these concepts to solve initial value problems associated with ordinary differential equations up to the second order Unit-2: After completing this unit the students will be able to • understand the concept of the harbor system in morning rush hour models using Monte Carlo simulation • generate random numbers using linear congruence method as well as learn different queueing theory models and their use in different methods of solving real life situations • get an overview of optimization modelling and linear programming models and use the algebraic and simplex methods for solving LPP's • understand the concepts of sensitivity analysis and apply it to the problems of linear programming

Course Outcome of B.Sc. General Mathematics

Semester	Course	Course Outcome
Semester -1	CC1/GE1 (Algebra-I, Differential Calculus - I, Differential Equation - I, Coordinate Geometry)	Ability to solve polynomial equations and to find the nature of their roots, to define some complex functions like exponential, hyperbolic, logarithmic functions. In differential calculus-I students can learn how to represent real numbers geometrically in real line, basic ideas of real valued functions and their limit, continuity, differentiability, geometrical explanation of derivatives, relation between derivative and continuity , derivatives of more than one variables, Cauchy's theorem Schwartz's theorem, Euler's Theorem. Students will also be able to find the derivatives of higher orders of the product of two or more functions.

Semester 2	CC2/GE2 (Differential Calculus - II, Differential Equation - II, Vector Algebra, Discrete Mathematics)	In differential calculus - II students can learn about different type of sequences, series and their convergence. Also students can acquire the knowledge how to expand and a real valued function on an interval. They can find the maximum or minimum value of a function. Students can easily find the limits of some complicated functions. In differential equation-II of this core course students gain the knowledge of solving linear homogeneous and non-homogeneous equations, simultaneous equations. Gain the knowledge of solving basic partial differential equations. In discrete mathematics students can learn basic theorems in elementary number theory. Ability to determine rules how a positive integer is divisible by another positive integer. Techniques to find integral solutions of systems of linear equations. Students can also check whether a ISBN no. or a credit card no. is true or false. Ability to determine a schedule of a tournament, to detect error in UPC.
Semester 3	CC3/GE3 (Integral Calculus, Numerical Method, Linear Programming)	In this course students get the basic idea improper integral and it's various application. In Numerical Analysis students attain the knowledge of polynomial interpolation, numerical integration techniques as well as solving non-linear equations using Newton-Raphson method . These are very useful methods which trains students to develop many ideas .
Semester 4	CC4/GE4 (Algebra II, Computer Science & Programming, Probability & Statistics)	
Semester 3	SEC A1 (Programming Language)	.
Semester 4	SEC B1 (Mathematical Logic)	
Semester 5	SEC A2 (Object Oriented Programming in C++)	
Semester 6	SEC B2(Boolean Algebra)	
Semester 5	DSE A (Particle Dynamics)	In this special paper , students get the idea of motion in one dimension as well as two dimension under gravity or any sort of attractive , periodic forces. Planetory orbit motion using Kepler's Three Laws are also being taught. Motion in resisting media under gravity as well as in constrained motion are also discussed . Tangential-normal acceleration in case of cartesian coordinate and radial- cross-radial component of velocity, acclrn. Are also being taught. Completing this course students get a comprehensive idea of dynamical motion and it's analysis.

Semester 5	DSE A (Graph Theory)	i
Semester 6	DSE B (Advanced Calculus)	
Semester 6	DSE B (Mathematical Finance)	

Department of Physics

Course Outcomes of Physics (Honours and General)

Program: B. Sc. Physics (Hons.); **Program Code**: PHSA

Semester	Course Name	Course Code	Credit	Marks	Course outcome
I	Mathematical Physics I	PHSA-CC-1	6 [Theory: 4 Practical: 2]	100	After completion of this course student should be able to learn the basics of mathematical techniques such as vector algebra, vector calculus, infinite series, partial derivatives, differential equations, plotting of graphs etc. He/she will study the matrix algebra in details and its applications in solving differential equations. This course has been formulated in such a way that it will help him/her to work out the mathematics behind different physics problems which he/she will encounter later in the undergraduate course. In the practical part, the student will learn a very powerful yet easy-to-learn programming language PYTHON. He/she will do basic programming using python like sorting different numbers, finding roots of an equation, solving ordinary differential equations, matrix operations. The student will also learn and use plotting software named GNUPLOT to visualize and plot the data. This practical course has an excellent one-to-one correspondence

					with what he/she learns in the theory portion.
I	Mechanics	PHSA-CC-2	6 [Theory: 4 Practical: 2]	100	After going through the course, the student should be able to understand the concept of Newtonian Mechanics and its application to various dynamical systems. He/she will learn the basics of energy-momentum conservation, central force problems, Gravitation and apply them to basic problems. The student will learn about the rotational dynamics of rigid body problems as well as the simple principles of fluid dynamics. In the laboratory course the students will first revamp their experimental skills using some of the basic tools for measuring length like vernier caliper, screw gauge and traveling microscope, as well as the concept of different errors introduced in different instruments. Then he/she will do some basic mechanical experiments to determine moment of inertia, Young modulus, value of acceleration due to gravity, height of a building etc.

II	Electricity and Magnetism	PHSA-CC-3	6 [Theory: 4 Practical: 2]	100	This course will help students in understanding basic concepts of electricity and magnetism and their applications. The student will learn electric field, potential, application of Gauss's law to solve a variety of problems. He/she will understand the concepts of dielectric properties of matter, magnetic field, magnetic properties of matter, electromagnetic induction and electrical circuits. In the laboratory course the student will get an opportunity to learn different measurement techniques of various quantities related to electricity and magnetism. List of practicals includes how to determine low resistance using Potentiometer, and Carey Foster bridge, study of LCR circuit, mutual inductance between two coils and determination of horizontal component of the Earth's magnetic field.
II	Waves and Optics	PHSA-CC-4	6 [Theory: 4 Practical: 2]	100	In this course the student will develop an understanding of various aspects of harmonic oscillations and waves specially superposition of collinear and perpendicular harmonic oscillations, various types of mechanical waves and their superposition, phase and group velocities. This course in basics of optics will enable the student to understand various optical phenomena, principles, workings and applications optical instruments. In the laboratory course, student will gain hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc. He/she will learn how to determine the thickness of a thin paper, to determine the frequency of an electric tuning fork by Melde's experiment. The laboratory course also includes the study of variation of refractive index of the material of a prism with wavelengths and the

					measurement of the spacing between the adjacent slits in a grating. All these practicals will strengthen his/her knowledge of understanding the theory behind this topic.
III	Mathematical Physics II	PHSA-CC-5	6 [Theory: 4 Practical: 2]	100	This course focuses to develop the basic knowledge in Mathematical Physics. The content of course is very important to qualify the NET, SET and other job oriented examinations for Physics Honours students. The knowledge and conception about the course topics are also essential to understand the higher level physics and engineering. In this course the students learn the Fourier analysis of different periodic functions and their applications in physical problems. They learn about the special functions, such as the Hermite polynomial, Legendre polynomial, the Bessel functions etc. and also their applications in various physical problems. The students also learn some special integrals the beta function, gamma functions and the error functions and their applications. They learn different methods to solve partial differential equations with examples of some important partial differential equations in Physics. They revise the knowledge of probability and probability distribution; acquire knowledge about probability distribution functions, binomial, Gaussian, and Poisson distribution. These basic mathematical structures are essential in solving problems in various branches of Physics. In the practical course, the students learn the fundamentals of the Numerical Python (NumPy) and Scientific Python (SciPy), which are very important for scientific computing. They learn applications of NumPy and SciPy in interpolation, numerical integration, solution of differential equations, curve fitting etc. The students also learn the Mathplotlib which is very useful for data visualization and graph plotting.

III	Thermal Physics	PHSA-CC-6	6 [Theory: 4 Practical: 2]	100	After the successful completion of the course the students are expected to learn the basic concepts of thermodynamics, the laws of thermodynamics, the concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations, Maxwell's thermodynamic relations. They also learn the basic aspects of kinetic theory of gases, Maxwell-Boltzmann distribution law, mean free path of molecular collisions, thermal conductivity, diffusion and Brownian motion. The students learn about the real gas equations, Van der Waal equation of state, the Joule-Thompson effect, conduction of heat, thermal conductivity, Fourier's equation for heat conduction and its solution. In the laboratory course the students do some basic experiments in thermal physics, and learn how to measure the (i) coefficient of thermal expansion of a metallic rod using an optical lever, (ii) coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method, (iii) boiling point of a liquid using platinum resistance thermometer, and (iv) temperature coefficient of resistance using Carey Foster bridge. The students also learn to calibrate a thermocouple by directly measuring the thermo-emf using a potentiometer.
III	Modern Physics	PHSA-CC-7	6 [Theory: 4 Practical: 2]	100	In this course the students learn the inadequacies of classical mechanics, understand historical development of quantum mechanics and experiments that reveal the dual nature of matter. They learn the theory of quantum measurements, wave packets, and uncertainty principle. They understand the central concepts of quantum mechanics: wave functions, momentum and energy operator, Schrodinger equation, probability density and normalization techniques. They acquire skills on problem solving e.g. one dimensional rigid box,

					tunnelling through potential barrier, step potential, rectangular barrier etc. In addition to these the students also study the properties of nuclei like density, size, binding energy, nuclear forces and structure of nucleus, nuclear liquid drop model, shell model, neutrinos and its role in of beta decay, nuclear fission and fusion. They learn to calculate the decay rates and lifetime of radioactive decays like beta and gamma decay. The students are able to understand the spontaneous and stimulated emission of radiation, basic lasing, optical pumping and population inversion. Three level and four level lasers. Ruby laser and He-Ne laser and their working principle. In the practical course, the students get the opportunity to perform few advanced experiments: (i) measurement of Plank constant using LED, (ii) verification of Stefan's law of radiation using a bulb glowing beyond the draper point, (iii) measurement of e/m of electrons by using bar magnet, (iv) verification of photoelectric effect and (v) study the tunnelling effect using I-V characteristics of a tunnel diode.
III	Scientific Writing	PHSA-SEC-A1	2 [Theory: 1 Project: 1]	100	The students will learn scientific word processing using the LaTeX software which is very useful in writing articles including mathematical equations and diagrams. They learn to use packages like amsmath, amssymb, graphics, graphicx, geometry, algorithms, color, hyperref etc. The students also acquire the proficiency in effectively using the GUI Windows, the LINUX operating system and also in using the LaTeX software for wring a text file. The students learn about LaTeX word processor, preparing LaTeX input file, compiling LaTeX File, LaTeX tags for creating different environments, defining LaTeX commands and environments. They also learn about document classes, changing the type style, symbols from other

					languages, page layout, equation representation, addition of tables and figures, generating table of contents, bibliography and citation, etc. For the project work the students get sufficient knowledge about LaTeX so that after finishing the course they are able to write articles, research papers, reports, mathematical equations, simple resume, and documentation of experiments done in laboratory with results, tables and graphs. The students also learn the basics of gnuplot.
IV	Mathematical Physics III	PHSA-CC-8	6 [Theory: 4 Practical: 2]	100	In this course the students will learn about the complex numbers and their properties, graphical representation of complex number, Euler's formula, root of complex numbers, function of complex variables, analyticity, poles and residues. The students are expected to learn the residue theorem and its applications in evaluating definite integrals. The student will also understand variational calculus, variational principle and apply it to simple systems. They will learn basic ideas of functionals, Lagrangian formulation, Euler's equations and apply it simple problems. They will acquire basic concept of cyclic coordinates, symmetries and conservation laws, Legendre transformations, Hamiltonian formulation, canonical equations of motion etc. They will recapitulate and learn the special theory of relativity, Lorentz transformations on space-time and other four vectors, four-vector notations, space-time invariant, length contraction, time dilation, mass-energy relation, problems involving energy momentum conservations. The students will also understand space-time diagrams, proper time and proper velocity, and Minkowski force. In the laboratory course, the students will learn to apply their knowledge in computer

					programming language to solve few problems: (i) solution of first and second order ordinary differential equations with appropriate boundary conditions, (ii) solution of some basic partial differential equations, (iii) evaluation of the Gaussian integrals, (iv) evaluation of a converging infinite series up to a desired accuracy, (v) evaluation of the Fourier coefficients of a given periodic function, (v) plotting and verification of the properties of few special functions.
IV	Analog Electronics	PHSA-CC-9	6 [Theory: 4 Practical: 2]	100	After going through the course, the students should be able to apply various network theorems such as the superposition, Thevenin, Norton, reciprocity, maximum power transfer theorem in electrical circuit analysis. They expected to acquire basic knowledge of the N and P type semiconductors, mobility, drift velocity, fabrication of PN junctions, forward and reverse biased junctions, application of PN junction for different type of rectifiers and voltage regulators. They will get basic idea about the working principle and structure of LED, photodiode, solar cell and varactor diode. They will learn about NPN and PNP transistors and basic configurations namely common base, common emitter and common collector; and also about current and voltage gain, biasing and equivalent circuits; basic structure, principle of operations and characteristics of field effect transistors; coupled amplifiers and feedback in amplifiers. The students are also expected to learn about the operational amplifiers, application of OPAMP in different configurations namely inverting and non-inverting amplifiers, inverting and non-inverting adder, differentiator as subtractor, logarithmic and anti-logarithmic amplifiers, comparator, Schmidt trigger, integrator and differentiator. The students will learn about multivibrators; construction and operation of bistable, monostable and astable

					multivibrator circuits; oscillators, Barkhausen's Criterion for self-sustained oscillations, RC phase shift oscillator, Wein-bridge oscillator, Hartley's and Colpitt's oscillators, and Relaxation oscillator using OPAMP. In the laboratory course, the students will (i) study the reverse characteristics, load regulation and line regulation of Zener diode; (ii) study the static characteristics of BJT in CE configuration and frequency response of BJT amplifier in CE mode; (iii) study OPAMPs as inverting amplifier, non-inverting amplifier, adder, subtractor, comparator, Schmitt trigger, integrator, differentiator, and relaxation oscillator; (iv) construction of series regulated power supply from an unregulated power supply; and (v) design a Wien bridge oscillator using OPAMP.
IV	Quantum Mechanics	PHSA-CC-10	6 [Theory: 4 Practical: 2]	100	In this course the students will learn more about different topics of quantum mechanics, description of particle using wave packets, Fourier transforms and momentum space wave-function, position-momentum uncertainty, continuity of wave function, boundary condition and emergence of discrete energy levels. They learn about the quantum mechanics of simple harmonic oscillator, setting up the eigenvalue equation for the Hamiltonian, ground state, zero point energy and uncertainty principle. The students also get knowledge about the time independent Schrodinger equation for a particle moving under a central force, the Schrodinger equation in spherical polar coordinates. Through understanding the behavior of quantum particle encountering a i) barrier, ii) potential, the student gets exposed to solving non-relativistic hydrogen atom, for its spectrum and eigen-functions. In this course they also study electron's magnetic moment and spin angular momentum, gyromagnetic ratio, Bohr magneton, Lande g factor, Larmor's theorem, Stern-Gerlach

					Experiment. The study of influence of electric and magnetic fields on atoms helps in understanding Stark effect and Zeeman Effect respectively. This basic course will form a firm basis to understand quantum many body problems. This course will develop an understanding of how to model a given problem such as particle in a box, hydrogen atom, hydrogen atom in electric fields, many electron atoms, L-S and J-J couplings. These will help the students in understanding the different quantum systems in atomic and nuclear physics. In the laboratory course, with the exposure in computational programming in the computer lab, the student will be in a position to find the eigenvalues of the bound state particle in a one-dimensional potential well and to plot the eigen-functions, use of shooting algorithm for solving bound state problems for Harmonic oscillator, Morse potential, triangular well etc. The students will also study the time evolution of a wave packet moving in free space by the numerical solution of the time dependent Scrödinger equation.
IV	Arduino	PHSA-SEC-B1	2 [Theory: 1 Project: 1]	100	This course will enable the students to learn basics of Arduino, programming, and they will also get familiar with Arduino boards. They will learn the brief history of the Arduino, open-source electronics prototyping, setting up Arduino board, installation of Arduino Integrated Development Environment (IDE) in PC/ laptop for Arduino programming. In Arduino programming they will learn Arduino data types, variables and constants, operators, control statements, loops, functions, string, etc. They also expected to learn interfacing the Arduino boards for serial communication, digital and analog input/output, getting input from temperature and ultrasonic sensor etc. For the project work the students get sufficient knowledge about Arduino boards

					and Arduino programming, so that after finishing the course they can do the following projects: (i) LED blinking and fading, (ii) measurement of voltages, (iii) interfacing 7-segment display, (iv) construction of thermometer using a temperature sensor, (v) construct experimental set up for studying simple pendulum and hence determine the acceleration due to gravity, and (vi) construct data logger for studying charging and discharging of RC circuit.
V	Electromagnetic Theory	PHSA-CC-11	6 [Theory: 4 Practical: 2]	100	Course Outcome (Theory) 1. Understand the basic mathematical concepts related to electromagnetic vector fields. 2. Apply the principles of magneto statics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density. 3. Understand the concepts related to Faraday‘s law, induced emf and Maxwell‘s equations. 4. Understand the unification of electric and magnetic fields and apply Maxwell‘s equations to solutions of problems relating to transmission lines and uniform plane wave propagation. 5. Ability to describe and make calculations of plane electromagnetic waves in homogeneous media, including reflection of such waves in plane boundaries between homogeneous media. 6. Distinguish the different types of aberrations and achromatism and Use different types of eyepieces according to their application. 7. Calculate wavelength difference and fringe width from the interference pattern and. explain diffraction pattern and calculate dispersive power of the grating. Course Outcome (Practical)

					1. Students will be able to identify, formulate and solve the problems to dispersive power and resolving power of a plane diffraction grating. 2. To introduce the concepts of Fresnel's formula they will be able to study Fresnel's law by the reflection on the surface of a prism
V	Statistical Physics	PHSA-CC-12	6 [Theory: 4 Practical: 2]	100	**Course Outcome (Theory)** 1. In this course the statistical description, quantum statistics of ideal gases, irreversible processes and fluctuations are dealt with. 2. Studying the statistical description students get in-depth knowledge and concept about thermodynamics and its applications. 3. Applications of statistical mechanics clarify the understanding of the students regarding number of breakthroughs in modern physics; e.g. Einstein's theory, partition function, theory of equipartition, specific heat of solids, entropy, Gibb's paradox etc. 4. Identical particles and their statistics is the key of the description of the quantum mechanical particles. Studying the Maxwell Boltzmann statistics, Fermi-Dirac statistics and Bose-Einstein statistics the analytical and mathematical concept of the students regarding the statistical behavior of the tiny bodies are developed thoroughly. 5. Finally the introduction of the irreversible processes and fluctuations help students to be groomed for present day statistical physics. **Course Outcome (Practical)** 1. In this course the Study of Random Numbers and Time series, Applications of Random Numbers, some plots, error, numerical methods and use of computational approach in Physics. 2. The knowledge of numerical methods functions as advantage to the students as

					they realize the numerical steps of calculus. 3. Finally applications of computational approach in Physics make students ready for the research and development.
V	Laser and Fiber Optics	PHSA-DSE-A1-b	6 [Theory: 5 Tutorial: 1]	100	1. Study of different types of lasers provides in-depth knowledge about the types of laser and their uses, which are badly needed in the current era of technology. 2. The knowledge of basic characterization, threshold conditions and the Q-switching etc. assist students to understand the operation of laser both technical and analytical way. 3. Study of propagation of light in optical media clarifies the knowledge of students regarding the interference, diffraction, polarization and other optical phenomena. 4. Theses train the students to work with different optical media and instruments as well. The study of non-linear optics analytically and mathematically strong about the subject
V	Astronomy and Astrophysics	PHSA-DSE-B1-a	6 [Theory: 5 Tutorial: 1]	100	1. The Course would be helpful in understanding our composition and universe, the dynamics of stars including our solar system and radiation. 2. This Course provides an opportunity to students to know about various experimental techniques astronomical observations; these include Detectors, Photometry and spectroscopic observational instruments, radio astronomical telescope, interferometer etc. Students would also learn about the Galactic system, extragalactic systems, cosmology and gravitation. 3. Use information learned in class and develops observation skills to be able to explain astronomical features and observations obtained via telescopic observations or data provided through computer simulations.

