



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

## Department of Microbiology

### Under Graduate Programme

#### Programme Specific Outcome (PSO) in Microbiology

Microbiology, an interdisciplinary subject in its core course prepares students for knowing the basics of both theory and practical; further focuses on the overlapping domains with the other streams of biology.

The main objective of the program is to train the students about the knowledge of microbiology and ignite young minds to think innovatively and nurture scientific temper as an outcome of attending several awareness programs, scientific lectures, and interactive sessions and thereby set their career and professional goals.

**PSO-1:** To provide detailed knowledge about the history of development of the subject through the ages, the awareness about the stalwart discoveries; different groups of microbes from primitive to newly evolved one; modern hierarchial and taxonomical status

**PSO-2:** To make the students familiar with the scope of applied field of the subject in areas like food environment ,agriculture & biofertilizers, microbial genetics, vaccines, immunology, , molecular biology, recombinant DNA technology, medical & pharmaceuticals, Virology and hence utilization in the research and industrial sectors.

**PSO-3:** To prepare the students with the knowledge related to laboratory based studies, hands-on-training, skill development for high-end instrument operation.

**PSO-4:** To provide knowledge to the students about the potential of microbiological studies to become an entrepreneur in agricultural and small-scale industrial aspect.

**PSO-5:** To provide the knowledge about the environmental issues, intervention of microbial consortia and microbial physiology for development of cleaner technology and hence sustainable development.

**PSO-6:** Microbiome literacy for better management of human health, environment and societal problems

PRINCIPAL

Dhruba Chand Halder College

P.O.- D. Barasat, P.S.- Jagnagar

South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

PSO-7: Enable the students to develop aptitude to study the subject in its interdisciplinary aspects and have some basic knowledge in biophysical chemistry, bioinformatics, biochemistry, Plant Pathology, metagenomics, Genetics, IPR etc.

PSO-8: To enable the students pursue M.Sc/ M.Tech or Medical degree and eventually earn Doctoral/Post Doctoral fellowship either at national or international level. Help the students to build the successful career in Microbiology either in academy or in industry.

PSO-9: Inculcate scientific, analytical and problem solving skills developed by microbiology graduates which are high in demand by employers especially at industry level.

## COURSE OUTCOME

### THREE-YEAR HONOURS COURSE OF STUDIES IN

#### MICROBIOLOGY

##### Semester I

##### **CC1: Introduction to Microbiology & Microbial Diversity**

##### Theory

###### **Unit 1: History of Development of Microbiology**

Develop a good knowledge about the development of the discipline of Microbiology and the contributions made by prominent scientists in this field. To be aware about the History of Microbiology as well as to be concerned about its development.

###### **Unit 2: Diversity of Microbial World**

Develop a very good understanding of the characteristics of different types of microorganisms (cellular & acellular), methods to organize/classify these, and basic tools to study these in the laboratory.

###### **Unit 3: An overview of scope of Microbiology**

To know the varieties of scope regarding Microbiology and apply it on practical field. Students shall gain knowledge as to how microbes can be put to work in many ways; making life savings drugs, the manufacture of biofuels, cleaning up pollution, producing food and drink; how they contribute to digestion, promote development of the immune system and detoxify harmful chemicals. Microbes are vitally important to all life forms on earth. As versatile organisms, they play a major role in various biochemical processes such as biodegradation, biodeterioration, climate change, food spoilage, epidemiology and biotechnology.

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Practical

### **Introduction to Microbiology and Microbial Diversity**

Knowledge about an ideal Microbiological Laboratory. Develop good laboratory practices. Adopt sterilization techniques, media preparation. Able to perform basic experiments to grow and study microorganisms in the laboratory. Exposure to concept of various microorganism through permanent slides. Understand principles of sterilization of culture media, glassware and plastic ware to be used for microbiological work.

Understand principles of a number of analytical instruments which the students have to use during the study and also later as microbiologists for performing various laboratory manipulations.

Learned handling and use of microscopes for the study of microorganisms which are among the basic skills expected from a practicing microbiologist. They also get introduced to a variety of modifications in the microscopes for specialized viewing.

Understand several separation techniques which may be required to be handled by microbiologists.

## **CC2: Bacteriology**

### Theory

#### **Unit 1: Cell organization**

Describing the importance and mechanism of the central dogma of life

Describing the structure and function of different components of a cell.

Differentiating the cellular and molecular processes between prokaryotes and eukaryotes. Describe characteristics of bacterial cells, cell organelles, cell wall composition, and various appendages like capsules, flagella, or pili.

#### **Unit 2: Bacteriological Techniques**

Acquired skills in visualizing bacteria by staining, using a microscope and culturing bacteria in microbiological media to describe the features of bacterial colonies. Understand the concept and importance of metagenomics.

Develop an initial understanding of recent developments in host-microbe interactions, synthetic biology, viable but non-culturable forms of microorganism etc.

#### **Unit 3: Microscopy**

Introduction to Microscopy, its different types in optical and electron based microscopy. Also presentation involved working principles of Optical, SEM & TEM microscope with their components working description. All microscope deeply discussed about the contrast, application, advantages & disadvantages. Light microscopy is the simplest form of microscopy. It has tools that are used to observe the small organisms or object and even macromolecules. It has wide variety of microscopic tools for studying the biomolecules and biological processes.. It includes all forms of microscopic methods that use electromagnetic radiation to achieve magnification.

PRINCIPAL

Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

**A NAAC Accredited Degree College Affiliated to University of Calcutta**

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Unit 4: Growth & Nutrition

Describe the nutritional requirements of bacteria for growth; develop knowledge and understanding that besides common bacteria there are several other microbes that grow in extreme environments. Describing the growth characteristics of the microorganisms capable of growing under the unusual environmental condition of temperature, oxygen, and solute and water activity. Describing the growth characteristics of the microorganisms which require different nutrients for growth and the associated mechanisms of energy generation for their survival like autotrophs, heterotrophs, chemolithoautotrophs, etc. Differentiating concepts of aerobic and anaerobic respiration and how these are manifested in the form of different metabolic pathways in microorganisms.

## Unit 5: Reproduction

Know the different types of reproduction in bacteria, understand the process of binary fission and other types of asexual reproduction, find a mathematical expression for measuring growth, understand the different types of genetic recombination in bacteria.

## Unit 6: Bacterial Systematics

Differentiate a large number of common bacteria by their salient characteristics; classify bacteria into groups, assign names, identify them. Updated knowledge about archae and eubacterial systematics and taxonomy as per International Code. Guidance for use of Bergy's Manual.

