

**(Abstract)**

Complementary Elective Course (Microbiology) for the B.Sc. Life Sciences (Zoology) & Computational Biology (CBCSS -OBE) w. e. f 2020 admission - Scheme, Syllabus and Pattern of Question Papers - Implemented -Orders issued.

**ACADEMIC C SECTION**

Acad/C2/16579/NGC/2021

Dated: 03.09.2021

- Read:-1. U.O No Acad/C2/16579/NGC/2021 dated 27.01.2021  
2. U.O No.Acad.C2/ 12726/2019 Dated 25 I 06/2019  
3. Letter No. Acad/C2/16579/NGC/2021 dated 23.07.2021  
4. Letter from the former Chairperson, Board of Studies in Microbiology (Cd) dated 17.08.2021

**ORDER**

1. As per paper read (1) above, the Scheme and Syllabus of B.Sc. Life Science (Zoology) & Computational Biology (CBCSS-OBE) [New Generation Programme] offered at St.Pius X College, Rajapuram was implemented w.e.f 2020 admission.
2. One of the Complementary Elective Courses for B.Sc. Life Science (Zoology) & Computational Biology Programme (CBCSS-OBE), is Microbiology.
3. As per paper read (2), the Syllabus of B.Sc. Microbiology Programme does not offer any Complementary Elective Course for the B.Sc. Life Science (Zoology) & Computational Biology Programme (CBCSS-OBE), as the same was already revised w.e.f 2019 admission.
4. As the Board of Studies was in reconstitution stage at that time, remarks of the former Chairperson, Board of Studies in Microbiology (Cd) was sought, regarding the Syllabus of Microbiology to be followed for the B.Sc.Life Science(Zoology)&Computational Biology.
5. As per paper read (4), the former Chairperson, Board of Studies, Microbiology (Cd), recommended to follow the same Scheme& Syllabus of the Complementary Elective Course in Microbiology being followed for the B.Sc.Bio Chemistry/ B.Sc. Biotechnology Programmes, as stated in the Syllabus of B.Sc Microbiology Program [which has been revised w.e.f 2019], for the aforesaid New Generation Programme also.
6. The Vice-Chancellor after considering the matter in detail and exercise of the powers of the Academic Council conferred under section 11(1), Chapter III of Kannur University Act 1996, accorded sanction to implement the Scheme, Syllabus and the Pattern of Question Papers of the Complementary Elective Course (Microbiology) for the B.Sc. Life Science (Zoology) & Computational Biology programme, offered at St. Pius X College, Rajapuram, Kasaragod, w.e.f 2020.
7. The Scheme, Syllabus and Pattern of Question Papers of the Complementary Elective Course (Microbiology) for the B.Sc. Life Science (Zoology) & Computational Biology Programme offered at St. Pius X College, Rajapuram, Kasaragod, w.e.f 2020 are uploaded on the University web site (www.kannuruniversity.ac.in).

Orders are issued accordingly.

*sd/-*

**BALACHANDRAN V K**  
**DEPUTY REGISTRAR (ACAD)**  
For REGISTRAR

- To: 1. The Principal  
St.Pius X College, Rajapuram, Kasaragod  
2. Dr.Sreejith.K, former Chairman, BoS in Microbiology (Cd)
- Copy To: 1. Examination Branch (Through PA to CE)  
2. PS to VC/PA to PVC/PA to R  
3. Web Manager (for uploading in website)  
4. SF/DF/FC



Forwarded / By Order  
*[Signature]*  
SECTION OFFICER



**B.Sc. MICROBIOLOGY COMPLEMENTARY ELECTIVE COURSES**  
**[ FOR B.Sc. BIOCHEMISTRY & B.Sc. BIOTECHNOLOGY**  
**PROGRAMME(S) ]**