					4. Prepare graduates with strong foundation to pursue advanced degree in Astronomy or Physics /Astrophysics or seek career in observatory /science education.
VI	Digital Electronics	PHSA-CC-13	6 [Theory: 4 Practical: 2]	100	<u>Course Outcome (Theory)</u> 1. Student will be able to employ the codes and number systems converting circuits and Compare different types of logic families which are the basic unit of different types of logic gates in the domain of economy, performance and efficiency. Analyze different types of digital electronic circuit using various mapping and logical tools and know the techniques to prepare the most simplified circuit using various mapping and mathematical methods. 2. Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints. 3. Understanding of digital systems. 4. Ability to use IC in different applications like, to verify laws and theorems of Boolean algebra, to study basic combinational circuits etc. 5. Understand working and use of flip-flop circuits, Registers and Counters. <u>Course Outcome (Practical)</u> 1. Students will learn and understand the Basics of digital electronics and able to design basic logic circuits, combinational and sequential circuits such as universal logic gates using ICs 7400, 7432, 7402, 7408, 7486, 7404. 2. They will realize the function of half adder, full adder and Interfacing 7-segment display system with IC 7447 to display 0-9. 3. The student will be able to Simplify the Boolean expression using Boolean

					algebra and verify NOT, OR, AND, NOR, XOR, XNOR using NAND.
VI	Solid State Physics	PHSA-CC-14	6 [Theory: 4 Practical: 2]	100	**Course Outcome (Theory)** 1. Understand the basic concepts of force between atoms and bonding between molecules. 2. Understanding of diffraction experiment and reciprocal lattice and crystal vibrations: phonon heat capacity and thermal conductivity 3. Understand free electron Fermi gas: density of states, Fermi level, and electrical conductivity 4. Understand electrons in periodic potential: energy bands theory classification of metals, semiconductors, insulators, band gap, effective masses, charge carrier distributions, doping, pn junctions 5. Understand metals: Fermi surfaces, temperature dependence of electrical conductivity 6. Understand the properties of semiconductors, relationship between semiconductors devices and understand the applications of semiconductor **Course Outcome (Practical)** 1. The students will learn the Measurement of variation of resistivity in a semiconductor and investigation of intrinsic band gap using linear four probe. 2. The students will learn how to measure the Hall voltage in semiconductor, by four probe method.
VI	Nanomaterials	PHSA-DSE-A2-a	6 [Theory: 5 Tutorial: 1]	100	1. System of nanomaterials exhibits certain unique and special properties which have great significances in industrial applications. 2. The course discusses types of nano-systems such as quantum wire, quantum well etc. and its key differences with respect to its counter part of the bulk system. 3. Different methods for synthesis of nanomaterials which include Top down

					and Bottom up approaches are discussed at length. 4. Characterization of nanostructures is quite challenging. Methodologies such as Electron Microscopy, Scanning Probe Microscopy, Photo luminescence spectroscopy, IR and Raman spectroscopy, X – Ray diffraction methods etc. are studied. 5. The course will enable the student either pursue higher education or apply the acquired knowledge in solving industrial problems 6. The student will gain experience in applying unique properties of nanomaterials to solve problems and challenges in our life. 7. The student will demonstrate the ability to develop case studies of nanomaterials with a focus on fundamentals, fabrication, characterization, and applications.
VI	Advanced Statistical Mechanics	PHSA-DSE-B2-b	6 [Theory: 5 Tutorial: 1]	100	1. The course is of much practical purpose for the students to learn basics of digital electronics. The digital electronics has wide applications in computing, process control, signal processing, communication systems, digital instruments etc. 2. The course is very important for the students to understand the broadcasting of a message signal from transmitter, its radiation mechanism (how modulated electrical signal is propagated in the form of radio waves) and its detection or demodulation (extraction of original message from modulated signal) at receiver. 3. The course includes the study of modulation, demodulation, transmitters, receivers, TL, antenna, propagation of radio waves, TV, Radar systems. 4. The course is gives the basic science of working of a wireless communications system. The course is also useful for the

					students to understand the basic function of Television and Radar systems.

Program: B. Sc. Physics (Gen.); Program Code: PHSG

Semester	Course Name	Course Code	Credit	Marks	Course outcome
I	Mechanics	PHSG-CC-1/GE-1	6 [Theory: 4 Practical: 2]	100	In this course, students will gain knowledge of linear motion, forces, energy, and circular motion, gravitation, surface tension, elasticity, oscillatory motion. They can apply those theories to explain natural physical processes. Basics of algebraic mathematics along with physical principles, learnt in this course can effectively help students to solve problems encountered in everyday life, further study in science, and in the professional world. In mechanics practical, Newtonian mechanics related physics is learnt and the basic instruments handling capabilities are developed.
II	Electricity and Magnetism	PHSG-CC-2/GE-2	6 [Theory: 4 Practical: 2]	100	After completion of this course student will learn the use of Coulomb's law and Gauss' law, electrostatic force, the relationship between electrostatic field and electrostatic potential, Lorentz force law for the magnetic force, Ampere's law to calculate magnetic fields, Faraday's law of induction, Maxell's equations. On completing the practical course, the students will be able to show their practical understanding of the electric field and potential, magnetic field related aspects and electromagnetic induction.
III	Thermal Physics and Statistical Mechanics	PHSG-CC-3/GE-3	6 [Theory: 4 Practical: 2]	100	The students will get to know the basics of thermal physics and the solution of problems related to thermal physics, kinetic theory of gases, Maxwell-Boltzmann distribution law, Brownian motion etc. after completion of the course.

					This course will also enable students to learn the behavior of real gases. Completion of the practical course will provide students the knowledge of hands on experience on thermal physics, low temperature physics, different statistical methods, thermodynamics, black body radiation, thermal conductivity and entropy.
III	Renewable energy and Energy Harvesting	PHSG-SEC-A2	2 [Theory: 2]	100	After completion of this course, students will get to know about various renewable energies like solar energy, wind energy harvesting, ocean energy, geothermal energy, hydro energy. Also, they will get to know about piezoelectric energy harvesting, electromagnetic energy harvesting and fuel cell.
IV	Waves and Optics	PHSG-CC-4/GE-4	6 [Theory: 4 Practical: 2]	100	At the end of the course, students will be able to understand wave equations, universal nature of waves, interference, Fraunhofer and Fresnel diffraction, principles of measurement and error analysis. In this practical course, students will get the experience to perform wave, sound and optics related practicals by themselves.
IV	Electrical Circuits and Network skills	PHSG-SEC-B2	2 [Theory: 2]	100	On completing this course, students understand the basic working principles of DC generator, transformer, AC motor. Along with this, the theory of wattmeters and its use as energy meters in domestic house, concept of megger, and different faults in the distribution system are also introduced to the students.
V	Renewable energy and Energy Harvesting	PHSG-SEC-A2	2 [Theory: 2]	100	After completion of this course, students will get to know about various renewable energies like solar energy, wind energy harvesting, ocean energy, geothermal energy, hydro energy. Also, they will get to know about piezoelectric energy harvesting, electromagnetic energy harvesting and fuel cell.

V	Modern Physics	PHSG-DSE-A2	6 [Theory: 5 Tutorial: 1]	100	During this course students are introduced with the idea of radiation and its nature, the foundation of Quantum Mechanics, Special Theory of Relativity, basic lasing action and lasers. In Quantum Mechanics, students learn the postulates of Quantum Mechanics, different dynamical variables such as linear Hermitian operators, expectation values of operators and their time evolution, Schrödinger equation as a first principle. In the Special Theory of Relativity students deal with Lorentz transformation, time dilation and length contraction, velocity addition rule, idea of relativistic momentum and relativistic mass, mass-energy equivalence.
VI	Electrical Circuits and Network skills	PHSG-SEC-B2	2 [Theory: 2]	100	On completing this course, students understand the basic working principles of DC generator, transformer, AC motor. Along with this, the theory of wattmeters and its use as energy meters in domestic house, concept of megger, and different faults in the distribution system are also introduced to the students.
VI	Nuclear Physics	PHSG-DSE-B2	6 [Theory: 5 Tutorial: 1]	100	After completion of this course, students will get to know general properties of nuclei, different nuclear models, radioactivity of nucleus and their detection techniques, nuclear reactions. Students are also provided with the knowledge of different type of accelerators, fundamental particles and their families in this course.

Department of Physiology

AQAR 2.6.1 Course Outcome--- Total 20 courses has to be completed by a student in 6 semesters		
SEMESTERS	**CORE COURSE**	**COURSE OUTCOME**
Semester 1 **2 COURSES**	**CC-1. Cellular Basis of Physiology, Genetics & Enzymes**	To understand the basic mechanisms of physiological processes it is mandatory to know the detailed structural and functional components of each cellular organells. For this It is necessary to know the organisation of chromosome and the mechanism of their packaging, division and alteration to carry out the life at molecular level. It is also essential to apprehend all the enzymatic biochemical reactions for proper understanding of every aspects in physiology. This CC1 module has been designed in such a way that our students can strengthen their foundation on this subject.
	CC--2. Biophysical Principles and Chemistry of Biomolecules	Develops an understanding of the principles and physical phenomena underlying cellular processes. Knowledge of the different types of microscopes and photometers equip students to handle such instruments required in graduate studies as well as in postgraduate research.* Builds a basic knowledge of the chemistry of biomolecules , their 3-D structures and their participation in bodily functions at the molecular level. * Exposure to basic biophysical and biochemical experiments make students well-prepared for postgraduate research.
Semester 2 **2 COURSES**	**CC-3. Cell Signalling & Nerve-muscle Physiology**	This module is on the basics of transmission of external signal to the molecular level and outcome of that as a physiological action. Nerves are the receiver and transmitters and muscles are the executer. Ultrastructure of the related organ and their step by step function of relaying message from molecule to system grabs the attention of the primary learners to internalise physiology.
	CC-4. Nervous System	The module introduces to the various structures of brain and spinal cord and their functions integrating the physiological functions with the actions of central nervous system. Delivery of the output of these structures through the peripheral nerves their divisions and actions. Physiological mechanisms of alertness, consciousness, posture, body balance, movement, sleep, emotion, endocrine control functions, memory, intelligence, nonvoluntary controls of blood pressure, respiration,

		cardiac functions, GI functions, renal functions are discussed. students will have a comprehensive understanding of our nervous system different neurological disorders affecting humans like alzheimer, parkinson ,epilepsy and psychological as well as neurological disorders interwined in afflictions like insomnia, depression, anxiety, and other diseases.
Semester 3 **4 COURSES**	**CC-5. Blood and Body Fluids**	Blood, one of the major connective tissue of the human body is needed to keep us alive. It brings oxygen and nutrients to all the parts of the body and give us immunity. An insight study of this module can make ourselves more knowledgeable regarding our own blood group, immunity and blood related diseases. The genetics behind the topics can lay the foundation of postgraduate study and research.
	CC-6. Cardiovascular System	In recent years, there is a tremendous increase in cardiovascular morbidity and mortality rate due to increased prevalence of diabetes, hypertension, ischemic heart diseases. Therefore, a student of Physiology and/or Medicine should learn the fundamentals of cardiovascular physiology for the understanding and management of cardiovascular abnormalities and diseases.
	CC-7. Respiratory System	We are dependent on our respiratory system as we need oxygen from the atmosphere . The respiratory system specializes in providing us the oxygen trapping it from the atmosphere and dissolving them into blood .The structure and functional aspects of our thorax and lung help us to do that throughout as we live. The oxygen and carbon dioxide carriage and delivery are also discussed . Regulation of respiration its voluntary control and diseases like asthma, COPD, emphysema and other muscle weakness that lead to respiratory insufficiency are discussed. Students will be able to analyse lung functions and tests associated to measure lung capabilities through practical.
	SEC -A 2 COURSES (ONE course in Semester 3)	MENTIONED BELOW
Semester 4 **4 COURSES**	**CC-8. Digestion and Metabolism**	Help develop a good understanding of the basic concepts of chemical reactions that occur in living systems which further enable to analyze the various perspectives of allied subjects and also empower students to understand the molecular basis of bodily functions both in health and disease.
	CC-9. Molecular Biology	This module is designed to understand the central dogma of molecular biology i.e. Replication , Transcription and Translation. Along with these basics of molecular biology

		the gene-environment interactions i.e. regulation of gene expression and Recombinant gene technology are also there to have a deep insight of the application of molecular biology in human health and diseases. Gene therapy and Transgenic Animal are two topics from where students can getidea about the applications in practical life and enjoy the subject. This module is the core of every life science branches and strengthen the foundation of their any future study and competitive exam in the field of life sciences.
	CC-10-TH. Nutrition and dietetics	Nutrition and dietetics ¬Vitamins: Thiamin, Riboflavin, Niacin, Pyridoxine, Pantothenic Acid, Biotin, Cyanocobalamin, Folic Acid, Ascorbic Acid, Inositol. Vitamins A, D, E and K. Dietary sources, daily requirements, biochemical functions, deficiency, symptoms, Hypervitaminosis, antivitamins.¬Minerals: Sources, biological functions of sodium, potassium, calcium, phosphorus, iron, zinc, iodine and fluoride.¬SDA, RQ and BMR :Factors affecting. Determination of BMR.¬Fuel Values of Food. Body calorie requirements – adult consumption unit. Dietary requirements of carbohydrate, protein, lipid and other nutrients. Balanced diet and principles of formulation of balanced diets for adult man, adult woman, lactating woman and pregnant women.. Nitrogen balance. Protein sparers. Supplementary value of proteins. Biological value of proteins.Net Protein utilization. Protein efficiency ratio. Dietary fibers.
	SEC-B **2 COURSES (ONE course in Semester-4)**	MENTIONED BELOW
Semester 5 **4 COURSES**	**CC-11. Special Senses**	CC Special sense will help the students to understand thoroughly the five special senses, associated wth vision, hearing, taste, smell and equilibrium. We experience /sense the environment around us via specialized sensory organs. Sensory receptors receive sensory information from the surroundings (environmental stimuli) and transduce their energy into electrical impuses which are then conveyed to the higher center (CNS) for integration, processing and reponse. Any abnormalities or loss of our senses can have a major impact upon us.
	CC-12. Endocrinology	Endocrinology is the subject from where students will learn how does the external signal like hormone transmitted its signal to the cellular level for doing a particular function. The subtopics under this module are nicely designed to understand the metabolic process of the

		body in cellular level. Specially understanding the hypo and hyper activities of each endocrine system like Pancreas , Thyroid and Adrenal with their causes and symptoms is not only make the base of the basic physiology of human body but also knowing these are exclusively beneficial in medical medical point of view.	
	DSE-A	MENTIONED BELOW	
	DSE-B	MENTIONED BELOW	
Semester 6 **4 COURSES**	**CC-13. Reproductive Physiology & Developmental Biology**	This module is highly interesting as it deals with the physiological	
	CC-14. Excretory Physiology		
	DSE-A	MENTIONED BELOW	
	DSE-B	MENTIONED BELOW	
Discipline Specific Electives (DSE) ***[Among 8 courses offered any student has to take 4 courses in 2 separate semesters]***	**DSE-A [4 COURSES] (ONE course in Semester 5 & ONE course in Semester 6*)***	**1. Biostatistics**	
		2. Microbiology & Immunology	As Discipline Specific Elective Courses the help students develop a comprehensive knowledge of the subjects. Students would be well equipped to explore research areas in these subjects.
		3. Ergonomics	Study of humans at work is all about ergonomics. The scope of the subject ranges from finding, analysing and making a solulution to various work related physical, physiological, musculoskeletal, cognitive, anthropological and design hazards. Principles of manual material handling, environmental and other workplace stressors are discussed and taught in detail. Anthropometry for Indians which is measuring of different physical dimensions of body are taken in practicals and design

			considerations and implications on Indian data are taught to be dealth within the purview of the subject .
		4. Community and Public Health	
	DSE-B [4 COURSES] ***(ONE course in Semester 5 & ONE course in Semester 6)***	**1. Chronobiology and Stress Physiology**	
		2. Advanced Molecular Biology and Nanotechnology	
		3. Toxicology and Pharmacology	As an allied science , the course imparts a good understanding of the interaction of drugs with living systems, including interactions between drug molecules and drug receptors and how these interactions elicit an effect. It also forms the concept of different classes of drugs that could be used therapeutically, their mechanism of actions .Knowledge is also imparted of the adverse effects of chemicals on living systems and the means to prevent such effects. Thus a comprehensive approach to the subject could be made.
		4. Work, Exercise and Sports Physiology	Students will get to know the concepts of physiological work energy expended during work and fundamentally how to measure work .The energy supply for different types of working schedules and their capacities and limitations .Sports performance is also evaluated in physiological terms and estimates that relate to parameters and terminlogies used in the sports arena are taught in detail.Training ,physical health and conditioning aerobic versus anerobic demands in sports are dealt with.