## Unit 7: Important Archaea & eubacterial groups

Acquire a fairly good understanding of the Diversity of the microbes both archae bacterial and eubacterial genera. Cyanobacteria in particular.

## Practical

### CC2: Bacteriology

Perform basic laboratory experiments to study microorganisms; preparation of different types of media, adopt various staining techniques, methods to isolate and preserve bacteria in the laboratory; estimation of cfu by pour plate /spread plate method.

Understand principles that underlie sterilization of culture media, glassware and plastic ware to be used for microbiological work.

Understand principles of a number of analytical instruments which the students have to use during the study and also later as microbiologists for performing various laboratory manipulations.

Learned handling and use of microscopes for the study of microorganisms which are among the basic skills expected from a practicing microbiologist. They also get introduced to a variety of modifications in the microscopes for specialized viewing.

Understand several separation techniques which may be required to be handled by microbiologists.

PRINCIPAL

Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Semester 2

### Theory

#### CC3: Biochemistry

##### Unit1: Bioenergetics

Acquire a clear knowledge of the biophysical chemistry module which will enhance the students ability to correlate the knowledge wherever applicable in the course/semester module.  
Develop a very good understanding of various bio-molecules which are required for the development and functioning of a bacterial cell.

##### Unit 2:Carbohydrates Unit 3: Lipids Unit 4: Proteins Unit 5: Enzyme Unit 6: Vitamins

Understand how the carbohydrates make the structural and functional components such as energy generation and storage of food molecules for the bacterial cells  
Conversant about multifarious function of proteins; are able to calculate enzyme activity and other quantitative and qualitative parameters of enzyme kinetics; also, knowledge about lipids and nucleic acids.  
Able to make buffers, study enzyme kinetics and calculate  $V_{max}$ ,  $K_m$ ,  $K_{cat}$  values.

### Practical

Vivid knowledge and hands-on-training on biochemical experiments like qualitative and quantitative estimation of carbohydrates, lipids, proteins, vitamins----- the important biomolecules and building blocks of the living system; additionally a detailed workout for enzymology.

#### CC4: Cell Biology

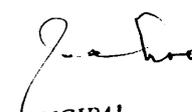
### Theory

##### Unit 1&2

Detailed review of structural and functional organization of the cell(both prokaryotic & eukaryotic) including important organelles with special reference to nucleus, the controlling centre of the cell and nuclear organization.

##### Unit 3

Understanding the role of cell organelles involved in protein manufacture, its functional aspect(sorting & transport).

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Unit 4&5

Understanding of the physiological and molecular aspects of cell division, cell cycle, cell death, cell renewal and cell signaling; thereby decipher the significance of the events in cellular context.

### Practical

Microscopical studies on different cellular entities, organelles, hand-on-training for preparation of samples to study cellular division (both mitosis and meiosis).

## Semester 3

### CC5: Virology

#### Theory

#### Unit 1 Nature & Properties of Viruses

To understand the basics of Virology. To get an overview of viral classification, viral characters and history of Virology. To get an overview of the scope of Virology

#### Unit 2 Bacteriophages

To understand lytic and lysogenic cycles. To understand the role of early & late proteins in viral cycle. To understand the regulation of transcription in lambda phage.

#### Unit 3 Viral Transmission, salient features of viral nucleic acids & replication

Basic concepts of Baltimore classification. To know about replication strategies, multiplication, capping and tailing mechanisms, release of virions. To get basic idea about alternative splicing, terminal redundancy, long terminal repeats etc.

#### Unit 4 Viruses and Cancer

To acquire basic knowledge about oncogenic virus. To understand the basic concepts of oncogene and proto oncogene.

#### Unit 5: Prevention and control of viral disease

Students should be familiar with different antiviral compounds as well as should know their mode of action. To get clear concept about interferon and its mode of action.

PRINCIPAL

Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas. Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

**A NAAC Accredited Degree College Affiliated to University of Calcutta**

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Unit 6: Application of Virology

Develop clear concept about how the knowledge of virology can be applied in recombinant DNA technology, gene therapy, phage display.

### Practical

Practical training for Plaque assay. Study of the structure of important plant, animal and bacterial virus using electron micrographs. Study of CPE of virus using electron micrographs.

## CC6: MICROBIAL PHYSIOLOGY AND METABOLISM

### Theory

#### Unit 1: Microbial growth and effect of environment on microbial growth

To understand the concept of batch culture, continuous culture, growth curve, generation time, diauxic growth curve. To get clear idea about autotroph, heterotroph, chemolithotroph, chemolithoautotroph, photolithoautotroph, photoorganoheterotroph.

#### Unit 2: Nutrient uptake and Transport:

To gather knowledge about passive and facilitated diffusion. To get the concept of primary and secondary active transport, symport, uniport, antiport.

#### Unit 3: Chemoheterotrophic Metabolism- Aerobic Respiration

To know about different sugar degradation pathway like; EMP, ED, PPP, TCA cycle. To understand basic concept of ETC, oxidative phosphorylation, uncoupler.

#### Unit 4: Chemoheterotrophic Metabolism- Anerobic Respiration and fermentation:

To gather knowledge about different types of fermentation: Lactic acid, Alcohol fermentation. To understand the basic concept of linear and branched fermentation.

#### Unit 5: Chemolithotrophic and phototrophic Metabolism:

To get basic idea about hydrogen oxidation, methanogenesis, oxygenic and anoxygenic photosynthesis. To know about phototrophic microbes, purple and green sulphur bacteria, Cyanobacteria.

PRINCIPAL

Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Unit 6: Nitrogen Metabolism:

Basic knowledge about biological nitrogen fixation and hence develop correlation with role of microbes in agriculture. To learn the distinguishing method of assimilatory and dissimilatory nitrate reduction.

### Practical

Acquire knowledge and training for study of the nature of the growth of bacteria by turbidometric and standard plate count method; generation time and specific growth rate calculation. Also standardize the effect of various parameters affecting bacterial growth.

## CC-7: MOLECULAR BIOLOGY

### Theory

#### Unit 1: Structures of DNA and RNA (genetic material)

To know about Watson Crick model of DNA double helix structure, different types of DNA (A-DNA, B-DNA, Z-DNA). To understand the concept of denaturation, renaturation, significance of cot curve, linking number. Develop concept of mitochondrial and chloroplast DNA.

#### Unit 2: Replication of DNA in prokaryotes and eukaryotes

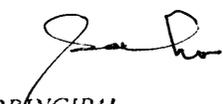
To get basic idea about different replication techniques; Bi and uni directional, rolling circle, theta mode of replication, conservative, semi conservative, dispersive model. To understand the significance of enzymes and proteins involved in replication.