**WORK AND CREDIT DISTRIBUTION**  
**(2019 ADMISSION ONWARDS)**

COURSE CODE	COURSE TITLE	SEMESTER	HOURS PER WEEK	CREDIT	EXAM HOURS
1CO1 MCB	Basic Microbiology I	I	4	2	3
2 C02 MCB	Basic Microbiology II	II	4	2	3
3CO3 MCB	Applied Microbiology I	III	3	2	3
3C04 MCB	Microbiology (Complementary) Practical I	III	2	-	-
4C05 MCB	Applied Microbiology II	IV	3	2	3
4C06 MCB	Microbiology (Complementary) Practical II	IV	2	4	3 HRS X 2 DAYS/ BATCH

Microbiology (complementary) practical examination of 3C04MCB Microbiology (complementary) practical I is to be conducted at the end of semester IV along with 4C06 MCB Microbiology (complementary) practical II with a total credit of 4 and 40 marks. The examination duration is 3 hours x 2 consecutive days per batch. 2hrs/week in the four semesters shall be utilized for practicals

**EVALUATION**

ASSESSMENT	WEIGHTAGE
EXTERNAL	4
INTERNAL	1

**INTERNAL ASSESSMENT**

COMPONENT*	WEIGHTAGE	REMARKS
COMPONENT1 Written class test	50 %	Minimum two test, average of the best two shall be taken
COMPONENT 2 Seminar and Assignment	50 %	30 % for seminar and 20 % for assignment

\*Any two components, Attendance shall not be a component

**COMPLEMENTARY ELECTIVE COURSE I:  
BASIC MICROBIOLOGY I**



SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
I	1C01 MCB	4	2	3

### **COURSE OUTCOME**

**CO 1. Understand the history and developments in Microbiology**

**CO 2. Explain Microbiological techniques**

#### **Unit I**

Introductory Microbiology: History- biogenesis versus abiogenesis, Germ theory of diseases, contributions of Louis Pasteur and Robert Koch, antiseptics, immunization and chemotherapy. The concept of sterilization, (dry heat, moist heat, radiation, chemical methods, Filtration)

**(14 Hrs)**

#### **Unit II**

Microscopy: Light microscopy - bright field and dark field, phase contrast, fluorescent electron microscope - TEM and SEM. Staining methods -simple, Gram, Negative, AFB, endospore, capsule and Fungal staining-LPCB

**( 20 Hrs)**

#### **Unit III**

Prokaryotic cell versus Eukaryotic cells. The ultra structure of bacterial cell -Gram positive and Gram negative. Bacterial endospore and sporulation

**(18 Hrs)**

#### **Unit IV**

Microbial Nutrition: Nutritional types. Macro and micro nutrients and their role. Nutrient uptake - imbibition, diffusion, osmosis, facilitated diffusion, role of carrier proteins, active transport, group translocation, uniport, symport and antiport.

**( 20 Hrs)**

### **Books for Study**

- 1) Microbiology : Concepts and Applications -Michael J Pelczar, E.C.S Chan, Noel R Krieg
- 2) Text Book of Microbiology- R Ananthanarayan, C.K.J Paniker
- 3) Prescott, Harley, and Kleins Microbiology –Prescott

### **Books for Reference**

- 1) Principles of Microbiology: Atlas R M
- 2) Microbiology - Principles and explorations: Jacquelyn G Black, Laura J black
- 3) Microbiology: An introduction- Tortora GJ, Funke BR, Case CL
- 4) Brock's Biology of Microorganisms

**Marks including choice:**

Unit	Marks
I	10
II	15
III	13
IV	12

**About the Pattern of Questions:**

- Part A -** Short answer (5 questions x Mark 1each = 5)  
Answer all questions (5 questions x Mark 1each = 5)
- Part B -** Short Essay (5 questions x Marks 2 each = 10)  
Answer any 4 questions (4 questions x Marks 2 each = 8)
- Part C -** Essay (5 questions x Marks 3 each = 15)  
Answer any 3 questions (3 questions x Marks 3 each = 9)
- Part D -** Long Essay (4 questions x Marks 5 each = 20)  
Answer any 2 questions (2 questions x Marks 5 each = 10)