Skill Enhancement Course (SEC) ***[Among 4 courses offered any student has to take 2 courses in 2 separate semesters]***	**SEC-A [2 COURSES]** ***(One course in Semester 3)***	**1. Hematological Techniques**	
		2. Clinical Biochemistry	
	SEC-B [2 COURSES] ***(One course in Semester 4)***	**1.Detection of Food Additives /Adulterants and Xenobiotics**	Study of this course helps students to become capable and competent to handle issues related to health hazards of chemicals in food as well as of environmental Pollutants that pose a threat to life. An in- depth theoretical knowledge is imparted that could easily be relevant for practical purposes.
		2. Bioinformatics	Data in biological sciences is on a explosion. Various databanks as depositories are available, storing structural, sequencing data . Functional and meaningful analysis of these data through the use of computer programs are taught in this part of syllabus. Exposure is given on the functional use of the tools for these data analysis . Interpreting the data, providing an understanding of the principles of computational biology in predicting structure, homology, allignments, drug interactions and design.

Department of Statistics

Course Outcomes of B.SC Statistics Honours

Semester	Course	Course Outcome
Semester-1	CC1 (Descriptive Statistics)	a. knowledge of Statistics and its scope and importance in various areas such as Medical, Engineering, Agricultural and Social Sciences etc. b. information about various Statistical organisations in India and their functions for societal developments, c. knowledge of various types of data, their organisation and evaluation of summary measures such as measures of central tendency and dispersion etc. d. knowledge of other types of data reflecting quality characteristics including concepts of independence and association between two attributes, e. insights into preliminary exploration of different types of data.
	CC-2 Probability and Probability Distribution -I	a. ability to distinguish between random and non-random experiments, b. knowledge to conceptualise the probabilities of events including frequentist and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem, c. knowledge related to concept of discrete random variable and its probability distribution including expectation and moments, d. knowledge of important discrete distributions such as Binomial, Poisson, Geometric, Negative Binomial and Hypergeometric and their interrelations if any, e. acumen to apply standard discrete **probability** distribution to different
Semester-II	CC3 (Mathematical Analysis)	They will acquire knowledge about a. Real Number b. Sequence , series of real number c. Limit , Continuity, Differentiability d. Improper Integral e. Function of two variables
	CC-4 (Probability and Probability Distribution -II)	a. knowledge about some probability inequalities, law of large numbers, Central Limit Theorem etc., b. ability to handle transformed random variables and derive associated distributions,

		c. knowledge of important continuous distributions such as Uniform, Normal, Exponential and Gamma and relations with some other distributions, d. ability to use and interpret Normal probability and q-q plots for testing Normality of data, knowledge about Box Mueller transformation for simulations
Semester-III	CC-5 (Linear Algebra)	Students will acquire Knowledge about a)Vectors and Vector Space b) Matrices and Determinants c)Rank of Matrix d) They will get idea about Eigen Value & Eigen Vector e) Quadratic Form
	CC-6 (Demography and Vital Statistics)	Students will acquire knowledge about a)Concepts of Population b) Concepts of Mortality Rate C)Concepts of Fertility Rate d)Concepts about Life Table e) Students will get idea about measurement of Population Growth.
	CC-7 (Statistical Computing and Analysis Numerical Analysis using C Programming)	a. demonstrate knowledge of different numerical methods , essential for providing Mathematical support to the Statisticians where intractability becomes severe, b. be able to learn various difference, interpolation formulae, c. be in a position to find solutions to equations using Bisection, Newton Raphson and Regula Falsi Methods, d. handle numerical differentiation and integration, e. be able to find solutions to difference equations of first order and linear difference equations with constant coefficients. f. Students will get idea to compute different Statistical measure Using C Programming.
	SEC-A (Statistical Data Analysis using R)	Students will know about a. various basic concepts related to computer architecture and its organization, various peripheral devices, b. languages: machine language, assembly language and high level languages, c. ideas on operating systems, linker, loader and compiler etc., d. R programming with some basic notions for developing their own simple programs and visualizing graphics in R.
Semester-III	SECA Research Methodology	Students will know about Statistical Techniques provide scientific approaches to develop the domain of human knowledge largely through empirical studies. The course will enable the students to a. understand basic concepts and aspects related to research, data collection, analyses and interpretation,

		b. Prepare and finalize research report on some real life situations.
Semester-IV	CC-8 Survey Sampling and Official Research	a) basic knowledge of complete enumeration and sample, sampling frame, sampling distribution, sampling and non-sampling errors, principal steps in sample surveys, limitations of sampling etc., b. introduced to various statistical sampling schemes such as simple, stratified, systematic and pps sampling, c. an idea of conducting the sample surveys and selecting appropriate sampling techniques, d. knowledge about comparing various sampling techniques.
	CC-9 (Statistical Inference-I and Sampling Distribution)	a) a fundamental understanding of advanced level topics in statistical inference on testing of statistical hypotheses for both randomized and non-randomized tests, b) confidence interval estimation and their relationships with testing, c) order statistics and their distributions, d) Parametric models for developing relevant inferences on associated parameters, e) to work on several standard examples to help them understand the various inherent concepts. f) Concepts of Chi – Square , Student's and Fisher's t Distribution, Sendecor's F Distribution.
	CC-10 (Index Number and Time Series Analysis)	a) Concept of Index Number, b) Different types of Index Number a. Wholesale Index Number , Consumer Price Index Number, Cost Of Living Index Number. fitting and plotting of various growth curves such as modified exponential, Gompertz and logistic curve, b. fitting of trend by Moving Average method, c. measurement of Seasonal Indices by Ratio-to-Trend, Ratio-to-Moving Average and Link Relative methods, d. calculation of variance of random component by variate component method, e. forecasting by exponential smoothing and short term forecasting methods such as Box Jenkins Method and Bayesian forecasting, f. weak stationarity, autocorrelation and correlogram,

		g. applications to real data by means of laboratory assignments.
	SECB (Data Base Management)	Students Will learn about a. Concept of Data Base Management System. b. SQL c. Network Database, Relational Database
	SEC-B (Monte Carlo Method)	They will learn about a. Random Number Generation b. CDF Inversion Method c. Concepts of finding Probabilities and moments using simulation. d. Concepts of generating Binomial, Poisson Distribution from uniform(0,1) e. Concepts of Graphical demonstration of Large Number.
Semester-V	CC-11 (Statistical Inference-II)	a. advanced level topics in statistical inference on testing of statistical hypotheses for both randomized and non-randomized tests, b. using Neyman Pearson Lemma and finding Uniformly Most Powerful Test, c. likelihood ratio test and its applications. knowledge of point and interval estimation procedures and different methods of point estimation, d. to understand the Cramer-Rao Inequality, Rao Blackwell and Lehmann Scheffe theorems and their applications in obtaining Minimum Variance Unbiased and Minimum Variance Bound estimators e. knowledge about Large Sample Distribution, Central Limit Theorem.
	CC-12 (Linear Model and Regression)	a. know about correlation and regression techniques, the two very powerful tools in statistics, b. get an idea of Linear, Polynomial and Multiple Linear regression, c. and estimation and tests for regression coefficients. d. study concept of coefficient of determination and inference on partial and multiple correlation coefficients. e. Estimation and hypothesis testing of multiple Regression Model. f. Concepts of Linear Model g. Gauss -Markov Theorem h. Estimation of Error Variance. i. Concepts of ANOVA Model.
	DSE-A 1 (Statistical Quality Control)	a. construct group control chart, b. draw charts for variables and attributes, c. understand single and double sampling inspection plans, OC and ASN functions,

		Students shall be able to draw different types of control charts for variables and attributes. They will also be able to understand the practical applicability of single and double sampling inspection plans.
	DSEA1 (Econometrics)	The course on econometrics will primarily focus on the use of statistical modelling and the relevant analyses to economic data problems. The students will get a thorough idea of The course on econometrics will primarily focus on the use of statistical modelling and the relevant analyses to economic data problems. The students will get a thorough idea of 1. various important econometric models and relevant model building concepts in econometrics 2. general linear models and estimation of inherent model parameters 3. multicollinearity, its detection and consequences and related inferential aspects 4. some advanced concepts of generalised least squares estimation, autocorrelation, its consequences, detection and strategy for reducing autocorrelation, heteroscedasticity and its inherent concepts including its consequences Practical aspects and real data illustration of the related problem.
	DSEB1 (Operation Research)	a) graphical and simplex method of solving linear programming problem (LPP) for finding degenerate, unbounded, alternate and infeasible solutions, b) post-optimality: addition of constraints, change in requirement vector, addition of new activity and change in cost vector, c) use of duality to solve a LPP, d) obtaining solution of a transportation problem by North West corner method, Matrix Minima method, Vogel's method, e) Hungarian Method for solving assignment problems, f) game theory for graphical solution of mx2 or 2xn rectangular game and mixed strategy
	DSEB1 (Stochastic Process)	The students will get acquainted with some important and useful concepts on a. Markov chains including the notion of transition probability matrix, b. various other stochastic processes such as Poisson process, birth and death processes, queuing process and Gambler ruin problems, c. application of these processes in real life problems, d. practical aspects relevant to above problems based on the considered topics.

Semester-VI	CC-13 (Design of Experiments)	a. carry out one way and two way Analysis of Variance (ANOVA), b. understand the basic terms used in design of experiments, c. use appropriate experimental designs to analyze the experimental data,
	CC-14 (Multi variate Analysis & Non Parametric Method)	This course will help the students to a. use different nonparametric/distribution-free tests when data don't meet the assumptions of parametric test, b. understand importance of different non-parametric test procedures, their applications and interpretation c. analyse categorical data using logistic regression models. d. Understand Multivariate Distribution
	DSEA2 (Survival Analysis)	a. Type-I (time), Type-II (order) and random censoring, b. Survival Function, Failure rate, mean residual life, Total time on Test, c. applications of exponential, gamma, Weibull distributions, lognormal, Pareto, linear failure rate distributions to lifetime data, d. ageing properties of IFR, IFRA, DMRL, NBU, NBUE and HNBUE and Dual classes. e. Actuarial and Kaplan –Meier estimator of survival function, f. Cox's proportional hazards and competing risk models, g. tests for exponentiality, h. Real lifetime data implementation of various concepts as outlined above through practical assignments.
	DSE B2 (Project Work)	Students will opt for a compulsory industrial Project in Semester VI. A copy of rules and regulations regarding completion and submission of the project work by a student and assessment of the project work to make available in the Department of Statistics in each university. Students should use advanced statistical tools in their project and submit the dissertation at the end of the semester. There will be subsequent presentations and seminars by the students along with project supervisor, internal subject expert and Head of the Department. The grades on the presentation and evaluation of the project will be given by the subject expert and project supervisor allotted to the student. The project has to be completed within a semester. At the end of this project, students can analyze and interpret and take appropriate decisions in solving real life problems using statistical tools in the present situations

Course Outcome of B.Sc. General Mathematics Course

Semester	Course	Course Outcome
Semester -1	CC1 (Descriptive Statistics)	Students will acquire (a) knowledge of Statistics and its scope and importance in various areas such as Medical, Engineering, Agricultural and Social Sciences etc. (b) information about various Statistical organisations in India and their functions for societal developments, (c) knowledge of various types of data, their organisation and evaluation of summary measures such as measures of central tendency and dispersion etc. (d) knowledge of other types of data reflecting quality characteristics including concepts of independence and association between two attributes, (e) insights into preliminary exploration of different types of data. (f) Knowledge of correlation, regression analysis, regression diagnostics, partial and multiple correlations.
Semester 2	CC2 (Elementary Probability Theory)	Students will acquire (a) ability to distinguish between random and non-random experiments, (b) knowledge to conceptualise the probabilities of events including frequentist and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem, (c) knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments, (d) knowledge of important discrete and continuous distributions such as Binomial, Poisson, Geometric, Negative Binomial and Hyper-geometric, normal, uniform, exponential, beta and gamma distributions, apply standard discrete and continuous probability distributions to different situations.
Semester 3	CC3 (Introduction to Statistical Inference)	The students will acquire (a) Concept of law large numbers and their uses (b) Concept of central limit theorem and its uses in statistics (c) concept of random sample from a distribution, sampling distribution of a statistic, standard error of important estimates such as mean and proportions, (d) knowledge about important inferential aspects such as point estimation, test of hypotheses and associated concepts, (e) knowledge about inferences from Binomial, Poisson and Normal distributions as illustrations, (f) knowledge about order statistics and associated distributions, (g) concept about non-parametric method and some important non-parametric tests.
Semester 4	CC4 (Applications of Statistics)	(a) basic knowledge of complete enumeration and sample, sampling frame, sampling distribution, sampling and non-sampling errors, principal steps in sample surveys, limitations of sampling etc., (b) introduced to various statistical sampling schemes such as simple, stratified and systematic sampling. (c) an idea of conducting the sample surveys and selecting appropriate sampling techniques, (d) knowledge about comparing various sampling techniques. (a) time series data, its applications to various fields and components of time series, (b) fitting and plotting of various growth curves such as modified exponential, Gompertz and logistic curve, (c) fitting of trend by Moving Average method, (d) measurement of Seasonal Indices by Ratio-to-Trend ,

		Ratio-to-Moving Average and Link Relative methods, (e) calculation of variance of random component by variate component method, (f) applications to real data by means of laboratory assignments. commonly used measures of demography pertaining to its three basic aspects, viz. the fertility, mortality and migration,
Semester 3	SEC A1 (Statistical Data Analysis Using R)	various basic concepts related to computer architecture and its organization, various peripheral devices, (b) languages: machine language, assembly language and high level languages, (c) ideas on operating systems, linker, loader and compiler etc., (d) R programming with some basic notions for developing their own simple programs and visualizing graphics in R.
Semester 4	SEC B1 (Data Base Management Systems)	The students shall be exposed to (a) various computational algorithms relevant to statisticians as support system, (b) codes preferably using R language, (c) Linear congruential and mid-square methods for uniform generator, (d) Inverse transform method for simulating various probability distributions and stochastic models, data base management system with special emphasis on significance of topic to the statisticians, (f) Entity relationship, Relational, Hierarchical and Network Models, (g) practical assignments on above mentioned topics.
Semester 5	SEC A2 (Research Methodology)	Statistical Techniques provide scientific approaches to develop the domain of human knowledge largely through empirical studies. The course will enable the students to (a) understand basic concepts and aspects related to research, data collection, analyses and interpretation, (b) Prepare and finalize research report on some real life situations.
Semester 6	SEC B2 (Monte Carlo Method)	They will able to generate random number using Computer, They will able to know how the distribution can Generate from uniform Distribution, Simulating Gaussian Distribution using Box - Muller Method They can generate Distribution from Binomial Distribution They will able to find Monte Carlo Integration.
Semester 5	DSE A (Operation Research)	The students shall get exposed to (a) graphical and simplex method of solving linear programming problem (LPP) for finding degenerate, unbounded, alternate and infeasible solutions, (b) use of duality to solve a LPP, (c) obtaining solution of a transportation problem by North West corner method, Matrix Minima method, Vogel's method, (d) Hungarian Method for solving assignment problems.
Semester 5	DSE A (Econometrics)	The course on econometrics will primarily focus on the use of statistical modelling and the relevant analyses to economic data problems. The students will get a thorough idea of (a) various important econometric models and relevant model building concepts in econometrics (b) general linear models and estimation of inherent model parameters (c) multicollinearity, its detection and consequences and related inferential aspects (d) some advanced concepts of generalised least squares estimation, autocorrelation, its consequences, detection and strategy for reducing autocorrelation, (e) heteroscedasticity and its inherent

		concepts including its consequences, (f) some inferential aspects on heteroscedasticity, (g) practical aspects and real data illustration of the related problem
Semester 6	DSE B (Sur5vival Analysis)	The course gives the application of statistics in handling survival data. The students will know about concepts of (a) Type-I (time), Type-II (order) and random censoring, (b) Survival Function, Failure rate, mean residual life, Total time on Test, (c) applications of exponential, gamma, Weibull distributions, lognormal, Pareto, linear failure rate distributions to lifetime data, (d) ageing properties of IFR, IFRA, DMRL, NBU, NBUE and HNBUE and Dual classes. (e) Actuarial and Kaplan –Meier estimator of survival function, The course gives the application of statistics in handling survival data. The students will know about concepts of (a) Type-I (time), Type-II (order) and random censoring, (b) Survival Function, Failure rate, mean residual life, Total time on Test, (c) applications of exponential, gamma, Weibull distributions, lognormal, Pareto, linear failure rate distributions to lifetime data, (d) ageing properties of IFR, IFRA, DMRL, NBU, NBUE and HNBUE and Dual classes. (e) Actuarial and Kaplan –Meier estimator of survival function,
Semester 6	DSE B Project	Students will opt for a compulsory industrial Project in Semester VI. At the end of this project, students will be in a position to (a) analyze and interpret and take appropriate decisions in solving real life problems using statistical tools. (b) use different Statistical packages for graphical interface, data analysis and interpretation, (c) write a systematic Statistical project report.