#### Unit 3: Transcription in prokaryotes and eukaryotes

Basic knowledge about transcription, differential aspects from replication. To get concept about promoter, significance of enzymes and transcription factors involved in transcription.

#### Unit 4: Post transcriptional processing:

To understand the concepts of split genes, introns and exons, RNA splicing, capping, polyadenylation. To understand the significance of RNA interference.

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

**A NAAC Accredited Degree College Affiliated to University of Calcutta**

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

## **Unit 5: Translation in prokaryotes and eukaryotes**

Basic knowledge about translation and understand the mechanisms of translation initiation, elongation, termination and role of translational factors. To get the concept of translational inhibitor.

## **Unit 6: Regulation of gene expression in prokaryotes and eukaryotes:**

To know the DNA methylation and Histone acetylation mechanisms for changing chromatin structure. To understand the concept of trp and lac operon.

### Practical

Training for quantitative estimation of nucleic acids and method of isolation from bacteria. Hands on experiment of Agarose gel and Poly acrylamide gel electrophoresis. Develop ideas about different types of DNA and RNA using photomicrographs.

## **SEC A2: BIOFERTILIZER AND BIOPESTICIDES**

### Theory

#### **Unit 1 Biofertilizer**

The students at the end of this unit shall get an overview of the importance, use and benefits of use of biofertilizer. They will understand the advantage of biofertilizer over chemical fertilizer, they will also understand the isolation process, characteristics and field application of different microbes that can be utilized as biofertilizer.

#### **Unit 2 Non symbiotic Nitrogen fixers**

Students will understand the isolation process, inoculation, mass production and application of free living nitrogen fixers.

#### **Unit 3 Phosphate solubilizers**

Students will understand the isolation process, inoculation, mass production and application of phosphate solubilising microbes.

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Unit 4 Mycorrhizal Biofertilizer

Students will understand the different types of mycorrhiza along with host plant that associated with it. They will learn the importance of production of VAM inoculum and its field application.

## Unit 5 Bioinsecticides

The students at the end of this unit shall get an overview of the importance, use and benefits of bioinsecticides. They will understand the advantage of bioinsecticides over chemical insecticides, they will also learn the importance of viral insecticides as well as bacterial insecticides like Bt (*Bacillus thuringiensis*). Enable the students to develop aptitude for field application to control pests.

## Semester 4

### CC-8: MICROBIAL GENETICS

#### Theory

#### Unit 1 Genome Organization and Mutations

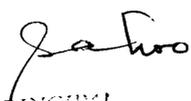
To acquire knowledge about mutations and mutagenesis: Physical and chemical mutagens; Molecular basis of mutations; Functional mutants (loss and gain of function mutants); Uses of mutations Reversion and suppression: True revertants; Intra- and inter-genic suppression; Mutator genes . To understand the basic concepts of Ames Test.

#### Unit 2 Plasmids

To know about different types of plasmids – F plasmid, R Plasmids, colicinogenic plasmids, Ti plasmids, linear plasmids, yeast- 2  $\mu$  plasmid., Basic idea about host range, plasmid-incompatibility, plasmid amplification, regulation of copy number, curing of plasmids.

#### Unit 3 Mechanisms of Genetic Exchange

Basic concept about transformation, Conjugation. To learn the method of distinguishing of Generalized transduction and specialized transduction.

  
PRINCIPAL  
Dhruva Chand Halder College  
P.O. - Dakshin Barasat, P.S. - Jayram  
South 24 Parganas, Pin - 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Unit 4 Phage Genetics

To know about T4 phage, to understand the genetic basis of lytic versus lysogenic switch of phage lambda.

## Unit 5 Transposable elements

To learn about prokaryotic and eukaryotic transposable elements: composite and non composite transposons, P element, Ty retrotransposon, mutransposons. To get basic idea about the use of transposons.

## Practical

Hands on experiment of conjugation, transformation, transduction. Plasmid DNA isolation. Study the effect of chemical and physical mutagen on bacterial cells.

## CC-9: ENVIRONMENTAL MICROBIOLOGY

### THEORY

#### Unit 1 Microorganisms and their Habitats

To know about soil texture, different micro niche (aquatic, terrestrial, ocean). To understand the concept of extremophiles; i.e. thermophile, barophile, halophile, etc.

#### Unit 2 Microbial Interactions

Students should be familiar with different Microbial interactions: (Mutualism, synergism, commensalism, competition, amensalism, parasitism, predation.) Microbe-Plant interaction: (Symbiotic and non symbiotic interactions). Microbe-animal interaction: Microbes in ruminants, nematophagus fungi and symbiotic luminescent bacteria.

PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372

PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Unit 3 Biogeochemical Cycling

To acquire the basic knowledge about different biogeochemical cycle: Carbon, nitrogen, sulphur, phosphorus, iron. To learn basic idea about nitrification, denitrification, ammonification.

## Unit 4 Waste Management

To know about solid and liquid sewage, To learn basic idea about primary, secondary and tertiary waste water treatment. Performance of Hands on experiment of BOD and COD. To know the application of trickling filter, septic tank.

## Unit 5 Microbial Bioremediation

To understand basic concepts about bioremediation and relative term biosurfactants.

## Unit 6 Water Potability

To acquire basic knowledge about MPN. To learn the method of distinguishing faecal and non faecal coliform bacteria.

## PRACTICAL

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 (dehydrogenase, amylase, urease) in soil.

## CC-10: RECOMBINANT DNA TECHNOLOGY THEORY

### Unit 1 Introduction to Genetic Engineering

To acquire the basic knowledge about genetic engineering and Recombinant DNA Technology

### Unit 2 Molecular Cloning- Tools and Strategies

To understand the concept of molecular cloning. To gather knowledge about molecular scissors (Restriction enzyme), major tools of cloning like cloning vector, expression vector etc. To know about different types of vectors: plasmid, cosmid, BACs, YACs.

PRINCIPAL

Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

## Unit 3 Methods in Molecular Cloning

To understand the concept of different molecular cloning methods like: gene gun, microinjection, and electroporation.

## Unit 4 DNA Amplification and DNA sequencing

To acquire the basic knowledge about different types of Polymerase Chain Reaction (PCR) Techniques (RT PCR, Real Time PCR). To understand the concept of primer walking, Sanger's method of DNA sequencing.

## Unit 5 Construction and Screening of Genomic and cDNA libraries

To learn the method of distinguishing Genomic and cDNA libraries, To acquire the basic knowledge about preparation of Genomic and cDNA libraries.