Total marks including choice - 50

Maximum marks of the course - 32



**COMPLEMENTARY ELECTIVE COURSE II:  
BASIC MICROBIOLOGY II**

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
II	2C02 MCB	4	2	3

**COURSE OUTCOME**

- CO 1. Explain microbial growth and metabolism.**  
**CO 2. Understand diversity of microbial nutrition**  
**CO 3. Understand general characteristics and life cycle of bacterial viruses**  
**CO 4. Understand gene transfer methods in microorganisms.**

**Unit I**

Microbial Growth: Growth curve, Measurement of growth - total count, viable count, Turbidimetric techniques to determine growth, Factors affecting growth. Culture media - nutrient agar, Mac Conkey Agar, PDA, EMB. Isolation of pure cultures-culture methods-streak, pour plate. Preservation of cultures.

**(15 Hrs)**

**Unit II**

Bacterial heterotrophism, Bacterial photosynthesis: light reaction- reaction centres, pigments. Sulphur assimilation in microbes.

**( 20 Hrs)**

**Unit III**

Bacteriophages: DNA and RNA phages, T4 phage, lytic and lysogenic cycles – Host cell adsorption and penetration, synthesis phage nucleic acid. Cultivation of phages.

**( 20 Hrs)**

**Unit IV**

Gene transfer in micro organisms- transformation ,transduction -generalised and specialised, conjugation- F+ x F-, Hfr x F-, F' x F-

**(17 Hrs)**

**Books for study**

- 1) Microbiology : Concepts and Applications -Michael J Pelczar, E.C.S Chan, Noel R Krieg
- 2) Prescott, Harley, and Kleins Microbiology –Prescott
- 3) Microbial Genetics- David Freifelder
- 4) Text book of Microbiology-R C Dubey

**Books for reference**

- 1) Text book of Microbiology – J. Black
- 2) Fundamentals of microbiology – Jeffrey Pommerville
- 3) Brock biology of Microorganisms – Michael T Madigan
- 4) Microbiology an Introduction – Gerard J. Tortora

**Marks including choice:**

Unit	Marks
I	15
II	8
III	15
IV	12

**About the Pattern of Questions:**

- Part A -** Short answer (5 questions x Mark 1each = 5)  
Answer all questions (5 questions x Mark 1each = 5)
- Part B -** Short Essay (5 questions x Marks 2 each = 10)  
Answer any 4 questions (4 questions x Marks 2 each = 8)
- Part C -** Essay (5 questions x Marks 3 each = 15)  
Answer any 3 questions (3 questions x Marks 3 each = 9)
- Part D -** Long Essay (4 questions x Marks 5 each = 20)  
Answer any 2 questions (2 questions x Marks 5 each = 10)

Total marks including choice - 50  
Maximum marks of the course – 32



**COMPLEMENTARY ELECTIVE COURSE III:  
APPLIED MICROBIOLOGY I**

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
III	3C03 MCB	3	2	3

**COURSE OUTCOME**

**CO 1. Understand the role of microbes in Food fermentation, spoilage, foodborne illnesses**

**CO 2. Explain food and water borne diseases and the microbial pathogens.**

**CO 3. Describe food preservation techniques and industrial production of foods**

**Unit I**

Microorganism important in food- yeast - Saccharomyces, Schizosacharomyces, mold- Aspergillus, Penicillium, Rhizopus , bacteria- Lactobacillus, Leuconostoc, Clostridium, Pseudomonas, . Sources of contamination of food- animals, plants, soil, air, sewage, contamination during handling and processing

( 8 Hrs)

**Unit II**

Food spoilage: Chemical changes caused by microorganisms - Causes of spoilage - Factors affecting the growth of microorganisms in food-

( 8 Hrs)

**Unit III:**

Food preservation - General principles - Asepsis, removal, anaerobic conditions. Methods of preservation : (i) Preservation by use of High temperature -Pasteurisation- Heating at 100°C, Canning. (ii) Preservation by use of low temperature - chilling or cold storage - Freezing or Frozen storage- (iii) Preservation by Drying - Sun drying - Drying by mechanical dryers – Freeze drying - Smoking - (iv) Preservation by food additives - Organic acids and their salts - Benzoates, Sorbates, Acetates, Nitrites and Nitrates, Alcohol and antibiotics.