Department of Zoology

Course Specific Outcomes	
Course	**Outcomes**
Non- Chordates I (Protista to Pseudocoelomate)	Students become familiar with the non-chordate world that surrounds us. Able to appreciate the process of evolution (unicellular cells to complex, multicellular organisms) Able to identify the invertebrates and classify them up to the class level with the basis of systematic Understand the basis of life processes in the non-chordates and recognize the economically important invertebrate fauna.
Molecular Biology	The students are enriched with the knowledge on the genetic variation through linkage and crossing over, gene frequency, chromosomal aberrations and sex determination. Understand the theories of classical genetics and blood group inheritance in man. Explain the concept of mutation and DNA structure. Paraphrase the Central dogma of molecular biology. Understand the molecular structure of genetic materials and understand the mechanism of gene expression and regulation character formation. Illustrate the mechanism

	of replication, transcription and translation. Justify the post transcriptional and post translational modifications.
Non-Chordate II (Coelomate Phyla)	The students get a detailed introduction to Coelomate non-chordate phyla with a detailed understanding of the different morphological, anatomical, physiological, ecological and evolutionary significance related to them. Students receive an enriched knowledge on the detailed understanding of Annelid, Arthropoda, Mollusca, Echinodermata.
Cell Biology	The students are able to understand the structure of cells and cell organelles in relation to the functional aspects and understanding of the working principles and applications of microscopes. Describe the composition of prokaryotic and eukaryotic cells. Understand the structure and functions of chromosomes; mitotic and meiotic cell divisions and their significance. Describe the three primary components of the cell's cytoskeleton and how they affect cell shape, function, and movement. Differentiate between structural, functional and biochemical aspects of all the cellular components and organelles. Acquire a well gained knowledge of cell transportation, gap and tight junctions and all other cellular activities and physiology.
Chordata	The students get to identify the characters of Amphibia and its parental care. To describe the Phylum Mammalia and its aquatic adaptations. To identify the poisonous and non-poisonous snakes. To write down classification of Aves and Flight adaptation in birds. To identify the formation of foetal membranes in chick embryos and their function.
Animal Physiology: Controlling & Co-ordinating system	Students are introduced to the very basics and fundamental approaches to the Neuroscience and Nervous system. Understand and analyze the significance of Ion channels and Neurotransmitters in the functional, physiological and biochemical study of the Neurobiology and Nervous system. Understanding of cellular and molecular basis of neurophysiology. Students learn to understand and acquire knowledge in the techniques to study the brain.
Fundamental of Biochemistry	Students gain the knowledge of basic terms in biochemistry. The student will be able to explain the structure, functions and reactions of the various biomolecules. Correlate the changes in the levels of these biomolecules with the diseases in humans. Calculate pH of buffer solution. Attained the knowledge of macromolecules such as carbohydrates, protein and fat, their types and significance. Understand and analyse the enzymes, mechanism of enzyme action and factors affecting the enzyme activity and the various types and importance of vitamins.
Comparative Anatomy of Vertebrate	The students are taught and enriched in their knowledge about the comparative structures of heart, aortic arches, kidney, balancing organ, hearing organ, thyroid, respiratory organs, brain of different animals which give them a definite idea not only the structure but also the structural development of that organ and how they become modified according to their need and environment. Students get a brief idea and knowledge about differentiation and organization of cells and maintenance of tissues. It helps to get a better idea about their structure and function.

Animal Physiology: Life Sustaining System	The students learn to describe the anatomy of different physiological systems at the tissue and cellular levels. Evaluate the physiological functioning of different organs. Analyse the physiological changes in relation to environmental conditions. Identify different tissues related to anatomy and physiology from an evidence-based perspective. Carry out physiological studies in the laboratory, Interpret data and graphs and write a report. Correlate the organism's internal and external environments with homeostasis and biological clocks. Justify energy utilization in physiological and metabolic activities.
Immunology	The students get imparted with in-depth knowledge of tissues, cells and molecules involved in host defense mechanisms. Understanding of different types of immunity and interactions of antigens, antibodies, complements and other immune components. Understanding of immune mechanisms in disease control, vaccination, process of immune interactions
Ecology	The student will be able to identify and critically evaluate their own beliefs, values and actions in relation to professional and societal standards of ethics and its impact on ecosystem and biosphere due to the dynamics in population. Critically understand the intricate links of food chains, food webs and link it with human life for its betterment and for non-exploitation of the biotic and abiotic components. Understand, anticipate, analyse and evaluate natural resource issues and act on a lifestyle that conserves nature. Working in nature to save the environment will help to develop leadership skills to promote betterment of the environment. The Learner understands and appreciates the diversity of ecosystems and applies beyond the syllabi to understand the local lifestyle and problems
Principle of Genetics	The students learn to describe the genetic variation through linkage and crossing over, gene frequency, chromosomal aberrations and sex determination. Understand the theories of classical genetics and blood group inheritance in man. Explain the concept of mutation. Explain DNA structure. Paraphrase the Central dogma of molecular biology. Understood the molecular structure of genetic materials and understood the mechanism of gene expression and regulation character formation. Illustrate the mechanism of replication, transcription and translation. Justify the post transcriptional and post translational modifications.
Developmental Biology	The students learn the explanation of the principles and process of fertilization and cleavage. Prepare the flowchart of the gametogenesis process. Identify the developmental stages and understand the process of development of animals. Describe the process of gametogenesis. Understood the process of organogenesis of selected organs, development of extra embryonic membrane and the nature and physiology of placenta. Explain the theories of preformation, and concepts like growth, differentiation and reproduction.
Evolutionary Biology	The students are able to understand the theories of evolution and highlight the role of evidence in support of evolution. Explain the theories of organic evolution. Describe the concept of origin of life and theories of origin of life. Describe the evolution of man. Illustrate the presence of organisms at various

	geological time scales. Apply the knowledge in relevant experimentations. Categorize different zoogeographical realms. Compare animal distribution in different zoogeographical realms. Described evolutionary knowledge through the concepts of coloration and mimicry.
Parasitology	Students are able to explain the basic biology and life cycle of parasites including epidemiology, diagnosis and treatment. Recognize morphological characteristics for identification of parasites and their developmental stages. Explain animal associations and their types. Discuss the life cycle and importance of major parasites. Illustrate transmission routes of animal and zoonotic parasites. Analyse the medical and public health aspects of human parasitic infections. Justify the control measures of arthropod vectors. Understand the importance of hygiene with respect to epidemic diseases
Endocrinology	The students acquire the detailed study of endocrine glands (pituitary, pancreas, adrenal, thyroid, gonads) with respect to their anatomical, histological and physiological aspects. Understanding of the ontogeny and phylogeny of the different endocrine glands. Molecular and biochemical study and analysis of neuroendocrine system, hormone receptors, signal transduction mechanisms. Understanding the hormones and their significance in reproduction - a. Seasonal breeders, b. Continuous breeders.
Animal Biotechnology	Students are imparted with the knowledge to culture animal cells in artificial media. Knowledge of animal cells in culture, growth of cell lines. Detailed and practical knowledge of recombinant DNA technology, genetic manipulations in a variety of industrial and research processes.
Fish & Fishery	Students acquire broad knowledge to identify the fish diseases and the causative organisms. Mention the various composite fish cultures with significance of each type. Describe the methods of freshwater prawn culture and its management. Explain the methods of pearl culture and pearl harvesting. Illustrate the preparation and management of fish culture ponds. Demonstrate the methods of packaging and transport of fish and brood fish. Illustrate techniques of fish harvesting, preservation & processing. Compare the techniques used in fishery development.
Apiculture	Students acquire sufficient knowledge to explain the basic concepts of apiculture like systematics, colony organization, polymorphism, morphology and foraging. Explain the tools and management of the apiary. Explain the importance of institutions pertinent to apiculture. Discuss the setup of the beekeeping business. Illustrate beekeeping as an occupation. Justifying the presence of bees to increase agricultural productivity.
Aquarium Fishery	The students acquire the knowledge on ornamental fish production and aquarium keeping. Develop entrepreneurship on ornamental fish breeding and rearing. Getting hands on exposure to students on various aspects of ornamental fish farming. Students are acquainted to be able to identify commonly used aquarium fishes. Students develop the ability to construct aquariums with innovative designs. Develops an insight of the mechanical equipment used along with the aquarium. Development of the ability to identify the major disease by merely noticing symptoms. Develop ability to

	breed fishes in controlled environments. Develop knowledge in maintaining marine aquariums. Students are made self-sufficient to maintain ornamental fish farms.
Applied Zoology	Students enrich their knowledge in explaining the coral reef and its significance. Explain parasitic roundworms of animals. Explain the role of insects of economic importance. Illustrate the lac culture, apiculture, prawn culture, vermiculture, Poultry, dairy industry and Piggery. Signifies the role of parasitic and soil protozoa in human welfare. Justify the use of animals in pharmaceutical research.
Sericulture	The students gain the knowledge of silk worm rearing and Mulberry cultivation. Study and analysis of pests and diseases associated with silkworm and mulberry. Various processes involved in silk production.
Ecology & Wildlife Biology	Students get to learn and acquire the knowledge regarding environment and conservation biology. Gains knowledge in the areas of responses to Laws of limiting factor, Laws of minimum, Laws of Tolerance. Types of ecosystem – freshwater, marine and terrestrial. Population characteristics and dynamics – conceptual approach of Growth curves and pyramids; sigmoid curve, J curve and hyperbola; logistic equation and concepts relating to population dynamics. The students get well equipped to become very competent in research or teaching fields
Medical diagnosis	Students acquire the detailed and critical knowledge related to the techniques involved in detection of various diseases. Pathology associated with various diseases. Practical skills of conducting basic clinical lab experiments and analysis associated with medical diagnostics Application of knowledge of clinical science and pathology to one's own life.

Department of Commerce

Course Learning Outcomes of B. Com.

(both Honours and General Degree course with specialization on Accounting and Finance)

1. ***Micro-Economics*** (GE1.1CHG-M1) and (GE4.1CHG-M1) - The student will be able to demonstrate an understanding, usage and application of basic economic principles. Describe and apply the methods for analyzing consumer behavior through demand and supply, elasticity and marginal utility. Understand the role of alternative property rights in resource allocation.
2. Indian Economy (GE4.1CHG-M2) – Develop ideas of the basic characteristics of Indian Economy
3. ***Macro-Economics*** (DSE5.1A-M1) - The student will be able to evaluate the resources and capabilities of an economy, churn out ways to increase the national income, boost productivity, and create job opportunities to upscale an economy in terms of monetary development.
4. ***Business Mathematics and Statistic*** (GE1.1CHG-M2), (GE3.1CHG)) and (DSE5.1A-M2) - Statistics and mathematical skills play important role in helping business leaders understand key functions within

and external to a company. In addition to standard spreadsheets, simple averages and distribution, this course introduces business forecasting techniques, decision modeling and Excel tools.

5. ***Business Law*** (CC1.1CHG) - Studying business law will develop excellent writing, problem-solving and analytical skills, alongside strong communication, negotiation and presentations skills. You will also develop the ability to interpret and explain complex information both verbally and in writing – a key attribute when in the world of business.
6. ***Company Law*** (CC2.1CHG) **–** Students will be aware of different provisions of Companies Act, 2013 and its practical implications.
7. ***Principles of Management and Marketing and Human Resource Management*** (CC1.2CHG) and (CC2.2CHG) - Knowledge management is important because it boosts the efficiency of an organization's decision-making ability. Critically evaluate the key analytical frameworks and tools used in marketing. Apply key marketing theories, frameworks and tools to solve Marketing problems. It's no secret to human resource professionals, managers and supervisors that one of the most critical decisions facing the workplace is talent acquisition, better known as recruiting. Recruiting really is the most important function of human resources.
8. ***Financial Accounting*** (CC1.1CH), (CC1.1CG), (CC3.1CH) and (CC3.1CG) - Financial accounting results in the determination of net income at the bottom of the income statement. Assets, liabilities and equity accounts are reported on the balance sheet. The balance sheet utilizes financial accounting to report ownership of the company's future economic benefits.
9. **Cost and Management Accounting (CC2.1CH), (CC2.1CG), (CC4.2CH) and (CC4.2CG)** - To maximise profits and sustain profitability, revenue as well as cost should be managed. Effective cost management will free up cost and capital funds, which then can be reinvested to grow the business or spent on other investment opportunities.
10. **E-Commerce (GE2.1CHG-M1)** - Analyze the impact of E-commerce on business models and strategy, Describe the major types of E-commerce, explain the process that should be followed in building an E-commerce presence and identify the key security threats in the E-commerce environment.
11. **Business Communication (GE2.1CHG-M2)** - Business Communication is a practical course that will show you the right way to write memos, letters and reports, Lessons include techniques for writing informational, persuasive, sales, employment, and good and bad news communications, to both internal and external audiences – with practice analyzing those audiences.
12. **Information Technology and its application in business (SEC3.1CHG)** - Analyze common business functions and identify, design, and develop appropriate information technology solutions (in web, desktop, network, and/or database applications). Learn future technologies through acquired foundational skills and knowledge and employ them in new business environments
13. **Indian Financial System (CC3.2CH)** – Students will able to gather detail knowledge of Indian Financial System and its components. India has a financial system that is controlled by independent regulators in the sectors of insurance, banking, capital markets and various services sectors.
14. **Entrepreneurship Development (CC4.1CHG-M1)** - Entrepreneurial education and training provides individuals with the ability to recognize commercial opportunities, self-esteem, knowledge and skills to act on them. It includes instruction in opportunity recognition, commercializing a concept, managing resources, and initiating a business venture.
15. **Business Ethics (CC4.1CHG-M2)** - This course aims to: Promote understanding of the importance, for business and the community, of ethical conduct, Enhance awareness and critical self-examination of one's own values, and to appreciate the relevance of personal values in the business / workplace setting.

16. **Taxation (CC4.1CH), (CC4.1CG), (CC5.2CH) and (DSE5.1A)** – Students will learn about both direct and Indirect Taxes in details, like Indian Income Tax Act, 1961; GST Act, 2005; Customs Act. Taxing citizens is a vital method of financing the most essential public sector activities, such as the courts, the legal system, national defense and police protection. In addition, it provides the means for producing social programs, such as public health services, education and welfare.
17. **Audit and Assurance (CC5.1CH) and (CC5.1CG)** - The result of the audit is an auditor's written opinion report. The four possible outcomes of an audit are an unqualified opinion, a qualified opinion, a disclaimer of opinion or an adverse opinion.
18. **Corporate Accounting (DSE5.2A)** - Corporate Accounting is defined as a special branch of accounting that deals with the accounting for companies, preparation of their final accounts and cash flow statements, analysis and interpretation of financial figures of companies, and accounting for specific events such as mergers and acquisitions (M&A), etc.
19. **Financial Reporting and Financial Statement Analysis (DSE6.1A)** - Read, understand, interpret and analyse general purpose financial reports; Understand differing accounting policies and their impact on financial statements; Evaluate different types of performance measurement systems in accounting and commonly used financial control systems
20. **Financial Management (DSE6.2A)** - Upon successful completion of Financial Management, the student will be able to: Demonstrate an understanding of the overall role and importance of the finance function. Demonstrate basic finance management knowledge. Communicate effectively using standard business terminology.

Department of Bengali

CC-1,3,5 : The syllabus is framed to have an overall idea on the history and development of Bengali Literature.
CC-2,6 : These two papers are framed to have an idea on Bengali Linguistics as well as to learn the development and evolution of Bengali Language from the old Indo-Aryan Age.
CC-4 : The syllabus of the paper is framed to give a primary idea on Bengali Literature.
CC-7 : Some Novels and Short Stories of Bengali Literature have been selected as text to give the idea on Bengali Novel and Short Story.
CC-8 : The syllabus is framed to give ideas on Medieval Bengali Literature.
CC-9 : The syllabus is framed to give ideas on Bengali Rhetoric, Prosody and Literary Theory.
CC-10 : The syllabus is framed to give ideas on Bengali Essays and Criticism.
CC-11 : The syllabus is framed to give ideas on Literary Types.
CC-12 : The syllabus is framed to give ideas on Bengali Drama and Theory of Drama.
CC-13 : The syllabus is framed to give ideas on Bengali Modern Poetry.
CC-13 : The syllabus is framed to give ideas on Bengali Modern Poetry.
CC-14 : The syllabus is framed to give ideas on Sanskrit, English and Hindi Literature.
SEC-A-1/2 and B-1/2 : The syllabuses are framed to develop the skill of the students so that they can make themselves eligible to have the job in different sectors related to Bengali Language and Literature.
DSE-A-1/2 and B-1/2 are special papers. The syllabuses are framed to get ideas on History of Bengal and Culture, Literature of Bangladesh, Literature on Partition of Bengal, Crime Literature, Science Fiction, Child Literature, Biographical Literature, Travelogue, Folk Literature and Comparative Literature.