## Unit 6 Applications of RDT

Students should be familiar with products of RDT (Bt transgenic - cotton, brinjal), Human therapeutic agent: Insulin, Recombinant vaccines (Hepatitis B vaccine).

## PRACTICAL

Students should be also familiar with different RDT related techniques like Southern Blotting, Northern Blotting, Western Blotting.

## SEC B1: Food Fermentation Techniques

### THEORY

#### Unit 1 Fermented foods

To gather information about fermented foods, understand their significance and utility in daily life. Awareness about fermented foods vs traditional food.

PRINCIPAL

Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Unit 2 Milk Based Fermented foods

Milk a complete food being known popularly; however knows-hows about the whole array of milk based fermented food can be understood by the students; thereb interest and utility of consumption of such food will be thoroughly comprehended by the students.

## Unit 3 Grain Based Fermented foods

Staple food crops of the country is mostly grain based. However, knowledge about the fermented products which can be derived should be duly understood for commercial purpose.

## Unit 4 Vegetable Based Fermented foods

Vegetables are important source of vitamins, proteins etc. How such specific vegetables may be used for fermentation purpose, if dissected, will earn beneficial effects for the learners in terms of their interest of consumption as well as business purpose.

## Unit 5 Fermented meat and fish

Meat and fish provide are important source of proteins the pivotal component for keeping the body fit. How such specific vegetables may be used for fermentation purpose, if dissected, will earn beneficial effects for the learners in terms of their interest of consumption as well as business purpose.

## Unit 6 Probiotic Foods

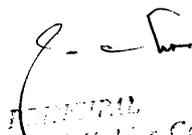
To understand the concept of neutraceutical food; i.e. food containing both nutritional and medicinal value. To gather knowledge about types of microbes involved in probiotics preparation. Help in understanding the prime importance in usage of probiotic and prebiotic foods for maintenance of good human health.

## Semester 5

### CC11: FOOD & DAIRY MICROBIOLOGY THEORY

#### Unit 1 Food as a substrate for microorganisms

The course is reasoning and application based, making the students eligible for higher studies, jobs in various sectors and entrepreneurship abilities. The students shall be acquainted with the basic knowledge of food microbiology. Learning the scientific methods students will gain knowledge of significance and activities of microorganisms in food.

  
Dhruba Chand Halder College  
P.O. - Dakshin Barasat, P.S. - Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

*A NAAC Accredited Degree College Affiliated to University of Calcutta*

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372 ●

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

## **Unit 2 Microbial spoilage of various foods**

Students will gain knowledge about microbiology of the spoilage of various dairy, egg & meat products. The students will at the end be versed with the principles of food spoilage & the role of different microbes in bringing about these spoilage.

## **Unit 3 Principles & Methods of food preservation**

Students shall be well acquainted with food preservation techniques and at the same time understand diverse strategies for food preservation. They shall understand the principles associated with these preservation techniques.

## **Unit 4 Fermented Foods**

Students will gain knowledge about microbiology of various fermented products such as dahi, cheese, dosa etc. Students will gain knowledge of significance and activities of microorganisms in food. They shall be made aware of the varied microbes involved in the fermentation process resulting in these various products. A little outlook on probiotics shall also be dealt in here.

## **Unit 5 Food borne diseases (causative agents, foods involved, symptoms and preventive measures)**

Students will gain knowledge of significance and activities of microorganisms in food spoilage. They will learn regarding the causative microbes involved in the spoilage, the signs of spoilage & at the same time the preventive measure to be adopted to overcome this spoilage.

## **Unit 6 Food sanitation & control**

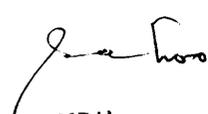
Students will also know the microbial quality control and quality schemes used in food industries. They shall be acquainted with the various food sanitary indices.

## **Unit 7 Cultural and rapid detection methods of food borne pathogens in foods and introduction to predictive microbiology**

Students shall be acquainted with the rapid detection methods that can be utilized for detecting the quality of food in various industries.

## **PRACTICAL**

Students shall be able to detect & differentiate between the quality of milk, (MBRT & Standard plate count) a wholesome food of daily requirement. Check the efficiency of pasteurization (ALP test) of milk samples of different origin. Develop aptitude for dahi/yogurt making. Develop skills to isolate, characterize, and tentatively identify microorganisms associated with food spoilage. The practical coverage will help the students to become versed with the food fermentation and spoilage processes.

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

**A NAAC Accredited Degree College Affiliated to University of Calcutta**

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## CC12: INDUSTRIAL MICROBIOLOGY THEORY

### Unit 1 Introduction to Industrial Microbiology

To acquaint students with basic concepts of industrial microbiology. They will be well versed with the history of Industrial Microbiology over the past years.

### Unit 2 Isolation of industrially important microbial strains and fermentation media

The students shall understand the basics of fermentation technology, screening techniques, microbial culture preservation techniques etc. Know the concepts of inoculum development and media sterilization for the fermentation process.

### Unit 3 Types of fermentation processes, bio-reactors and measurement of fermentation parameter

They will also have the knowledge about the fermentation processes, bio-reactors and measurement of fermentation parameters. They shall learn about the typical structure of fermenter and its parts, types of fermentation processes and synchronous growth.

### Unit 4 Downstream Processing

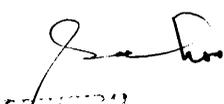
The students shall be made aware of the detailed downstream processing of various fermented important microbial products, and the different methods involved thereof.

### Unit 5 Microbial production of industrial products (micro-organisms involved, media, fermentation conditions, downstream processing and uses)

After successful completion of this unit, the students are expected to: understand the basics of principles, conditions, parameters & steps involved in the industrial production of various fermented products along with its uses.

### Unit 6 Enzyme Immobilization

Students shall know regarding the microbial production of industrial products & enzyme immobilization. They will be made aware of various cell/enzyme immobilization techniques utilized and its importance.

  
Principal  
Dhruva Chand Halder College  
P.O. - Dakshin Barasat, South 24 Parganas  
West Bengal, Pin - 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## PRACTICALS

After successful completion of the practicals the students shall understand the structure, working principle and significance of different parts of the fermenter. To enhance practical skills of students in Industrial microbiology and enzymology. They shall be able to qualitatively & quantitatively study the various products of industrial importance & its production.

### Industrial Visit

Students shall get an insight into the working of an industry associated with the production of various important products particularly fermented products. The students shall get an onsite exposure on the various downstream processes employed. Eventually gets opening for internships, summer projects or the like.