( 16 Hrs)

**Unit IV:**

Food and water-borne diseases – Food infections and intoxication- Viral- Gastroenteritis – rota, noro, adeno, Infectious hepatitis, Polio myelitis. Bacterial- Cholera, Typhoid fever, Listeriosis – symptoms, and preventive measures commonly employed.

( 14 Hrs)

**Unit V:**

Microbial production of bread, Beer, vinegar, yoghurt, cheese, industrial alcohol.

( 8 Hrs)



### **Books for Study**

- 1) Food Microbiology- William C Frazier, Dennis C Westhoff
- 2) Industrial Microbiology-L E Casieda
- 3) Introduction to Food Biotechnology- Sinosh Skariyachan, Abhil

### **Books for Reference**

- 1) Text book of Microbiology – J. Black
- 2) Fundamentals of microbiology – Jeffrey Pommerville
- 3) Brock biology of Microorganisms – Michael T Madigan
- 4) Microbiology an Introduction – Gerard J. Tortora

### **Marks including choice:**

Unit	Marks
I	8
II	7
III	15
IV	10
V	10

### **About the Pattern of Questions:**

- Part A -** Short answer (5 questions x Mark 1each = 5)  
Answer all questions (5 questions x Mark 1each = 5)
- Part B -** Short Essay (5 questions x Marks 2 each = 10)  
Answer any 4 questions (4 questions x Marks 2 each = 8)
- Part C -** Essay (5 questions x Marks 3 each = 15)  
Answer any 3 questions (3 questions x Marks 3 each = 9)
- Part D -** Long Essay (4 questions x Marks 5 each = 20)  
Answer any 2 questions (2 questions x Marks 5 each = 10)

Total marks including choice - 50

Maximum marks of the course - 32



**COMPLEMENTARY ELECTIVE COURSE IV:  
MICROBIOLOGY (COMPLEMENTARY) PRACTICAL I**

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
III	3C04 MCB	2	-	-

**COURSE OUTCOME**

- CO 1. Understand the principle and working of bright field microscopy**  
**CO 2. Understand the working principle and procedure of laboratory equipments**  
**CO 3. Understand the structural basis of prokaryotic cells through microscopic analysis.**  
**CO 4. Understand the growth requirements of bacteria through media formulations.**  
**CO 5. Perform pure culture isolation techniques**

**List of Experiments**

1. Use and care of microscopes
2. Microscopy-Staining-Simple, Negative, Gram staining, Hanging drop motility, Fungal staining-LPCB.
3. Cleaning and sterilization of glasswares
4. Use of Hot Air Oven, Autoclave, Incubator, Water bath, Colony counter, Laminar air flow
5. Preparation of culture media - Simple , Selective, Differential.
6. Isolation of bacteria by Streak plate method.
7. Personal hygiene-Microbes from hands, tooth scum, other body parts.
8. Isolation of microorganisms from soil samples.(serial dilution and pour plating)

**Books for Study**

- 1) Microbiology Laboratory Manual- Capuccino, Sherman, Pearson Education.
- 2) Practical Microbiology- R.C Dubey, D.K Maheshawari, S. Chand & Company, New Delhi
- 3) Manual of Microbiology: Tools and Techniques, Kanika Sharma, Ane Books Pvt Ltd

**Books for Reference**

- 1) Microbiology : Concepts and Applications- Pelzer Jr, Chang Kreig, Mc Graw, Hill Inc
- 2) Microbiological Applications : Harold T Benson



**COMPLEMENTARY ELECTIVE COURSE V:  
APPLIED MICROBIOLOGY II**

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
IV	4C05 MCB	3	2	3

**COURSE OUTCOME**

**CO 1. Understand the role of soil Microbes.**

**CO 2. Understand biological management of sewage and solid waste**

**CO 3. To develop interest in waste management through microorganisms**

**Unit I**

Nitrogen fixation-Microbes as Biofertilizers:, *Rhizobium*. Mycorrhiza - types, *Azolla-Anabaena* system its benefits. Production of microbial inoculants and application-  
Rhizobium

( 12 Hrs)

**Unit II**

Microbiology of Municipal sewage: sewage treatment- primary, secondary and tertiary treatments - septic tank , - trickling filters - Imhoff tank - activated sludge process - oxidation ponds -, rotating bio discs-anaerobic sludge digestion.