Department of English

course outcome

Serial No.	Name of the Course	Semester	Course Code	Credit	Marks in the Course	Course Outcome
ENGLISH HONOURS						
1.	History of English Literature & Philology	1	ENG-A-CC-1-1	6	100	Detailed overview of English literary periods, trends and genres. History of English language and its development over time.
2.	European Classical Literature	1	ENG-A-CC-1-2	6	100	Classical Greek & Roman Literature meant to acquaint students in the early literary influences on successive periods of English Literature. The Epics, Ancient Plays and genres of Tragedy and Comedy are taught with an eye on the socio-historical periods.
3.	Indian Writing in English	2	ENG-A-CC-2-3	6	100	A historical overview of the uses of English for literary self-expression of Indian writers through poems, novels and dramas. The course is meant to provide a postcolonial context to the study of English literature.
4.	British Poetry & Drama (14th-17th century)	2	ENG-A-CC-2-4	6	100	The social and Intellectual background through the poetry and drama of canonical authors Chaucer, Milton, Shakespeare, Donne & Marvell acquaints students with the stylistic and thematic aspects of their writing.
5.	American Literature	3	ENG-A-CC-3-5	6	100	The poems, short stories, dramas and novels of the modern American literary period provide knowledge of

						the genres, social background and history of ideas.
6.	Popular Literature	3	ENG-A-CC-3-6	6	100	Theories of popular fiction and writings of Agatha Christie, Lewis Caroll, Sukumar Ray and Herge acquaint students with contemporary understanding of literature and the other arts while expanding their notion of the politics of 'high' and 'low' art.
7.	British Poetry & Drama (17th & 18th century)	3	ENG-A-CC-3-7	6	100	Literature of Milton, Pope, Webster and Behn along with the social and intellectual backgrounds of the periods are taught to the students.
8.	18th century British Literature	4	ENG-A-CC-4-8	6	100	The social and intellectual background to the poetry and prose of Johnson, Gray, Defoe and Addison offer a perspective on the changing social landscape of British society and the literary trends particular to the periods.
9.	British Romantic Literature	4	ENG-A-CC-4-9	6	100	A study of the poetry and novels of the early and late Romantics with an overview of the social, political and literary movements of the period.
10.	19th century British Literature	4	ENG-A-CC-4-10	6	100	The course introduces students to Victorian poets and novelists like Hardy, Dickens, Austen and others, while also familiarizing them with the social history of England.
11.	Women's Writings	5	ENG-A-CC-5-11	6	100	Poetry by Dickenson, Browning, Walker, Mahasweta Devi, and prose pieces by Rassundari Devi and Mary Wollstonecraft sensitize students to the feminist perspectives on society and literary expression.
12.	Early 20th century British Literature	5	ENG-A-CC-5-12	6	100	Theories on Modernism, poetry of Eliot, Yeats, Owen and the novels of Conrad and Lawrence introduce

						students to the linguistic and artistic experimentations of the period.
13.	Modern European Drama	6	ENG-A-CC-6-13	6	100	Modernist experimentations in dramatic language in the plays of Ibsen, Beckett and Brecht introduce students to the socio-political influences on the writers of the period.
14.	Postcolonial Literatures	6	ENG-A-CC-6-14	6	100	This course is meant to expand the students' understanding of the politics of empire and the colonial deployment of the English language by analyzing the texts of Marquez, Achebe, Neruda and Walcott.
15.	Business Communication	3	ENG-A-SEC-A-3-2	2	100	The course is meant to offer a practical understanding of the language of business transaction and communication skills in a formal capacity.
16.	Academic Writing & Composition	4	ENG-A-SEC-B-4-2	2	100	This course offers perspective on research methodology and critical writing to equip students in the art of writing academically sound papers.
17.	Modern Indian Writing in English Translation	5	ENG-A-DSE-A-5-1	6	100	Students are offered insight into Translation Studies through the writing of Chugtai, Tagore, Tendulkar, Premchand and others.
18.	Literary Types, Rhetoric & Prosody	5	ENG-A-DSE-B-5-1	6	100	Literary terms pertaining to Tragedy, Comedy and Short Stories, along with the study of scansion, figures of speech, etc, help students understand the usage of the language better.
19.	Media & Communication Studies	6	ENG-A-DSE-A-6-4	6	100	This course teaches students the art of communication with the use of various media forms, while also acquainting them with the theories of communication.

20.	Autobiography	6	ENG-A-DSE-B-6-3	6	100	Writing of Tagore, Gandhi, Nirad C. Chaudhuri and Binodini Dasi offer perspectives on the form of the autobiography as an expression of the writers' social and political worldviews.
21.	Communicative English	1	AECC1	2	100	Students are given an in-depth understanding of the uses of grammar and the construction of syntactically correct sentences.
ENGLISH GENERAL						
22.	Poetry & Short Story	1	ENG-G-CC-1-1	6	100	Students are taught canonical English literary trends through the works of Shakespeare, Wordsworth and Conrad, among others.
23.	Essay, Drama & Novel	2	ENG-G-CC-2-2	6	100	Essays of Lamb and Orwell, plays of Shakespeare and Shaw, and a novel by Hardy acquaint students to these literary genres and close textual reading.
24.	Women's Writing & Women's Empowerment	3	ENG-G-CC-3-3	6	100	Poems by Browning, Rossetti, Dickenson and Naidu, and prose by Devi and Hussain are taught with an eye on the feminist underpinnings of these textual expressions.
25.	Academic Writing	4	ENG-G-CC-4-4	6	100	Students are taught to write essays, citing sources for research-based papers, summarizing and paraphrasing as part of their skill development.
26.	Business Communication	3/5	ENG-G-SEC-A-3/5-1	2	100	The course is meant to offer a practical understanding of the language of business transaction and communication skills in a formal capacity.
27.	Creative Writing	4/6	ENG-G-SEC-B-4/6-1	2	100	Students are taught modes of creative writing and the methods of getting their works published.

28.	Language, Variety & Stylistics	3	ENG-G-LCC-1-3-1	6	100	Students are taught the various aspects of language and communication with emphasis on the difference between British and American English.
29.	Language, Society & Personality	4	ENG-G-LCC-2-4-1	6	100	Students are acquainted with the intellectual relationship between society and language through the writings of Fischer, Tharoor, Chugtai and Ramachandra Guha.
30.	Language, Imagination & Creativity	5	ENG-G-LCC-1-5-2	6	100	Students are taught the poetry of canonical authors along with the creative uses of language to write travelogues, stories and advertisements.
31.	Language, Creativity & Analysis	6	ENG-G-LCC-2-6-2	6	100	Students study Indian short stories and poems by eminent authors such as Narayan, Tagore, Bond etc.
32.	Modern Indian Writing in English Translation	5	ENG-G-DSEA-5-2	6	100	Students are offered insight into Translation Studies through the writing of Tanveer, Tagore, Tendulkar, Premchand and others.
33.	Partition Literature	6	ENG-G-DSEB-6-1	6	100	Students are introduced to the history of the Partition through the writings of Amitav Ghosh, Manto, Sankha Ghosh, etc.
34.	Communicative English	1	AECC1	2	100	Students are given an in-depth understanding of the uses of grammar and the construction of syntactically correct sentences.

Department of Hindi

COURSE OUTCOME

Modern Indian Language, Hindi Vyakaran Aur Sampreshan & Hindi Bhasha Aur Sampreshan

1	Nibandh	By Reading this, it is know that how can one say his point in less words.
2	Poems	The purpose of including this is how the poem is written. How to express your feelings.
3	Short Story	Children can be conveyed their point very easily through story, they can be easily explain to any subject.
4	Paaribhaashik Shabdawalee	These are very useful while doing correspondence in the office.
5	Hindi Vyakaran Aur Sampreshan	Thus, communication is the process of conveying a massage in which the communicator and the listener exchange, expessence, feeling and knowledge etc, among themselves by means of sings. Therefore, the meaning of 'communication' is the transmission of ideas and information from one person to another in such a way that the listener can know and understand it.
6	Hindi Bhasha Aur Sampreshan	In other words, communication is an essential need of man and also the basis of his social life. For social behaviour, human being have to establish communication with each other, therefore, only through communication, the operation process of human society becomes possible. Communication is not limited to human being but its history is even older than this.

Department of History

COURSE OUTCOME IN HISTORY

Full syllabus with course outcome in History Honours and History General

PROGRAMME OFFERED : **B.A. HISTORY HONOURS**
PROGRAMME CODE : **HISA**
DURATION : **6 SEMESTERS**
TOTAL CREDIT : **140**

HISA courses semester wise-

	SEM-1	SEM-2	SEM-3	SEM-4	SEM-5	SEM-6
CC	CC-2TH/ 2TU 1& 2	CC- 2TH/2TU 3&4	CC- 3TH/3TU 5,6&7	CC- 3TH/3TU 8,9&10	CC- 2TH/2TU 11,&12	CC- 2TH/2TU 13&14
DSE					DSE-A* DSE-B 2TH/2TU	DSE-A* DSE-B 2TH/2TU
**GE	GE-1 1TH/ 1TU	GE-2 1TH/ 1TU	GE-3 1TH/ 1TU	GE-4 1TH/ 1TU		
AECC	AECC-1 1TH/0 TU	AECC-2 1TH/ 0TU				
SEC			SEC-A 1TH/0 TU	SEC-B 1TH/0 TU		
Total No. of Courses and Marks	4x100= 400	4x100= 400	5x100= 500	5x100= 500	4x100= 400	4x100= 400
Total Credits	20	20	26	26	24	24

Syllabus of B.A (Hons) History Course under CBCS HISA

SEM-1

CC 1 : History of India From the earliest times to C 300 BCE

(Full Marks-100 : Credits -6)

Course Outcome: This course would enable the students to get an idea about the sources of ancient Indian history along with the major developments in political, economic, social and religious spheres till 300 BCE.

I. Reconstructing Ancient Indian History

II. Hunter-gatherers and the advent of food products

a) Paleolithic cultures- sequence and distribution; stone industries and other technological developments. b) Mesolithic cultures – regional and chronological distribution; new developments in technology and economy; rock art. c) Neolithic and Chalcolithic cultures: distribution and subsistence pattern

III. The Harappan civilization: Origins; settlement patterns and town planning; agrarian base; craft productions and trade; social and political organization; religious beliefs and practices; art; the problem of urban decline and the late/post-Harappan traditions.

IV. Cultures in transition: Settlement patterns, technological and economic developments; social stratification; political relations; religion and philosophy; the Aryan problem. a) North India (circa 1500 BCE – 300 BCE) b) Central India and the Deccan (circa 1000 BCE – circa 300 BCE)

CC-2 : Social Formations and Cultural Patterns of the ancient world other than India
(Full Marks-100 : Credits -6)
Course Outcome:

I. Evolution of human kind: Paleolithic and Mesolithic cultures – Role of kinship social institutions in the development of early societies.
II. Food production : beginnings of agriculture and animal husbandry.
III. Bronze Age civilizations, with reference to any one of the following : i)Egypt (Old Kingdom); ii) China(Shang), economy, social stratification, state structure, religion.
IV. Nomadic groups in Central and West Asia; Debate on the advent of iron and its implications.
V. Slave society in ancient Greece & Rome: agrarian economy, urbanization, trade.
VI. Polis in ancient Greece: Athens and Sparta; Greek culture.

SEM-2

CC-3 : History of India C 300 BCE to C 750 CE
(Full Marks-100 : Credits -6)
Course Outcome: This course would enable the students to know about the major developments in the polity, economy, society and culture between 300 BCE to 750 CE

I. Economy and Society (circa 300 BCE to circa CE 300) a)Expansion of agrarian economy : production relations b)Urban growth: north India, central India and the Deccan; craft Production: trade and trade routes; coinage c)Social stratification: class, Varna, Jati, untouchability; gender; marriage and property relations.
II. Changing political formations (circa 300 BCE to circa CE 300): a)The Mauryan Empire b)Post-Mauryan Poliities with special reference to the Kushanas and the Satavahanas; Gana- Sanghas
III. Towards early medieval India (circa CE fourth century to CE 750): a) Agrarian expansion: land grants, changing production relations; graded land rights and peasantry. b)The problem of urban decline: patterns of trade, currency, and urban settlements. c)Varna, proliferation of Jatis: changing norms of marriage and property d) The nature of polities: the Gupta empire and its contemporaries: post-Gupta polities- Pallavas, Chalukyas, and Vardhanas.
IV. Religion, philosophy and society (circa 300 BCE – CE 750): a)Consolidation of the Brahmanical tradition : dharma, Varnashram, Purushastras, Samskaras. b)Theistic cults (from circa second century BC): Mahayana; the Puranic tradition. c) The beginnings of Tantricism.
V. Cultural developments (circa 300 BCE to circa CE 750): a)A brief survey of Sanskrit, Pali, Prakrit and Tamil literature. Scientific and technical treatises. b)Art and architecture and forms and patronage; Mauryan , Post-Mauryan, Gupta , Post-Gupta.

CC-4 : Social Formations and Cultural patterns of the Medieval World other than India
(Full Marks-100 : Credits -6)
Course Outcome:
I. Crisis of the Roman Empire and its principal causes: Historiography
II. Religion and Culture in Medieval Europe: Society, Religious organizations (Church and Monastery), Carolingian renaissance 12th century renaissance, Position of Women in Medieval Europe, Witchcraft and Magic, Urbanization, Rise of University, Medieval art and architecture.

III. The feudal society its origins and its crisis: Historiography
IV. Judaism and Christianity under Islam

SEM-3

CC-5 : History of India (CE 750 – 1206)
(Full Marks-100 : Credits -6)
Course Outcome: This course would enable the students to know about the major developments in the polity, economy, society and culture from 750 CE to till Early medieval period.

I. Studying Early Medieval India: Historical geography sources: texts, epigraphic and numismatic data. Debates on Indian Feudalism, rise of the Rajputs and the nature of the state.
II. Political Structures: a) Evolution of political structures: Rashtrakutas, Palas, Pratiharas, Rajputs and Cholas. b) Legitimization of kingship; Brahmanas and temples; royal genealogies and rituals c)Arab conquest of Sindh : nature and impact of the new set-up; Ismaili Dawah d) Cause and consequences of early Turkish invasions : Mamud of Ghazna; Shahab-ud-Din of Ghur.
III. Agrarian structure and social change: a) Agricultural expansion; crops b)Landlords and peasants c) Proliferation of castes: status of untouchables d) Tribes as peasants and their place in the Varna order
IV. Trade and Commerce: a) Inter-regional trade b) Maritime trade c) Forms of exchange d) Process of urbanization e) Merchant guilds of South India
V. Religious and Cultural developments: a) Bhakti, Tantrism, Puranic traditions; Buddhism and Jainism; Popular religious cults. b) Islamic intellectual traditions: Al-Biruni; Al-Hujwiri c) Regional languages and literature d)Art and architecture: Evolution of regional styles.

CC-6: Rise of the Modern West - I
(Full Marks-100 : Credits -6)
Course Outcome: This course would provide a comprehensive idea about Europe between the fourteenth and sixteenth century.
I. Transition Debate on transition from feudalism to capitalism: problems and theories.
II. a)The exploration of the new world: motives. b.) Portugese and Spanish voyages.
III. a) Renaissance : its social roots b.) Renaissance humanism c.) Rediscovery of classics d.) Italian renaissance and its impact on art, culture, education and political thought. e.) Its spread in Europe
IV. a) Reformation movements: Origins & courses b.) Martin Luther & Lutheranism c.) John Calvin & Calvinism d.) Radical reformation: Anabapists and Huguenots e.) English reformation and the role of the state f.) Counter Reformation
V. a) Economic developments b.) Shift of economic balance from the Mediterranean to the Atlantic c.) Commercial Revolution d.) Price Revolution e.) Agricultural Revolution and the Enclosure Movement
VI. a) Development of national monarchy b.) Emergence of European state system.

CC-7 : HISTORY OF INDIA (c.1206-1526)
(Full Marks-100 : Credits -6)
Course Outcome: This course would enable the students to know about the major developments in the polity, economy, society and culture of the Sultani period.

I. Interpreting the Delhi Sultanate: Survey of sources: Persian tarikh tradition; vernacular histories; epigraphy

II. Sultanate Political Structures: a. Foundation, expansion and consolidation of the Sultanate of Delhi; the Khaljis and the Tughlaqs; Mongol threat and Timur's invasion; Rise and fall of Syed dynasty; The Lodis; Conquest of Bahlul and Sikandar; Ibrahim Lodi and the battle of Panipat; b. Theories of Kingship; Ruling elites; Sufis, Ulama and the political authority; imperial monuments and coinage c. Emergence of provincial dynasties: Bahamanis, Vijayanagar, Gujarat, Malwa, Jaunpur and Bengal d.Consolidation of regional identities: regional art, architecture and literature

III. Society and Economy: a. Iqta and the revenue-free grants b. Agriculture production; technology c. Changes in rural society; revenue systems d. Monetization; market regulations; growth of urban centres; trade and commerce; Indian Ocean trade

IV. Religion and Culture: a. Sufi silsilas: Chishtis and Suhrawardis; doctrines and practices; social roles. b. Bhakti movements and monotheistic traditions in South and North India; Women Bhaktas; Nathpanthis; Kabir, Nanak and the Sant tradition c. Sufi literature; Malfuzat; Premakhayans d. Architecture of the Delhi Sultanate

SEC –A (1): Archives and museums

(Full Marks-100 : Credits -2)

Course Outcome: This course introduces students to the institutions that house and maintain documentary, visual and material remains of the past. Museums and archives are among the most important such repositories and this course explains their significance and how they work. Students will be encouraged to undertake collection, documentation and exhibition of such materials in their localities and colleges. Visit to the National Archives and National Museum are an integral part of the course.