## **DSEA1: MICROBIAL BIOTECHNOLOGY**

### **THEORY**

#### **Unit 1 Microbial Biotechnology and its Applications**

After successful completion of this unit students are expected to understand the basic of microbial biotechnology and its application in various spheres. They will also now the concepts of strain development through genetic engineering.

#### **Unit 2 Therapeutic and Industrial Biotechnology**

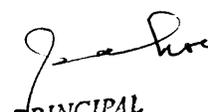
Through this unit course students can understand the role of microbes in the industrial production of recombinant products, along with the microbial production of biopesticides, biofertilizers and an overview of microbial biosensors.

#### **Unit 3 Applications of Microbes in Biotransformations**

Students are expected to understand the bio catalytic process & steps involved in the industrial production of different important products.

#### **Unit 4 Microbial production & their recovery**

The recovery steps & various purification methods available for the recovery of industrial microbial products will be knowledgeable by the students. They also get a brief overview on the importance & application of cell/enzyme immobilization.

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas. Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Unit 5 Microbes for bioenergy & Environment

After successful completion of this unit students are expected to understand the role, importance and steps in the production of bioenergy utilizing microbial culture. They will also understand the use of microbes in various remediation methods for a clean environment.

## Unit 6 RNAi

After successful completion of this course students are expected to understand the basics of RNA interference, gene silencing & its utilization.

## Unit 7 Intellectual Property Rights

After successful completion of this course students are expected to understand the terms patents, copyright, trademark and its utilities. This will enable them while pursuing research work at higher levels of education.

## PRACTICAL

Students shall know regarding the steps, principle involved and importance of cell immobilization techniques (various methods) for better industrial productions. Gain insight about pigment and enzyme production (of commercial importance) by various microorganisms and hence try to develop user-friendly techniques of industrial use.

Students shall get a brief exposure on the nature, application & importance of single cell protein as well.

## DSEB 1: INHERITANCE BIOLOGY

### THEORY

#### Unit 1 Introduction to Genetics

The students will come to know about the historical development of genetics and how different model organisms can be used for genetic studies & experimentation.

#### Unit 2 Mendelian Principles

The students will know about the Mendelian laws, concept of segregation, alleles, dominance complementation tests etc. The students should be able to determine how a dominant/recessive genes would behave as per Mendel's law.

#### Unit 3 Linkage & cross over

This unit allows the students to know about the principles, mechanism and types of crossing over.

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O. - D. Barasat, P.S. - Ajaygarh  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Unit 4 Extra chromosomal inheritance

After completion of this unit the students will know about the rules of extra nuclear inheritance, understand the concept of organelle heredity, infectious heredity etc.

## Unit 5 Characteristics of Chromosomes

After completion of this unit the students shall be well acquainted with the concept of organization of chromosome, structure of chromosome, how changes in chromosome number can lead to various genetic diseases.

## Unit 6 Recombination

The students shall be well acquainted with recombination types and the underlying principle.

## Unit 7 Human Genetics

Through this unit the students will be able to perform human pedigree analysis, determining lod score and understand genetic disorders.

## Unit 8 Quantitative Genetics

This unit shall help the students to be well acquainted with measurement of heritability, QTL Mapping.

## PRACTICALS

Students shall understand the basic principle of Mendel's Law on one hand; on the other hand also gather knowledge behind the deviation of Mendelian law. They will put their hands on bench to prepare temporary mounts (Barr body) and analyse them; use photographs for various genetic phenomenon like karyotyping; develop aptitude for chi square analysis, pedigree analysis etc.

## Semester 6

### CC 13: IMMUNOLOGY

## THEORY

### Unit 1 Introduction

The students shall be aware of the components of human immune system. They will acquire knowledge regarding the contribution of various immunologists around the world towards the development of field of Immunology.



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## Unit 2 Immune cells & Organs

The students will know about the role of immune cells and organs and the functional mechanisms of each.

## Unit 3 Antigens

The students will understand the concepts related to antigens and the characteristics of antigens.

## Unit 4 Antibodies

The students will understand the concepts related to antibodies. They will understand the structure, function, type and the genetic recombination involved. They will also get a brief overview on chimeric, monoclonal and superantigens.

## Unit 5 Major Histocompatibility Complex

The students will get to know about MHC and Antigen Presentation. They will also get an overview on the pathways involved in antigen processing & presentation.

## Unit 6 Complement System

The students will get to know about the components, activation pathways & the consequences of complement pathways.

## Unit 7 Generation of Immune Response

The students will get to know about the different types of immune responses, the role, importance & functioning of CTL & NK cells. They will understand the concept of tolerance and self restriction.

## Unit 8 Immunological Disorders and Tumor Immunity

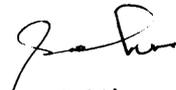
The students will get to know about hypersensitivity, autoimmunity, immunodeficiency. They will also get an overview of different animal models employed in immunological studies. They will also get a brief on Cancer immunology & therapy

## Unit 9 Immunological Techniques

The students will get an overview of the principles & importance of various immunological techniques employed in disease detection & characterization.

## PRACTICALS

Enable the students to have close practical training to do human blood grouping, leukocyte count, blood sample handling, immunological tests( Ouchterlony, Dot ELISA, Immunoelectrophoresis etc)

  
PRINCIPAL  
Dhruba Chand Halder College  
Dakshin Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

## CCI4: MEDICAL MICROBIOLOGY

### THEORY

#### **Unit 1 Normal microflora of the human body and host pathogen interaction**

Being a student of Microbiology it is important for them to have vivid understanding of the presence of microbes on, within or around the human; and to understand the host-pathogen interaction.

#### **Unit 2 Sample collection, transport and diagnosis**

Diagnosis of diseases is of prime importance for treatment & care. Hence, detailed study of methods of sampling, transport to diagnostic centre is of vital importance for analysis & confirmation of pathogenic materials, hence at the end the student should develop an aptitude for working in diagnostic clinics.

#### **Unit 3 Bacterial diseases**

Different groups of bacteria can affect the surface (skin) or organs of the human. Description of such diseases with respect to the causal organism, transmission, symptoms & prevention shall be dealt.

#### **Unit 4 Viral diseases**

With the evolution of different viral variants in today's global scenario students will get an immense opportunity to learn about viral subtypes, diseases caused by them & preventive measures.

#### **Unit 5 Protozoan diseases**

In hot & humid tropical belt such as India, there is prevalence of protozoan parasites. So it is beneficial to develop ideas about diseases caused by such protozoan parasite & their remedial parasites.