( 16 Hrs)

**Unit III**

Solid waste disposal: Sanitary landfills - composting – Vermicompost - Biogas - Gobar gas plant technology –common models. Microbiology of Methane production.

( 16 Hrs)

**Unit IV:**

Soil micro organisms and pesticide degradation - microbial decomposition of herbicides, insecticides and fungicides - Effect of pesticides on soil micro organisms.

( 10 Hrs)

**Books for Study**

- 1) Microbial Ecology: Fundamentals & Applications- Richard Bartha, Ronald M Atlas
- 2) Agricultural Microbiology - G. Rangaswami, D.N Bagyaraj
- 3) Soil Microorganisms and Plant Growth - N S Subba Rao



- 4) Microbiology: Concepts and Applications -Michael J Pelczar, E.C.S Chan, Noel R Krieg

### **Books for reference**

- 1) Text book of Microbiology – J. Black
- 2) Fundamentals of microbiology – Jeffrey Pommerville
- 3) Brock biology of Microorganisms – Michael T Madigan
- 4) Microbiology an Introduction – Gerard J. Tortora

### **Marks including choice:**

Unit	Marks
I	15
II	15
III	13
IV	7

### **About the Pattern of Questions:**

- Part A -** Short answer (5 questions x Mark 1each = 5)  
Answer all questions (5 questions x Mark 1each = 5)
- Part B -** Short Essay (5 questions x Marks 2 each = 10)  
Answer any 4 questions (4 questions x Marks 2 each = 8)
- Part C -** Essay (5 questions x Marks 3 each = 15)  
Answer any 3 questions (3 questions x Marks 3 each = 9)
- Part D -** Long Essay (4 questions x Marks 5 each = 20)  
Answer any 2 questions (2 questions x Marks 5 each = 10)

Total marks including choice - 50  
Maximum marks of the course – 32



**COMPLEMENTARY ELECTIVE COURSE VI:  
MICROBIOLOGY (COMPLEMENTARY) PRACTICAL II**

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
IV	4C06 MCB	2	4	3HRSX 2DAYS /BATC

**COURSE OUTCOME**

- CO 1. Determine the count of actively growing organisms in a sample**  
**CO 2. Perform the biochemical characteristics of bacteria useful for its identification**  
**CO 3. Determine the antimicrobial spectrum of the given bacterial species**  
**CO 4. Determine the role of microorganisms in the post harvest decay of fruits and vegetables.**

**List of Experiments**

1. Quantitative estimation of viable microorganisms through Serial dilution and spread plate technique
2. Metabolic characterization of bacteria(IMViC test)
3. Antibiotic sensitivity test-use of antibiotic disc diffusion method(Kirby Bauer Technique)
4. Identification of important fungi associated with post harvest rot of fruits and vegetables through microscopy(LPCB staining)

**Books for Study:**

- 1) Microbiology Laboratory Manual- Capuccino, Sherman, Pearson Education.
- 2) Practical Microbiology- R.C Dubey, D.K Maheshawari, S. Chand & Company, New Delhi
- 3) Manual of Microbiology: Tools and Techniques, Kanika Sharma, Ane Books Pvt Ltd

**Books for Reference:**

- 1) Microbiology : Concepts and Applications- Pelzer Jr, Chang Kreig, Mc Graw, Hill Inc
- 2) Microbiological Applications : Harold T Benson

**INTERNAL ASSESSMENT OF PRACTICAL COURSES**

COMPONENT	WEIGHTAGE	REMARKS
Lab involvement	25 %	Involvement in preparatory session, safety precautions, disposal and completion of all experiments
Record	25 %	
Lab examination/ viva	50 %	