I. Definition and history of development (with special reference to India)

II. Types of archives and museums: Understanding the traditions of preservation in India Collection policies, ethics and procedures Collection: field exploration, excavation, purchase, gift and bequests, loans and deposits, exchanges, treasure trove confiscation and others. Documentation: accessioning, indexing, cataloguing, digital documentation and de- accessioning Preservation: curatorial care, preventive conservation, chemical preservation and restoration

II. Museum Presentation and Exhibition

III. Museums, Archives and Society: (Education and communication Outreach activities)

SEM-4

CC-8 : Rise of the Modern West - II

(Full Marks-100 : Credits -6)

Course Outcome:This course would provide a comprehensive idea about Europe between the fourteenth and sixteenth century.

I. a) Printing Revolution. b) Revolution in war techniques

II. a.) Crisis in Europe in the 17th century b.) Its economic, social and political dimensions

III. a.) The English Revolution : major issues b.)Political and intellectual issues

IV. a.) Scientific Revolution b.) Emergence of scientific academies c.) Origins of Enlightenment.

V. a.) Mercantilism and European economics b.) Preludes to the Industrial Revolution

VI. a).European Politics in the 17th & 18th Century b.) Parliamentary monarchy c.) patterns of Absolutism in Europe

CC-9 : History of India (c 1526 – 1605)

(Full Marks-100 : Credits -6)

Course Outcome: This course would enable the students to know the major developments in the society, polity, economy and culture of the Mughal era during the time of Akbar.

I. Sources and Historiography: a) Persian literary culture; translations; Vernacular literary traditions. b)Modern Interpretations

II. Establishment of Mughal rule: a) India on the eve of Babur's Invasion b) Fire arms, military technology and warfare c) Humayun's struggle for empire d) Sher Shah and his administrative and revenue reforms

III. Consolidation of Mughal rule under Akbar: a) Campaigns and conquests: tactics and technology b) Evolution of administrative institutions: Zabt, Masnab, Jagir, Madad-I-Maash c) Revolts and resistance

IV. Expansion and Integration: a)Incorporation of Rajputs and other indigenous groups in Mughal nobility. b)North-West frontier, Gujarat and the Deccan c) Conquest of Bengal

V.Rural Society and Economy: a)Land rights and revenue system; Zamindars and Peasants; rural tensions b)Extension of agriculture; agricultural production; crop patterns c) Trade routes and patterns of internal commerce; overseas trade; rise of Surat

VI. Political and religious ideals: a) Inclusive political ideas: theory and practice b) Religious tolerance and Sulh-i-kul; Sufi mystical and intellectual interventions c) Pressure from the Ulama

CC-10: History of India (c 1605 – 1750s)

(Full Marks-100 : Credits -6)

Course Outcome: This course would enable the students to know the major developments in the society, polity, economy and culture from the Mughal emperor Jahangir to Aurangzeb to till 1750 CE.

I. Sources: Persian and vernacular literary cultures, histories, memoirs and travelogues

II. Political Culture under Jahangir and Shah Jahan a) Extension of Mughal rule; changes in Mansab and Jagir systems; imperial culture b) Orthodoxy and syncretism – Naqshbandi Sufis, Miyan Mir, Dara Shukoh, Samrad

III. Mughal Empire under Aurangzeb a) State and religion under Aurangzeb; issues in the war of succession; policies regarding religious groups and institutions b) Conquests and limits of expansion c) Beginning of the crisis: contemporary perceptions; agrarian and Jagir crises; revolts.

IV. Visual Culture: Paintings and Architecture

V. Patterns of Regional Politics: a) Rajput political culture and state formation b) Deccan kingdoms; emergence of the Marathas; Shiva; expansion under the Peshwas c) Mughal decline; emergence of successor states d) Interpreting eighteenth century India: recent debates

V. Trade and Commerce a) Crafts and technologies; Monetary system b) Markets, transportation, urban centres c) Indian Ocean trade network

SEC –B (2): Art Appreciation: an Introduction to Indian Art

(Full Marks-100 : Credits -2)

Course Outcome: The purpose of this course is to introduce students to Indian art, from ancient to contemporary times, in order to understand and appreciate its diversity and its aesthetic richness. The course will equip students with the abilities to understand art as a medium of cultural expression. It will give students direct exposure to Indian art through visuals, and visits to sites and museums.

I. Prehistoric and protohistoric art: Rock art; Harappan arts and crafts

II. Indian art (c. 600 BCE – 600 CE): Notions of art and craft Canons of Indian paintings Major developments in stupa, cave, and temple art and architecture Early Indian sculpture: style and iconography Numismatic art

III. Indian Art (c. 600 CE – 1200 CE) : Temple forms and their architectural features Early illustrated manuscripts and mural painting traditions Early medieval sculpture: style and iconography Indian bronzes or metal icons

IV. Indian art and architecture (c. 1200 CE – 1800 CE) : Sultanate and Mughal architecture Miniature painting traditions: Mughal, Rajasthani, Pahari Introduction to fort, palace and haveli architecture

V. Modern and Contemporary Indian art and Architecture: The Colonial Period Art movements: Bengal School of Art, Progressive Artists Group, etc. Major artists and their artworks Popular art forms (folk art traditions)

SEM-5

CC-11: History of Modern Europe (c.1780 – 1939)

(Full Marks-100 : Credits -6)

Course Outcome: This course would enable the students to get an idea about modern Europe between the eighteenth and nineteenth centuries and additionally the developments in world politics after the First World War.

I. The French Revolution and its European repercussions: *a)* Crisis of *ancien regime* b) Intellectual currents c) Social classes and emerging gender relations. d) Phases of the French Revolution e)Art and Culture of French Revolution f)Napoleonic consolidation – reform and empire.

II. Restoration and Revolution: c.1815 - 1848 a) Forces of conservatism and restoration of old hierarchies. b) Social, Political and intellectual currents. c) Revolutionary and Radical movements, 1830 - 1848

III. Capitalist Industrialization and Social and Economic Transformation (Late 18th century to AD 1914) a) Process of capitalist development in industry and agriculture: case studies of Britain, France, the German States and Russia. b) Evolution and Differentiation of social classes : Bourgeoisie, proletariat, Land Owning classes and peasantry. c) Changing trends in demography and urban patterns d) Family, gender and process of industrialization.

IV. Varieties of Nationalism and the Remaking of States in the 19th and 20th centuries : a)Intellectual currents, popular movements and the formation of National identities in Germany, Italy, Ireland and the Balkans. b) Specifications of economic development, political and administrative Reorganization – Italy; Germany. c) Revolutions of 1905; the Bolshevik Revolution of 1917 d) Programme of Socialist Construction and the Soviet Union during the inter-war period 1918- 39.

V. Imperialism, War and Crisis: c.1880 - 1918 a) Theories and mechanisms of imperialism; b) Growth of Militarism; c) Power blocks and alliances; d) Expansion of European empires e) War of 1914 - 1918

VI. Europe between Two World Wars: a) Post War Europe: A Diplomatic History b) The Great Depression c) Rise of Fascism in Italy and Nazism in Germany d) The Spanish Civil War e) Policy of Appeasement and Russo German Non-Aggression Pact f) Origins and Course of the Second World War

CC-12: History of India (c 1750s – 1857)

(Full Marks-100 : Credits -6)

Course Outcome: This course would enable the students to know the major developments from the mid eighteenth century to till the emergence of the East India Company state along with a focus on the Colonial state mechanism and uprising of 1857.

I. India in the mid 18th Century; Society, Economy, Polity

II. Expansion and Consolidation of Colonial Power : a) Mercantilism, foreign trade and early forms of exactions from Bengal b) Dynamics of expansion, with special reference to Bengal, Mysore, Western India, Awadh, Punjab and Sindh.

III. Colonial State and Ideology: a) Arms of the colonial state : army, police, law b) Ideologies of the Raj and racial attitudes. c) Education : indigenous and modern.

IV. Rural Economy and Society: a)Land revenue systems and forest policy b) Commercialization and indebtedness c) Rural society : change and continuity. d) Famines e) Pastoral economy and shifting cultivation.

V. Trade and Industry: a)De industrialization b)Trade and fiscal policy c) Drain of Wealth d) Growth of modern industry

VI. Popular Resistance: a) Santhal uprising (1857); Indigo rebellion (1860); Pabna Agrarian Leagues(1873); Deccan riots (1875) b) Uprising of 1857

DSE-A-1 : History of Bengal (c.1757-1905)

(Full Marks-100 : Credits -4)

Course Outcome: This course would enable the students to know the major developments of Bengal from the battle of Plassey to till the partition of Bengal.

I. Political history of Bengal under the Nawabs: Rise of British power in Bengal from the battle of Plassey to Buxar.

II. Administrative history: 1765--1833

III. Colonial economy: - Agriculture, trade and industry.

IV. Cultural changes and Social and Religious Reform Movements: Christian missionaries- The advent of printing and its implications, education: Indigenous and western - Hindu and Muslim religious revivalist movements.

V. Social Reforms and the women's question.

VI. Protest movements and insurgencies against the Raj: The Fakir and Sannyasi revolts, Indigo Revolt (1859-1860), Pabna Peasant Uprisings (1873-76)

VII. Partition of Bengal 1905: Curzon and the administrative blueprint.

DSE-B-1: History of Modern East Asia – China (c.1840 – 1949)

(Full Marks-100 : Credits -4)

Course Outcome: This course would provide a comprehensive idea about East Asia with specific focus on China.

I. Imperialism and China during the 19th and early 20th century a) Chinese feudalism : Gentry, Bureaucracy and peasantry; the Confucian value system; Sinocentrism; the canton commercial system b) The transformation of China into an informal colony; the Opium Wars; the Unequal Treaties; the scramble for concessions; Finance Imperialism; the Open Door policy. c) Agrarian and Popular Movements : Taiping and Yi Ho Tuan d) Attempts at Self-Strengthening (Tzu-Chiang): Reforms of 1860-95; 1898; and 1901-08.

ii) The Emergence of Nationalism in China a)The Revolution of 1911: Causes , nature and significance; the social composition of the Revolution; Sun Yat-sen and his contribution; the formation of the Republic; Yuan Shih Kai; War Lordism. b)May Fourth Movement of 1919: Nature and Significance

SEM-6

CC-13 : History of India (c. 1857 – 1964)
(Full Marks-100 : Credits -6)

Course Outcome: This course would enable the students to know the major developments from the mid nineteen century to till the Nehruvian Era

I. Cultural changes and Social and Religious Reform Movements: a) Growth of a new intelligentsia – the Press and Public Opinion b) Reform and Revival : Brahmo Samaj, Prarthna Samaj, and Ramakrishna and Vivekananda, Arya Samaj, Wahabi, Deoband, Aligarh and Singh Sabha Movements. c) Debates around gender d) Making of religious and linguistic identities e)Caste : Sanskritising and anti Brahminical trends
II. Nationalism : Trends up to 1919 a)Formation of early political organizations b) Moderates and extremists c)Swadeshi movement d)Revolutionaries
III. Gandhian nationalism after 1919 : Ideas and Movements: a) Mahatma Gandhi : his Perspectives and Methods b) i) Impact of the First World War ii) Rowlatt Satyagraha and Jalianwala Bagh iii)Non-Cooperative and Civil Disobedience iv)Provincial Autonomy, Quit India and INA c)Left wing movements d)Princely India : States people movements
IV. Nationalism and Social Groups : Interfaces: a) Landlords, Professionals and Middle Classes b)Peasants c)Tribals d)labours e)Dalits f)Women g)Business groups
V. Communalism: Ideologies and practices, RSS , Hindu Maha Sabha, Muslim League
VI. Independence and Partition a)Negotiations for independence and partition b)Popular movements c)Partition riots
VII. Emergence of a New State: a)Making of the Constitution b)Integration of princely states c)Land reform and beginnings of planning d) The Nehru years.

CC-14: History of World Politics: 1945-1994
(Full Marks-100 : Credits -6)

Course Outcome: This course will give the students an idea about modern Europe from the Second World War political developments till the collapse of the Soviet Union.

I. The Cold War: Weakening of European balance of power: Origins of The Cold War: Yalta and Potsdam Conferences; End of wartime alliance.
II. The USA in World Politics: Truman Doctrine, Marshall Plan, NATO.
III. The USSR in World Politics: Molotov Plan, COMECON and Cominform; Sovietisation of Eastern Europe; Berlin Blockade; Warsaw Pact.
IV. Manifestation of Cold War: The Korean Crisis- End of French Colonial rule in Indo-China and the Vietnam War – Cuban Crisis.
V. De-Stalinization: Thaw in Cold War; Détente and road to the ending of Cold War.
VI. Disintegration and Decline of the Soviet Union – Glasnost and Perestroika – Crisis of Socialist regimes in other East European Countries: Poland, Germany, Czechoslovakia, Hungary – Response of the USA; Rise of a Unipolar World system, Globalization.
VII. Emergence of the People's Republic of China – China and the USA – Sino-Soviet rift.
VIII. West Asian Crisis– Palestine and Western Powers – Birth of Israel – Arab-Israel Conflict The Suez Crisis (1956); Origin and Formation of PLO; Yom Kippur War(1973) ; Camp David Accord(1979); Oslo Peace Accord(1993).

IX. Decolonization: The African Case Study: Ghana, Algeria, Congo, Kenya.

X. Protest Politics: Civil Rights Movement, Anti-Apartheid Movement and the end of Apartheid (1994), Second Wave Feminist Movement.

DSE-A-3: History of Bengal (c.1905-1947)

(Full Marks-100 : Credits -4)

Course Outcome: This course would enable the students to know the major developments of Bengal from the partition of Bengal to till the partition of India.
I. Partition of Bengal and Swadeshi Movement (1905-08): Political ideology and organizations, rise of Extremism in Bengal, Swadeshi movement, Revolutionary terrorism.
II. Communal Politics (1906- 30): Birth of Muslim League, and the Hindu response.
III. Gandhian nationalism after 1919: Non- Cooperation and Khilafat movement, Swaraj party, Civil Disobedience movement, Revolutionary Nationalists and the beginnings of Left politics in the 1920s, Rise of Krishak Praja Party, Muslim League in Bengal politics.
IV. Government of India Act 1935 and its aftermath:
V. Peasant Movements in Bengal 1920-1946, Labour Movement in Bengal 1920-1946, Caste Movement in Bengal 1920-1946, Women's Movements in Bengal 1920-1946**.**
VI. Subhash Chandra Bose and the Congress, Quit India Movement in Bengal, Post war upsurges in Bengal- Left wing movements.
VIII. Independence and Partition: Communal Riots, the great Calcutta killing and Noakhali riots, Hindu Mahasabha, Muslim League, freedom and Partition, Birth of West Bengal and East Pakistan.

DSE-B-3: History of Modern East Asia- Japan (c.1868 – 1945)
(Full Marks-100 : Credits -4)

Course Outcome: This course would provide a comprehensive idea about East Asia with specific focus on Japan.
I) Transition from feudalism to capitalism: a) Crisis of Tokugawa Bakuhan system b) Meiji Restoration: Its nature and Significance c) Political Reorganization d) Military Reforms e) Social, cultural and educational reforms (Bunmeikaika) f) Financial reforms and educational development in the 'Meiji' era g) Meiji Constitution
II) Japanese Imperialism a) China b) Manchuria c) Korea
III) Democracy and Militarism / Fascism a) Popular/ People's Rights Movement b) Nature of political parties c) Rise of Militarism-Nature and significance d) Second World War; American occupation e) Post-War Changes

PROGRAMME OFFERED : **B.A. HISTORY GENERAL**
PROGRAMME CODE : **HISG**
DURATION : **6 SEMESTERS**
TOTAL CREDIT : **120**

Semester wise Courses for HISG

Course	SEM-1	SEM-2	SEM-3	SEM-4	SEM-5	SEM-6
CC	CC-1 2TH+2TU	CC-2 2TH+2TU	CC-3 2TH+2TU	CC-4 2TH+2TU		
GE	GE-1 TH+TU	GE-2 TH+TU				
AECC	AECC-1TH	AECC-2TH				
DSE					DSE-A 2TH+2TU	DSE-B 2TH+2TU
SEC			SEC-A TH	SEC-B TH	SEC-A TH	SEC-B TH

SEM-1

CC-1/GE-1: History of India from Earliest Times upto 300 CE
(Full Marks-100 : Credits -6)

Course Outcome: This course will give the students a general idea about the historical developments in India from ancient period till the post Muryan Age.

I. Sources & Interpretation
II. Abroad survey of Palaeolithic, Mesolithic and Neolithic Cultures.
III. Harappan Civilization: Origin, Extent, dominant features & decline,Chalcolithic age.
IV. The Vedic Period: Polity, Society, Economy and Religion, Iron Age with reference to PGW & Megaliths.
V. Territorial State sand rise of Magadha,Conditions for the rise of Mahajanpadas and the Causes of Magadha's success
VI. Iranian and Macedonian Invasions, Alexander's Invasion And Impact
VII. Jainism and Buddhism: Causes, Doctrines, Spread, Decline and Contributions
VIII. The Satavahanas Phase: Aspects of Political History, Material Culture, Administration, Religion
IX. Emergence and Growth of Mauryan Empire; State Administration, Economy, Ashoka's Dhamma, Art & Architecture
X. The Sangam Age: Sangam Literature,The three Early Kingdoms,Society & the Tamil language
XI. The age of the Indo-Greeks, Shakas: Parthians & Kushanas: Aspects of Polity, Society, Religion, Arts & Crafts, Coins, Commerce and Towns.