#### **Unit 6 Fungal diseases**

Different groups of fungi can affect the surface (skin) or organs of the human,. Description of such diseases with respect to the causal organism, transmission, symptoms & prevention.

#### **Unit 7 Antimicrobial agents: General characteristics and mode of action**

To know the utility of antimicrobial agents to control diseases, and its mode of action against various human pathogens such as bacteria, fungi, virus etc. In parallel the students shall also be acquainted with the problems related to overuse of antibiotics.

### PRACTICALS

Students get an elaborate exposure to varied aspects of medical microbiology including identification of fecal versus non-fecal bacteria, perform related biochemical tests, preparation, selection and categorizing differential media for bacterial culture & identification, normal skin microflora, antibiotic sensitivity test. Further familiarization with important diseases included in the syllabus.

  
Principal  
Dhruva Chand Halder College  
Dakshin Barasat, P.S. Dakshin  
South 24 Parganas, Pin-743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

## DSE B3: Instrumentation & Biotechnology

### THEORY

#### **Unit 1 Microscopy**

After successful completion of this module students are expected to understand the theory in microscopy and their handling techniques. They shall be made aware of the working principle of different microscopic methods/types available.

#### **Unit 2 Chromatography**

Detailed knowledge about the different chromatographic techniques shall be available to the students along with their role, principle & importance.

#### **Unit 3 Electrophoresis**

After successful completion of this module students are expected to understand the principle, types and uses of the different electrophoretic techniques.

#### **Unit 4 Spectrophotometry**

Detailed lessons on spectrophotometry, will help the students are expected to understand the principle, identification and quantification of various macromolecules using colorometric & turbidimetric methods; thereby enhance their ability for applications.

#### **Unit 5 Centrifugation**

Students will gather knowledge related to the principle, types, importance & various terminologies associated with centrifugation methods.

### PRACTICALS

The students will be able to study, identify & visualize the various microbial preparations through micrographs. Gain acquaintance with different chromatographic techniques, PAGE technique, centrifugation technique. In total the instrument principles and application aptitude will scale up.

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## DSE A3: Plant Pathology

### THEORY

#### Unit 1 Introduction and History of plant pathology

Students shall get an overview on the types of plant pathogens, plant diseases its symptoms and disease cycle. They shall be acquainted with the contribution & development of this field by various scientists.

#### Unit 2 Stages in the development of diseases

Students shall get an overview on the infection, colonization & dissemination of various plant pathogens & diseases.

#### Unit 3 Plant disease epidemiology

Students shall get an idea on various diseases, disease triangle & forecasting of diseases and how these attempts are relevant in Indian context.

#### Unit 4 Host Pathogen interaction

Students shall get an idea on the role of toxins, virulence factors in disease development. They shall be made aware of the effect of pathogens on the host. They shall also learn about the different defense mechanisms operative in plants.

#### Unit 5 Control of plant diseases.

Students shall get an idea on the practices & principles of plant disease management. They will learn methods utilized for the eradication of infected hosts and how pathogens are controlled on a larger scale.

#### Unit 6 Specific plant diseases.

Students shall get an overview on various types of specific plant diseases, its symptoms, transmission and control and hence become familiar with the huge economic loss that often a country/region encounters.

### PRACTICALS

Students shall get hands-on-training to verify Koch's diseases postulates utilizing bacterial, fungal and viral pathogens which they had studied theoretically only. Study of important diseases of crop plants dissecting infected plant materials and understanding the difference between an infected and healthy plant. Also help the students to have the know-hows about plant pathogenesis and its correlation to agriculture.

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## COURSE OUTCOME

### THREE-YEAR GENERAL COURSE OF STUDIES IN

### MICROBIOLOGY

### SEMESTER- 1

#### Theory

#### CC-1/GE1: INTRODUCTION AND SCOPE OF MICROBIOLOGY

##### Unit 1: History of Development of Microbiology

To understand the history of Microbiology. To know the contribution of Scientists in the field of Microbiology. To know about the spontaneous generation and Biogenesis.

##### Unit 2: Diversity of Microorganisms

To know the Systems of classification. To know the General characteristics of different groups of microorganisms. To understand about the Eukarya like algae, fungi and protozoa.

##### Unit 3: Microscopy

To know about the function of different light microscopes. To understand the function of different Electron Microscopes

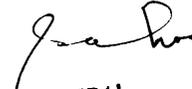
##### Unit 4: Sterilization

To know the function of Moist Heat, Autoclave, Dry Heat, Hot Air Oven. To understand about Tyndallization, To know about the Filtration

##### Unit 5: Microbes in Human Health & Environment

Medical microbiology and immunology

To understand about important human diseases and their causative agents of various human systems.

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jangra  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

To know about immune system of organisms

Environmental microbiology

To know about the Definitions and examples of important microbial interactions. To understand about the biopesticides, biofertilizers, To know about biodegradation, biodeterioration and bioremediation

## Unit 6: Industrial Microbiology

To know about fermentation, primary and secondary metabolites, To understand about types of fermentations and fermenters .To know about microbes producing important industrial products

## Unit 7: Food and Dairy Microbiology

To know about Microorganisms used as food (SCP) and fermentation. To understand about the probiotics. To understand about food spoilage and food borne infections.

## Practical

### CC-1/GE1: INTRODUCTION AND SCOPE OF MICROBIOLOGY

Microbiology Laboratory Management and Biosafety. To study the principle and applications of important instruments (biological safety cabinets, autoclave, incubator, BOD incubator, hot air oven, light microscope, pH meter) used in the microbiology laboratory. Preparation of culture media for bacterial cultivation. Hands-on-training for various microbiological techniques and microscopy for visualization of samples.

## SEMESTER- 2

### CC-2/GE2: BACTERIOLOGY AND VIROLOGY

#### Unit 1 Cell organization

To understand about Cell size, shape and arrangements of microorganisms. To understand the detailed structures of microbial appendages. To know about the structure and function of microbial cell organelles.

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas. Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

## Unit 2 Bacterial growth and control

To know about the composition and function of different Culture media. To know and understand the different process of Pure culture isolation. To know about the cultivation of anaerobic bacteria. To understand the Growth of bacteria and phases of growth

## Unit 3 Bacterial Systematics and Taxonomy

To know about the Taxonomy, nomenclature, systematic of microorganisms. To know about the types of classifications Morphology, ecological significance. To understand about the economic importance of the different groups of bacteria. To know about proteobacteria, non-proteobacteria, low G+C content bacteria.