SEM-2

CC-2/GE- 2: History of India from. C.300 to1206

(Full Marks-100 : Credits -6)
Course Outcome: This course will give the students a general idea about the historical developments in India from the Gupta age till the foundation of Delhi Sultanate..

I. The Rise & Growth of the Guptas: Administration, Society, Economy, Religion, Art, Literature, and Science & Technology.
II. Harsha & His Times: Harsha's Kingdom, Administration,Buddhism & Nalanda
III. South India: Polity, Society, Economy & Culture
IV. Towards the Early Medieval: Changes in Society, Polity Economy and Culture with reference to the Pallavas, Chalukayas and Vardhanas.
V. Evolution of Political structures of Rashtakutas, Pala &Pratiharas.
VI. Emergence of Rajput States in Northern India: Polity,Economy &Society.
VII. Arabs in Sindh: Polity, Religion &Society.
VIII. Struggle for power in Northern India & establishment of Sultanate.

SEM-3

CC-3/GE-3 : History of India from 1206 to1707

(Full Marks-100 : Credits -6)

Course Outcome: This course will give the students a general idea about the historical developments in India from the Sultani period to till the Mughal period.

I. Foundation, Expansion & consolidation of the Delhi Sultanate; Nobility & Iqta system.
II. Military, administrative & economic reforms under the Khiljis & the Tughlaqs.
III. Bhakti &Sufi Movements.
IV. Provincial kingdoms: Mewar, Bengal, Vijaynagara & Bahamanis.
V. Second Afghan State.
VI. Emergence and consolidation of Mughal State, C.16th century to mid 17th century.
VII. Akbar to Aurangzeb: administrative structure-Mansab & Jagirs, State & Religion, Socio-Religious Movements.
VIII. Economy, Society & Culture under the Mughals.
IX. Emergence of Maratha Power.

SEC-A- 1: Historical Tourism: Theory & Practice

(Full Marks-100 : Credits -2)

Course Outcome:

I. Defining Heritage Art & Architecture in India: An overview: Field Work: Visit to historical sites & Museums
II. Understanding Built Heritage: Stupa Architecture, Temple Architecture, Indo Persian Architecture, Forts, Palaces, Mosques, Colonial Architecture, Present day structures
III. Field Work: Visit to site & Conducting of research
IV. Modalities of conducting tourism

SEM-4

CC-4/GE-4 History of India; 1707-1950

(Full Marks-100 : Credits -6)

Course Outcome: This course will give the students a general idea about the historical developments in India from the downfall of the Mughal Empire till independence

I. Interpreting the 18th Century.
II. Emergence of Independent States & establishment of Colonial power.
III. Expansion & consolidation of Colonial Power upto 1857.
IV. Uprising of 1857: Causes, Nature & Aftermath.
V. Colonial economy: Agriculture, Trade & Industry.
VI. Socio-Religious Movements in the 19th century.
VII. Emergence & Growth of Nationalism with focus on Gandhian nationalism.
VIII. Communalism: Genesis, Growth and partition of India.
IX. Advent of Freedom: Constituent Assembly, establishment of Republic

SEC-B -1: Museums & Archives in India

(Full Marks-100 : Credits -2)
Course Outcome: This course introduces students to the institutions that house and maintain documentary, visual and material remains of the past. Museums and archives are among the most important such repositories and this course explains their significance and how they work. Students will be encouraged to undertake collection, documentation and exhibition of such materials in their localities and colleges. Visit to the National Archives and National Museum are an integral part of the course.

I. Definitions
II. History of setting up of Museums and Archives: Some case Studies
III. Field Work; Studying of structures & Functions
IV. Training & Employment

SEM-5

DSE- A -2: Some Aspects of European History: C.1780-1945
(Full Marks-100 : Credits -6)
Course Outcome: This course would enable the students to get an idea about modern Europe between the late eighteenth and nineteenth centuries and additionally the developments in world politics till the Second World War.

I. The French Revolution: Genesis Nature & Consequences
II. Napoleonic Era and aftermath.
III. Revolutions of 1830 & 1848.
IV. Unification of Italy & Germany.
V. Social and economic Changes.
VI. Imperialist Conflicts: World War I
VII. Rise of Fascism and Nazism.
VIII. Origins of World War II

SEC-A- 1: Historical Tourism: Theory & Practice

(Full Marks-100 : Credits -2)
Course Outcome:

I. Defining Heritage Art & Architecture in India: An overview: Field Work: Visit to

historical sites & Museums

II. Understanding Built Heritage: Stupa Architecture, Temple Architecture, Indo Persian Architecture, Forts, Palaces, Mosques, Colonial Architecture, Present day structures
III. Field Work: Visit to site & conducting of research
IV. Modalities of conducting tourism

SEM-6

DSE- B-1: Patterns of Capitalism in Europe: C.16TH Century to early 20th Century
(Full Marks-100 : Credits -6)
Course Outcome:

I. Definitions & Concepts
II. Commercial Capitalism: 1500-1700
III. Industrial Revolution in England: Causes & Nature
IV. Industrial Capitalism in France: Genesis & Nature
V. Growth of Industries in Germany
VI. Impact of Industrial Revolution on European Society, Polity & Economy.

SEC-B -1: Museums & Archives in India

(Full Marks-100 : Credits -2)
Course Outcome: This course introduces students to the institutions that house and maintain documentary, visual and material remains of the past. Museums and archives are among the most important such repositories and this course explains their significance and how they work. Students will be encouraged to undertake collection, documentation and exhibition of such materials in their localities and colleges. Visit to the National Archives and National Museum are an integral part of the course.

I. Definitions
II. History of setting up of Museums and Archives: Some case Studies
III. Field Work; Studying of structures & Functions
IV. Training & Employment

Department of Journalism & Mass Communication

COURSE OUTCOME (HONS)

SL NO.	SEM	PAPER CODE	PAPER NAME	CREDIT	MARKS	COURSE OUTCOME
1.	SEM 1	CC-1	Theory : Introduction to Journalism Practical :	4 2	50 30	Students learn basic concepts of news, report writing on different types of news.

2.	SEM 1	CC-2	History of Indian Journalism	6	100	Students learn early Indian journalism, extremist press, contribution of Nationalist press in freedom movement and post-independence era of Indian Press.
3.	SEM 2	CC-3	Reporting & Editing	6	100	Students learn reporting to page layout, structure of newsroom
4.	SEM 2	CC-4	Theory : Media & Communication Practical :	4	50	Students learn the definition of communication, different types of communication, responsibility of the media, change of reporting. In practical, they learn different types of news writing in print media.
5.	SEM 3	CC-5	Communication, media and society	6	100	Students learn various models and theories of mass communication. They also learnt social theories of communication
6.	SEM 3	CC-6	Media and cultural studies	6	100	Student learnt different Schools of Mass Communication, philosophy, code text used in communication and different aspects of traditional media.
7.	SEM 3	CC-7	Theory : Introduction to Radio Practical :	4 2	50 30	Students learn about different phases of radio production, rise of Indian radio. They learnt in details various radio presentation
8.	SEM 3	SEC/ A-3-1	Radio writing & presentations	2	80	Students learn radio presentations like radio talk, feature, magazine etc. They also got basics of radio newsroom and production stages.
9.	SEM 3	SEC/ A-3-2	Photo Journalism	2	80	The syllabus is very compact with all the nook and corners of photography, handling of photographic instruments, apertures. The students well understood the mechanisms of photography. they gained knowledge on digital photography as well as photojournalism and its ethics

10.	SEM 4	CC-8	Theory : Introduction to TV Practical :	4 2	50 30	Students got vivid descriptions of tv news presentations. working in tv newsroom handling of tv camera and technological advancement.
11.	SEM 4	CC-9	Film theories and production	6	100	Students were encouraged in film production. .They learnt in detail the theories of film. how to make a film, learned the details about Indian and foreign directors and their work.
12.	SEM 4	CC-10	Media management and press laws	6	100	Students learned in detail about media management and laws related to press.
13.	SEM 4	SEC/B-4-1	Documentary	2	80	Students were taught to make Documentary along with scripts.
14.	SEM 4	SEC/B-4-2	feature film production	2	80	Students Were taught to make feature film along with script.
15.	SEM 5	CC-11	Theory : Introduction to New Media Practical :	4 2	50 30	The Students had an elaborate idea on new media and its development, details of web journalism, use of alternative journalism, how the network society is and the power of social media. Practically they learned the tools of online journalism. making of websites, blogs and how to promote it, content designing, multimedia, linear and non-linear writing
16.	SEM 5	CC-12	Development communication	6	100	Students will get vivid description on Development and its growth, areas of development, about developed and developing countries, models of development, paradigms of development. They will learn a lot of the schemes of government and details of development support communication and consumer awareness

17.	SEM 5	DSE/A-5-1	Global Media and politics	6	100	Students learned the basics of global media and politics all-around with recent examples.
18.	SEM 5	DSE/A-5-2	Human rights, gender, environment studies	6	100	Students learned the rights of human. gender inequality, women empowerment, child rights .
19.	SEM 5	DSE/B-5-1	Multimedia	6	100	Students got basic ideas of multimedia and its importance in modern age.
20.	SEM 5	DSE/B-5-2	Communication research	6	100	Students learnt in details of communication research, why it is essential, it's role ,function and importance.
21.	SEM 6	CC-13	Theory : Advertising Practical	4	50	Students got detailed idea of Advertising and its type. .its creativity as well as its ethics.
22.	SEM 6	CC-14	Public Relations	2	30	Students learnt details of pr. marketing, propaganda. how to deal with public.
23.	SEM 6	DSE/A-6-1	Dissertation	6	100	Students have to do research work on any one topic and present in exam.
24.	SEM 6	DSE/A-6-2	Political Communication	6	100	Students got detail idea of political communication. .and it's essentials in society
25.	SEM 6	DSE/B-6-1	Folk and community media	6	100	Students learned the importance of folk media, differences between folk and traditional media with relevant examples.
26.	SEM 6	DSE/B-6-2	Health and science communication	6	100	Students got clear idea on health and science communication.

COURSE OUTCOME (GENERAL)

Sl No.	SEM	PAPER CODE	PAPER NAME	CREDIT	MARKS	COURSE OUTCOME
1.	SEM 1	CC/GE 1	Basic of Journalism	6	100	Students will learn the abc of journalism and its other aspects.

2.	SEM 2	CC/GE 2	Media Management	6	100	Students will know in details about different media management.
3.	SEM 3	CC/GE 3	Advertising & Public Relations THEORY PRACTICAL	4 2	50 30	Students will gain knowledge on advertising, its layout., different ad copies .at the same time about public relations, dealing with public, marketing,
4.		SEC-A-3/5	Journalistic writing or Newspaper design or Film Appreciation or print Advertising	2		The Students will gain practical knowledge on journalism.
5.	SEM 4	CC/GE 4	Press Laws & Indian constitution	6	100	Students learned 10 to 15 laws of the press. and Indian constitution
6.		SEC-B-4/6	Documentary Script writing or Radio TV script writing or Anchoring or media presentation	2		Students will get knowledge on practical journalism, anchoring and presentation both audio and electronic media
7.	SEM 5	DSE - A-5-1	FILM STUDIES	6	100	Students will learn about directors, their work, different aspects of film.
8.		DSE - A-5-2	Specialized writings	6	100	Practical knowledge on reporting, feature writing, column writing.
9.		DSE - B-6-1	Broadcasting Media	2		Basics of radio/ tv
10.		DSE - B-6-2	International relations	6	100	It is very essential to have knowledge of different countries, their whereabouts, history, social, cultural and financial conditions and understanding with other countries. Students get knowledge on these.

Department of Philosophy

Course Outcome of Philosophy Honours:

Course	Name of the Course	Course Outcome
CC1 (SEM1)	INDIAN PHILOSOPHY -1	This course helps the students to get the basic knowledge of several schools of Indian Philosophy namely Carvaka, Jainism, Buddhism, Nyaya and Vaisesika. It creates an interest about the epistemological and metaphysical views of the above mentioned schools in the mind of the students.
CC2 SEM1	History of Western Philosophy-1	This Course helps the students to get the basic knowledge of some western philosophers namely Thales, Heraclitus, Parmenides, Empedecler, Anaxagoras, Democritus, Protagoras, (pre-socretic philosophers),Plato, Aristotle, St. Thomas Acquinas, Descartes, Spinoza and Leibnitz. This course creates an interest about the Philosophical views of the above mentioned Philosophers in the mind of the students.
CC3 (SEM2)	Outline of Indian Philosophy-2	This course helps the students to get the basic knowledge of several schools of Indian Philosophy namely Samkhya, Yoga, Mimamsa, Advaita Vedanta, Visistadvaita Vedanta. It creates an interest about the epistemological and metaphysical views of the above mentioned schools in the mind of the students
CC4 (SEM2)	History of Western Philosophy -2	This Course helps the students to get the basic knowledge of some western philosophers namely Locke, Berkeley, Hume, Kant. This course creates an interest about the Philosophical views of the above mentioned Philosophers in the mind of the students
CC5 (SEM3)	Philosophy of Mind	This Course helps the students to be oriented with the basic concepts of Psychological namely sensation, perception, learning, mind-body theory, consciousness, intelligence and personality. this course creates an interest about the philosophical theories of mind in the mind of the students.
CC6 (SEM3)	Social and Political Philosophy	This particular course helps the students to get a brief sketch of different concepts of social and political philosophy namely society,community,association,family,class,caste,secularism,social change, democracy, socialism etc. This basic orientation encourage them to keep interest on social and political matter of the society. It motivates students to work as administrative service.
CC7 (SEM3)	Philosophy of Religion	This course develops the interest in the students minds regarding various religious theories, topics and practices namely doctrine of karma and doctrine of liberation of Hinduism, Jainism, and Buddhism; philosophical teachings of the Holy Quran, basic tenets of Christianity, different arguments for and against the existence of God and religious languages. It helps students to build a unprejudiced mind about religion in the filed of public

CC8 (SEM4)	Western Logic 1	This course helps the students to be enriched with the power of logical reasoning and to distinguished between deductive and inductive reasoning of logic. This course particularly motivates the students to prepare for the competitive exams in future since logical reasoning is an important topic of the said exams at present.
CC9 (SEM4)	Western Logic 2	This course is an advancement of the previous course,i.e-,CC8. This particular portion of Western Logic helps the students to be enriched with the advanced logical aptitude. It includes the basic knowledge of symbolic logic in the students mind.
CC10 (SEM4)	Epistemology and Metaphysics (Western)	This course helps the students to get the basic knowledge of Western epistemological views and the nature of ultimate reality from the perspective of Western Philosophy. It creates interest about realism, idealism, phenomenalism, causal principles, propositional knowledge, analytic truth, logical possibility, etc in the students mind
CC11 (SEM5)	Nyaya Logic & Epiestemology -1	This course is a deep and Critical study of Indian Logic & Epiestemology from the perspective of Nyaya Darsana. The concepts of this course namely buddhi(cognition),smriti(memory), karana(cause), prama(proper knowledge) and pramana(means of proper knowledge),definition of pratyaksa(perception) etc enhances analytic mind of the students.
CC12 (SEM5)	Indian Ethics	Ethics is an essential sphere of human conduct and behaviour in social life. The ethical studies of dharma, purusarthas, vidhi, nisedha, anubrata, mahabrata, pancasila etc provide a very sound understanding of morality from the standpoint of Indian Philosophy. This makes an ideal and dutiful man to his mark in every field of service.
CC13 (SEM6)	Nyaya Logic & Epiestemology -2	This course is a deep and Critical study of Indian Logic & Epiestemology from the perspective of Nyaya Darsana. The concepts of this course namely anumana (inference),hetvabhasa,sabda(testimony),upamana(comparison),saktigraha,arthapatti,laksana etc enhances analytic mind of the students.
CC14 (SEM6)	Western Ethics	Ethics is an essential sphere of human conduct and behaviour in social life. The ethical studies of moral and non-moral actions, object of moral judgement, hedonism, utilitarianism, theories of punishment, deontological theories etc provide a very sound understanding of morality from the standpoint of Western Philosophy. This makes an ideal and dutiful man to his mark in every field of service.
DSE A(1) (SEM5)	Philosophy of Language(Indian)	Linguistic study of this paper developes a sound skill of languages which is very much useful for academic purpose. Students get the basic knowledge of language viz., definition of pada, concept of asatti, yogyata, definition of laksana, sabdobodha, which help them to be more analytical and thoughtful.

DSE B(1) (SEM5)	Classical text: An Enquiry Concerning Human Understanding.	This text based course helps the students to develop the interest of reading original text and to be more argumentative.
DSE-A(2) (SEM6)	Philosophy of Language (Western)	This course helps the students to get the basic knowledge of language, viz., syntax, semantics, word-meaning , vagueness, sentence meaning. It develops the thought process of the mind of the students.
DSE-B(2) SEM(6)	M. K. Gandhi	This particular course helps the students to get a clear idea of the philosophy illustrated by M.K. Gandhi. It enriches the students by initiating the concepts of hind swaraj , trusteeship, social & political thought of Gandhi as a whole. This may inspire and motivate our students to follow his path.
SEC A(b)/ SEC A2 SEM(3)	Man & Environment	The uniqueness of this course is that it explains the role and importance of nature in human life , i.e, how to balance between man and environment. It helps the students to realize the Indian classical attitude towards environment, respect for nature ,intrinsic value of nature, eco-feminism, deep ecology and its third world critique.
SEC B(b)/SEC B2 SEM (4)	Philosophy of Human Rights	The effectiveness of this course rests on the students understanding about the nature of human rights which is a very useful and relevant issue in today's world. It offer an overall orientation to the student about natural rights , human rights and fundamental rights.