## Unit 4 Introduction to Viruses

To know the Properties of viruses; To know about the general nature and important features of Subviral particles To know the important process of Isolation and cultivation of viruses

## Unit 5 Structure and multiplication of viruses

To understand about the different symmetry structure of viruses. To know the viral multiplication in the Cell. To know the salient features of the important human viruses.

## Unit 6 Role of Viruses in Disease and its prevention

To understand about the Role of viruses in causing diseases. To understand the Prevention and control of viruses. To understand about the Viral vaccines, interferons and antiviral compounds.

## Practical

### CC-2/GE2: BACTERIOLOGY AND VIROLOGY

Training for preparation of different bacteriological media and hands -on-training for microbial techniques, staining procedures, microscopy for permanent slide visualization.

## SEMESTER- 3

### CC-2/GE2: MICROBIAL METABOLISM

#### Unit 1 Microbial Growth and Effect of Environment on Microbial Growth

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

**A NAAC Accredited Degree College Affiliated to University of Calcutta**

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

To understand about the growth of bacteria. To know about the different culture methods of bacteria. To understand about the different physical factors affecting on growth of bacteria.

## Unit 2 Nutrient uptake and Transport

To know the Passive and facilitated diffusion. To understand the Primary and secondary active transport, To know the Group translocation and Iron uptake

## Unit 3 Chemoheterotrophic Metabolism - Aerobic Respiration

To understand the Concept of aerobic respiration, anaerobic respiration and fermentation. To know about Sugar degradation pathways. To understand about the uncouplers and inhibitors

## Unit 4 Chemoheterotrophic Metabolism- Anaerobic respiration and fermentation

To understand Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate /nitrite and nitrate/ammonia respiration; fermentative nitrate reduction). To understand about the Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways

## Unit 5 Chemolithotrophic and Phototrophic Metabolism

To know the Introduction to aerobic and anaerobic chemolithotrophy. To understand about Introduction to phototrophic metabolism - groups of phototrophic microorganisms, To know the oxygenic photosynthesis with reference to photosynthesis in green bacteria and cyanobacteria

## Unit 6 Nitrogen Metabolism - an overview

To understand the Introduction to biological nitrogen fixation. To understand about the Ammonia assimilation. To understand about the Assimilatory nitrate reduction

## Practical

### CC-3/GE3: MICROBIAL METABOLISM

Develop an understanding as to the nature of bacterial growth, mathematical expression and derivation, factors affecting bacterial growth ; also demonstration of industrial aspects of microbiology.

  
Principal  
Dhruva Chand Halder College  
P.O. - Dakshin Barasat, P.S. - Jayrampur  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

## SEMESTER- 4

### CC-4/GE4: MICROBIAL GENETICS AND MOLECULAR BIOLOGY

#### Unit 1 Structures of DNA and RNA / Genetic Material

To understand about the, Salient features of DNA structure. To understand about the Types of DNA, denaturation and renaturation, To understand the Organization of DNA and RNA in different life forms.

#### Unit 2 Replication of DNA

To understand the different processes of replication. To understand the Mechanism of DNA replication

#### Unit 3 Transcription

To understand the different Transcription elements. To know about Transcriptional Machinery and Mechanism of transcription

#### Unit 4 Translation

To understand about the Genetic code, To know about the detail of Translational machinery and mechanisms.

#### Unit 5 Regulation of gene Expression

To understand the Principles of transcriptional regulation. To understand about the regulation at initiation with examples from lac and trp operons

#### Unit 6 Mutations

To understand about the Mutations and mutagenesis: Definition and types of Mutations; To understand about the Physical and chemical mutagens; To know about the Uses of mutations, To understand about the DNA repair mechanisms

#### Unit 7 Mechanisms of Genetic Exchange

To understand about the detail of Transformation. To understand about the detail of To understand the detail of Transduction.

#### Unit 8 Plasmids and Transposable Elements

  
Principal  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Dakshin Barasat  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Date .....20

Ref. No. ....

To understand the Property, types and function of plasmids. To understand about the different Prokaryotic transposable elements. To understand about the mechanism of different transpositions. To understand the Uses of transposons and transposition.

## Practical

### CC-4/GE4: MICROBIAL GENETICS AND MOLECULAR BIOLOGY

Elaborate understanding and practical orientation of the methods for estimation / analysis of nucleic acids, proteins; mutagenicity and method of bacterial genetics.

## SEMESTER- 5

### SEC-A1 BIOFERTILIZERS AND BIOPESTICIDES

#### Unit 1 Biofertilizers

To know the microbes used as biofertilizers. To understand the different cultivation, property and isolation of Symbiotic N<sub>2</sub> fixers. To understand about the Role in rice cultivation, Crop response, field application

#### Unit 2 Non - Symbiotic Nitrogen Fixers

To know the free isolation, characteristics, mass inoculums, production and field application of Free living Azospirillum, To understand the free isolation, characteristics, mass inoculums, production and field application of Free living Azotobacter -

#### Unit 3 Phosphate Solubilizers

To know the Phosphate solubilizing microbes - Isolation, characterization, mass inoculum production, field application

#### Unit 4 Mycorrhizal Biofertilizers

To know the Importance of mycorrhizal inoculum, types of mycorrhizae, To understand the associated plants, Mass inoculum production of VAM, field applications of Ectomycorrhizae and VAM.

  
PRINCIPAL

Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

**A NAAC Accredited Degree College Affiliated to University of Calcutta**

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372 ●

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

## Unit 5 Bioinsecticides

To understand about the General account of microbes used as bioinsecticides and their advantages over synthetic pesticides, Bacillus thuringiensis, production, Field applications, Viruses – cultivation and field applications.

## DSE-A: 1. GENETIC ENGINEERING AND BIOTECHNOLOGY

### Unit 1 Introduction to genetic engineering

To know about the Milestones in genetic engineering and biotechnology. To know the detail of Restriction modification systems. To know the applications of Type II restriction enzymes in genetic engineering DNA modifying enzymes and their applications: DNA polymerases. Terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases Cloning: Use of linkers and adaptors Transformation of DNA: Chemical method, Electroporation Methods of DNA, RNA and Protein analysis: Agarose gel electrophoresis, Southern - and Northern - blotting techniques, dot blot, DNA microarray analysis, SDS-PAGE and Western blotting.

### Unit 2 Vectors

To understand about the Definition and Properties of Cloning Vectors. To know about Expression vectors, To know about the E.coli, lac and T7 promoter-based vectors, To understand the yeast Ylp, YEp and YCp vectors, To know the Baculovirus based vectors, mammalian SV40-based expression vectors

### Unit 3 DNA Amplification and DNA sequencing

To understand about PCR: Basics of PCR, RT-PCR, Real-Time PCR Genomic and cDNA libraries: Preparation and uses, Genome sequencing Sanger's method of DNA Sequencing: traditional and automated sequencing

### Unit 4 Application of Genetic Engineering and Biotechnology

To understand the different methods of Gene delivery and viral-mediated delivery. To understand about the Agrobacterium - mediated delivery, To understand the Products of recombinant DNA technology such as insulin, hGH, antisense molecules. To understand the Bt transgenic: cotton, brinjal, flavosavo tomato, To know about the Gene therapy, recombinant vaccine and protein engineering

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O. - D. Barasat, Dist. - Jharghat,  
South 24 Parganas, Pin - 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

**A NAAC Accredited Degree College Affiliated to University of Calcutta**

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372 ●

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

Unit 5 Intellectual Property Rights

To know about the Patents. To understand about the Copyrights. To know about the Trademarks.

## Practical

### GENETIC ENGINEERING AND BIOTECHNOLOGY

Isolation of Plasmid DNA from E.coli. Digestion of DNA using restriction enzymes and analysis by agarose gel electrophoresis. Ligation of DNA fragments. Interpretation of sequencing gel electropherograms. Designing of primers for DNA amplification. Amplification of DNA by PCR. Demonstration of Southern blotting

## SEMESTER- 6

### SEC-B2 FOOD FERMENTATION TECHNIQUES

#### Unit 1 Fermented Foods

To understand about the Definition, types, advantages and health benefits

#### Unit 2 Milk Based Fermented Foods

To know about the Dahi, Yogurt, Buttermilk (Chach) and cheese: Preparation of inoculums, types of microorganisms and production process

#### Unit 3 Grain Based Fermented Foods

To understand about the Soy sauce, Bread, Idli and Dosa: Microorganisms and production process

#### Unit 4 Vegetable Based Fermented Foods

To understand about the Pickels, Saeurkraut: Microorganisms and production process

#### Unit 5 Fermented Meat and Fish

To know about the Types, microorganisms involved, fermentation process

#### Unit 6 Probiotic Foods

To understand about the Definition, types, microorganisms and health benefits

### DSE-B1: MEDICAL MICROBIOLOGY AND IMMUNOLOGY



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

**A NAAC Accredited Degree College Affiliated to University of Calcutta**

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372 ●

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

## **Unit 1 Normal microflora of the human body and host pathogen interaction**

To know about the Normal microflora of the human body: Importance of normal 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,

## **Unit 2 Sample collection, transport and diagnosis**

To know about the Collection, transport and culturing of clinical samples and their identification characteristics.

## **Unit 3 Bacterial diseases**

To understand about the List of diseases of various organ systems and their causative agents.

## **Unit 4 Viral diseases**

To know about the List of diseases of various organ systems and their causative agents.

## **Unit 5 Protozoan diseases**

List of diseases of various organ systems and their causative agents.

## **Unit 6 Fungal diseases**

To know about the Brief description of various types of mycoses.

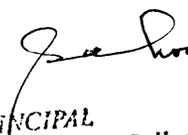
## **Unit 7 Antimicrobial agents: General characteristics and mode of action**

To understand about 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, Griseofulvin Antiviral agents: Mechanism of action of Amantadine, Acyclovir, Azidothymidine

## **Unit 8 Immune Cells and Organs**

To know about the 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

## **Unit 9 Antigens and Antibodies**

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O.- D. Barasat, P.S.- Jaynagar  
South 24 Parganas, Pin- 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

**A NAAC Accredited Degree College Affiliated to University of Calcutta**

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372 ●

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

To understand the Characteristics of an antigen (Foreignness, Molecular size and Heterogeneity); Haptens; Epitopes (T & B cell epitopes), Adjuvants, Structure, Types and Functions of antibodies.

## Unit 10 Generation of Immune Response

To understand Primary and Secondary Immune Response; Generation of Humoral Immune Response (Plasma and Memory cells); Generation of Cell Mediated Immune Response

## Unit 11 Immunological Disorders and Tumor Immunity

To understand the Types of Autoimmunity and Hypersensitivity with examples; Immunodeficiencies - Animal models (Nude and SCID mice).

## Unit 12 Immunological Techniques

To know about the Principles of Precipitation, Agglutination, Immunodiffusion, Immuno-electrophoresis, ELISA, ELISPOT.

## Practical

### MEDICAL MICROBIOLOGY AND IMMUNOLOGY

Help to identify diagnostic process for identifying bacterial genera especially of medical importance using differential media, antibiotic sensitivity tests, develop aptitude for studying immunological reactions pertinent for determining normal responses.

  
PRINCIPAL  
Dhruba Chand Halder College  
P.O. - D. Barasat, Dist. - South 24 Parganas,  
South 24 Parganas, Pin: 743372



# DHRUBA CHAND HALDER COLLEGE

(FORMERLY DAKSHIN BARASAT COLLEGE)

ESTD. - 1965

A NAAC Accredited Degree College Affiliated to University of Calcutta

P.O. - Dakshin Barasat Dist. - South 24 Parganas West Bengal Pin - 743372

E-mail: dchcollege@yahoo.com, Website: www.dchcollege.org

Phone: (03218) -222550 (Prin.) /223-668 (Off.)

Ref. No. ....

Date .....20

## Mapping between CO and PSO for Advance/Honours course

CO of	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CC1	✓	✓						✓	✓
CC2	✓	✓							
CC3							✓		
CC4							✓		
CC5		✓				✓			
CC6					✓				
CC7		✓							
CC8		✓							
CC9		✓			✓				
CC10		✓							
CC11		✓			✓	✓			
CC12		✓		✓		✓			✓
CC13		✓				✓			
CC14		✓	✓			✓			
SEC A2			✓	✓	✓			✓	✓
SEC B1		✓			✓	✓		✓	✓
DSE A1		✓		✓		✓			✓
DSE B1		✓				✓			
DSE A3	✓						✓		
DSE B3			✓				✓		

## General

CO of	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CC1	✓	✓	✓						
CC2	✓	✓	✓			✓		✓	✓
CC3			✓		✓			✓	
CC4		✓	✓	✓		✓			✓
DSE A1		✓	✓	✓		✓			
DSE B1			✓				✓	✓	✓
SEC A1		✓		✓	✓	✓			✓
SEC B2		✓		✓	✓	✓		✓	✓

*[Handwritten Signature]*  
 P.O. Dakshin Barasat  
 South 24 Parganas, West Bengal