Course Outcome of Philosophy General:

CC1	Indian Epistemology and Metaphysics	This course helps the students to get the basic knowledge of several schools of Indian Philosophy namely Carvaka and Nyaya epistemology, Vaisesika and Advaita Metaphysics. It creates an interest about core concepts of Indian Philosophy in the students' mind.
CC2	Western Epistemology and Metaphysics	This course helps the students to get the basic knowledge of Western Philosophy namely Conditions of Propositional Knowledge, Rationalism, Empiricism, Kantian theory, Theory of Causality, Realism, Idealism etc. It creates an interest about core concepts of Western Philosophy in the students' mind.
CC3	Western Logic	This course helps the students to be enriched with the power of logical reasoning. It enriches the students by providing basic knowledge about Aristotelian Logic, Modern Logic and Inductive Logic.
CC4	Philosophy of Mind	This course helps the students to be oriented with the basic concepts of Psychology namely Sensation, Perception, Consciousness, Memory, Learning ,Intelligence etc.

Sem 3/Sem 5 SEC	SEC-A1/SEC-A(a) Logical Reasoning and Application	It helps the students to know the main objective of logical reasoning to distinguish between good and bad arguments, functional applications of ordinary operative relations between sense-organs and respective objectives, application of Laws in Inductive & deductive reasoning.
Sem 4/Sem 6 SEC	SEC-B1/SEC-B(b) Man and Environment	The uniqueness of this course is that it explains the role and importance of nature in human life. Indian classical attitude towards environment, respect for nature, intrinsic value of nature, eco-feminism, deep-ecology and its third World Critique.
Sem 5 DSE	DSE-A1 / DSE-A(a) Ethics : Indian and Western	Ethics is an essential sphere of human conduct and behavior in social life. The ethical studies i.e., Purusarthas, Buddhist Ethics, Moral and Non-moral actions, Teleological Ethics and Theories of Punishment provide a very sound understanding of morality from the standpoints of both Indian and Western Philosophy.
Sem 6 DSE	DSE- B (b) Contemporary Indian Philosophy	This course helps the students to be acquainted with the philosophy of some Contemporary Indian thinkers, namely, Swami Vivekananda, M. K. Gandhi and B.R. Ambedkar. This course enriches the students to follow our heritage and Indian philosophical tradition.

Department of Political Science

COURSE OUTCOME -

B.A HONOURS

CORE COURSES -

CC 1 (UNDERSTANDING POLITICAL THEORY : CONCEPTS) -
Students get acquainted with the key concepts - Conceptualizing Politics - meaning of political which with equip them with knowledge and cognitive skills.

CC 2 (UNDERSTANDING POLITICAL THEORY : APPROACHES & DEBATES) -
Students get acquainted with different approaches to the study of Political Science & debates involves therewith, knowledge of which will equip them with knowledge & cognitive skills.

CC 3 (CONSTITUTIONAL GOVERNMENT IN INDIA) -
Study of this course provide students with knowledge regarding basic structure of policy enshrined in the Constitution of India, which equip them with cognitive skills to compete successfully competitive examinations like IAS, WBCS.

CC 4 (POLITICS IN INDIA : STRUCTURES & PROCESSES)-
Students came to know the structures and processes through which the political system works in India, the knowledge of which will equip them with cognitive skills and analytical reasoning.

CC 5 (INDIAN POLITICAL THOUGHT - 1) -
After going through this course students become equipped with knowledge regarding great Indian Political Thought - Ancient, Medieval and Modern - hailed by the whole world- which will definitely imbibe them with values, attitudes and lifelong learning.

CC 6 (COMPARATIVE GOVERNMEN T & POLITICS) -
Study of this course will equip students with cognitive skills and skills like analytical reasoning to study politics scientifically and in a meaningful manner.

CC 7 (PERSPECTIVES ON INTERNATIONAL RELATIONS) -
Knowledge acquired from this course will equip students with cognitive skills and critical thinking to understand relations among states on international scenario and different theories evolved to deal with emergent issues.

CC 8 (INDIAN POLITICAL THOUGHT II) -
Knowledge of political ideas of stalwart thinkers of modern India will definitely enhance cognitive skills of the students to think critically about the ideas political in present scenario.

CC 9 (GLOBAL POLITICS SINCE 1945) -

This course will provide knowledge regarding evolution of world political systems which will equip students to act skillfully as citizens of globalized world.

CC 10 (WESTERN POLITICAL THOUGHT & THEORY I) –
Knowledge acquired through this course will enrich intellectual exercised of the students on western political thought and related theories.

SKILL ENHANCEMENT COURSE :

DEMOCRATIC AWARNESS THROUGH LEGAL LITERACY (SEC A1) -
Knowledge of this course will equip students with legal literacy & thereby activate their democratic awareness to fight skilfully against wrong doing in society.

LEGISLATIVE PRACTICES & PROCEDURES (SEC B1) -
Students come to know the Constitutional Provisions regarding Legislative Practices & Procedures functioning at different tires of governance which will enable them to deal with legal problems skillfully.

B.A GENERAL -

CORE COURSES :

CC 3 (GOVERNMENT & POLITICS IN INDIA) -
By going through this course students will become equipped with knowledge regarding the Constitution of India & the functioning of its Polity which will enable them skilfully compete examinations like IAS, WBCS .

CC 4 (INTERNATIONAL RELATIONS) -
Students become equipped with the knowledge of different approached is analyze relations among states on International changing scenario - which will help them to develop skills like analytic reasoning, critical thinking.

SKILL ENHANCEMENT COURSE :

ELEMENTARY DIMENSIONS OF RESEARCH (B-1) -
After completing this course students come to know elementary guide of Research Method - which will provide them cognitive skills for future research - oriented activities.

Department of Psychology

COURSE OUTCOME, DEPARTMENT OF PSYCHOLOGY						
Semester	**Sl No**	**Name of the course**	**Course code**	**Credit**	**Marks**	**Course outcome**
SEM-I	1	Introduction to Psychology	CC-1	TH-4+PR-2=6	100	To introduce students to the basic concepts of the field of psychology with an emphasis on applications of psychology in everyday life.
	2	Statistical methods for psychological research-i	CC-2:	TH-4+PR-2=6	100	To familiarize students with the use of statistical methods in psychological research and the techniques of descriptive statistics for quantitative research
SEM II	3	Biopsychology	CC-3	TH-4+PR-2=6	100	To explore the biological basis of experience and behaviour; To develop an understanding of the influence of behaviour, cognition, and the environment on the bodily system; To develop an appreciation of the neurobiological basis of psychological function and dysfunction.
	4	Psychology of individual differences	CC-4	TH-4+PR-2=6	100	To develop an understanding of the concept of individual differences with the goal to promote self-reflection and understanding of self and others.

SEM- III	5	Development of psychological thought	CC-5	TH-4+PR-2=6	100	This course provides a basic introduction to the development of the discipline both from the Indian as well as western perspective; Review the development of psychological thought and introduce the issues and debates in contemporary psychology.
	6	Psychological research	CC-6	TH-4+PR-2=6	100	To educate students with the process and the methods of quantitative and qualitative psychological research traditions.
	7	Social psychology	CC-7	TH-4+PR-2=6	100	Develop an understanding of the individual in relation to the social world; Introduce students to the realm of social influence, as to how individuals think, feel and behave in social situations.
	8	Behaviour modification	SEC-A-01	2	100	To understand the concept of behaviour modification and its applications.
	9	Communication	OR SEC-A-01	OR, 2	OR, 100	To understand communication and its different facets in different contexts.
SEM- IV	10	Understanding psychological disorders	CC-8	TH-4+PR-2=6	100	The paper aims at providing an overview of the concept of abnormality and the symptoms and etiology of various psychological disorders. This will sensitize them to information on psychopathology and dispel myths regarding it.
	11	Statistical methods for psychological research-ii	CC-9	TH-4+PR-2=6	100	To educate students with the techniques of inferential statistics and hypothesis testing.

	12	Applied social psychology	CC-10	TH-4+PR-2=6	100	To help student understand social problems and gain knowledge about intervention strategies.
	13	Emotional intelligence	SEC-B-02	2	100	To understand the concept of emotional intelligence and learn ways of developing it.
	14	Stress management	OR SEC-B -02	OR, 2	OR, 100	In everyday life we experience stress related to various situations. Students will learn how they can make adjustments and manage to cope with stress more effectively.
SEM- V	15	Understanding and dealing with psychological disorders	CC-11	TH-4+PR-2=6	100	To introduce the etiological understanding and therapeutic interventions for the various psychological disorders; Help students develop and understanding of how to deal with moderate to severe psychopathology.
	16	Developmental psychology	CC-12	TH-4+PR-2=6	100	To equip the learner with an understanding of the concept and process of human development across the life span To impart an understanding of the various domains of human development To inculcate sensitivity to socio-cultural context of human development.
	17	Positive psychology	DSE-A -01	TH-4+PR-2=6	100	To introduce the basic concepts of the growing approach of positive psychology and understand its applications in various domains.
	18	Health psychology	DSE-B -03	TH-4+PR-2=6	100	To understand the relationship between psychological factors and physical health and learn how to enhance well-being.

SEM-VI	19	Organizational behaviour	CC-13	TH-4+PR-2=6	100	To develop an awareness of the concepts related to organizational behavior; Help the students develop connectivity between concepts and practices of organizations.
	20	Counselling psychology	CC-14	TH-4+PR-2=6	100	To develop an understanding of basic concepts, processes, and techniques of Counseling; To acquaint the learner with the challenges of Counseling.
	21	Human resource management	DSE-A -02	TH-4+PR-2=6	100	To help students understand the various processes and issues inherent in organizations related to human resources.
	22	Community psychology	DSE-B -04	TH-4+PR-2=6	100	To learn the link between individuals and communities and deal with social issues more effectively with people's participation.

Department of Sanskrit

COURSE OUTCOME

SEMESTER -1

Course Code	Course Title/Topic	Credit	Marks	Course outcome
CC-I	Classical Sanskrit Literature (Poetry)	6	100	This course helps the students to avail college teacher job and acting arena.It also enhance the knowledge of Mahakavya.

CC-2	Critical Survey of Sanskrit Literature	6	100	This course helps the students to avail college teacher job, research institute job and administrative job. It also enhance the knowledge of Brahmanas, Upanisadas, and Puranas.

COURSE OUTCOME

SEMESTER-2

Course code	Course title/topic	Credit	Marks	Course outcome
CC-3	Classical sanskrit literature (prose)	6	100	This course helps the students to avail college teacher job and acting arena. It also helps the students to get administrative job. It also enhance the knowledge of History of Sanskrit poetics.
CC-4	Self management in the Gita	6	100	This course helps the students to get college teacher job and research institution job. For this ,we arrange seminars and discussions GITA topic.

COURSE OUTCOME

SEMESTER-3

Course Code	Course Title/Topic	Credit	Marks	Course outcome
CC-5	Classical Sanskrit literature (drama)	6	100	This course helps the students to avail school and college teacher job and acting arena. It also enhance the knowledge of Sanskrit Drama.
CC-6	Poetices and literary criticism	6	100	This course helps the students to avail college teacher job and acting arena. It also helps the students to get administrative job. It also enhance the knowledge of History of Sanskrit poetics.
CC-7	Indian social institutions and polity	6	100	This course helps students to avail college teacher job, research institute job, administrative job. Sanskrit writing skill helps students to get job of translating.

COURSE OUTCOME
SEMESTER-4

Course code	Course title/topic	Credit	Marks	Course outcome
CC-8	Indian epigraphy, palaeography and chronology	6	100	This course helps the students to avail school and college teacher job and archaeology job. This

				course aims to acquaint the students with the epigraphical journey in Sanskrit.
CC-9	Modern sanskrit literature	6	100	This course helps the students to get college teacher job and research institution job.
CC-10	Sanskrit world literature	6	100	This course helps the students to get college teacher job and research institution job. Spoken Sanskrit course helps students to get teaching job of spoken Sanskrit .

COURSE OUTCOME

SEMESTER-5

Course code	Course title/topic	Credit	Marks	Course outcome
CC-11	Vedic literature	6	100	This course helps the students to get college teacher job and research institution job. We arrange seminars, symposiums and discussions shastriya topics. Its also help to get chanting teacher job.
CC-12	Sanskrit grammar	6	100	This course helps the students to get college teacher job and research institution job. We arrange seminars, symposiums and discussions shastriya topics.
DSE-1	Philosophy, religion and culture in sanskrit tradition	6	100	This course helps the students to get college teacher job and research institution job.It also enhance the knowledge of Sanskrit tradition.
DSE-2	Indian perspectives in personality development	6	100	This course helps students to develop their personalities.

COURSE OUTCOME

SEMESTER-6

Course code	Course title/topic	Credit	Marks	Course outcome
CC-13	Indian ontology and epistemology	6	100	This course helps the students to get college teacher job and research institution job. We arrange seminars, symposiums and discussions shastriya topics
CC-14	Sanskrit composition and communication	6	100	This course helps the students to get college teacher job and research institution job. Spoken Sanskrit course helps students to get teaching job of spoken Sanskrit
DSE-3	Literery criticism	6	100	This course helps the students to get college teacher job and research institution job.

DSE-4	Nationalism in sanskrit literature	6	100	This course helps the students to avail college teacher job and acting arena. It also helps the students to get administrative job.

Department of Sociology

COURSE OUTCOME

Sl. No:	Semester	Course	Paper offered	Course outcome
1	1	H- CC- 1	Introduction to Sociology-1	Distinctiveness of sociology as a science and components of society
		H- CC- 2	Sociology of India-1	An approach to the study the nature of Indian society
		GE-CC/GE-1	Introduction to Sociology	Sociology and other social sciences, basic concepts of sociology
2	2	H- CC- 3	Introductory Sociology- 2	An introduction to the theoretical bases of sociology
		H- CC-4	Sociology of India-2	Varied issues and challenges of Indian society
		GE-CC/GE- 2	Sociology of India	Study of Indian society- Pre & post independent India
3	3	H- CC-5	Political Sociology	Basic concepts and nature of political system in different societies

		H- CC-6	Religion and Society	Religion as a sociological concept, its components and relation between religion and society, secularism, communalism and religious fundamentalism
		H-CC- 7	Sociology of Gender and Sexuality	Social construction of gender and related issues
		H- SEC-A-2	Gender sensitization	Gender, society and gender related policies
		GE-CC/GE-3	Sociological theories	Introduction to the western sociological thinkers
		GE-SEC-A-2	Gender sensitization	Gender, society and gender related policies
4	4	H- CC- 8	Economic Sociology	Economics and society, exchange, system of production and contemporary issues
		H- CC-9	Population Studies	Demographical studies of society, concept, approach, migration, population and development
		H- CC-10	Social stratification	Studying social inequality, theories, social mobility and reproduction
		H-SEC-B-1	Statistical reasoning for Sociology	Effectiveness of statistical methods in social research
		GE-CC/GE-4	Methods of Sociological Enquiry	Study of techniques and stages of social research
		GE-SEC-B-2	Statistical reasoning for Sociology	Gender, society and gender related policies
5	5	H- CC-11	Sociological Thinkers- 1	Understanding of western sociological thought of- Karl Marx, Weber and Durkheim
		H- CC-12	Research Methods- 1	Tools, techniques and components of methodology of social research
		H- DSE-A-1	Urban Sociology	Understanding the concepts, perspectives, settlement and urban problems
		H- DSE-B-1	Indian Sociological Traditions	Understanding of Indian sociological thought of- G. S. Ghurye, Radhakamal Mukerjee, Dhurjatiprasad Mukherji
		GE-SEC-A-1	Social research methods	Study of techniques and stages of social research
		GE-DSE-B-2	Family, marriage and kinship	Family, marriage, kinship and household concepts and contemporary issues
6	6	H- CC-13	Sociological thinkers- 2	Study of theoretical school of thought from- classical to post modern
		H- CC-14	Research methods -2	Tools, techniques and components of methodology of social research

		H- DSE-A-3	Environmental sociology	Envisioning environmental sociology, different perspectives, global issues and challenges
		H- DSE-B-4	Project- Field work and dissertation	Practical exposure of social issues through field work and sample studies
		GE-SEC-B-1	Theory and practice of Development	Understanding development and its various dimensions, participatory development and decentralisation of development
		GE-DSE-B-1	Social stratification	Studying social inequality in different forms, theories and social mobility

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Department of Urdu

Course outcome – Department of Urdu

The Urdu language is an Indo-Aryan language that is spoken by all around the world which makes it another important language to study. Specific learning outcome for Urdu course (language and literature) include the following points

1. **B. A , B. Sc & B. Com – semester -1 – AECC-01** for academic year 2020-2021
   The main objective of this course is to make the students fully accustomed with Urdu poetry , prose and life works of great personality .This course will also helpful to the students ability in communicating skill and precise manner .
2. **B. A (General) – Semester -04 & 06 – LCC-2** for academic year 2020-2021
   This course propose to enable the students to fully grasp the development of Urdu literature after progressive movement. The course intends to provide a good knowledge of Modern Urdu Poetry and Prose .Urdu poetry has many different forms like Ghazal ,Marsiya, Masnavi ,Nazm etc. In this course (LCC-2) ,Students have the fully aware the difference between classical and modern literature .The course proposes to provide brief knowledge about modern Novel and short story writer like Manto , Ghulam Abbas, Surendra Prakhash Balraj Minraa.This course also intends to prepare the students for writing on a given General / Literary topic .