VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

JNANASAGARA CAMPUS, BALLARI-583105

Department of Studies in Biotechnology

II Semester Syllabus

Bachelor of Science

With effect from 2021-22 and onwards

Semester-II

DSC:2- Microbiological Methods

Course Title:Microbiological Methods	**Course code: 21BSC2C2MML**
Total Contact Hours:56hrs	**Course Credits: 04**
Internal Assessment Marks: 40	**Duration of SEE: 03**
Semester End Examination Marks: 60	

Course Outcomes (CO's):

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

1. Understand and explain basic principles and different kinds of microscope
2. Explain the process of different sterilization and staining techniques
3. Understand and compare various types of stains and dyes
4. Understand the role of drugs in disease control and their mechanism of action

DSC 21BSC2C2BTL: Microbiological Methods

Unit	Description	Hours
1	**Instruments used in Biotechnology:** Microscopy: Principles of Microscopy- resolving power, numerical aperture, working principle and applications of Compound microscope, Dark field microscope, Phase contrast microscope, Fluorescence Microscope, confocal microscope, Electron Microscopes- TEM and SEM. Analytical techniques: Working principles and applications: Centrifuge, Ultracentrifuge, Spectrophotometer, Chromatography: Paper and TLC.	12
2	**Sterilization techniques:** Definition of terms-sterilization, disinfectant, antiseptic, sanitizer, germicide, microbicidal agents, micro biostatic agent and antimicrobial agent. Physical methods of control: Principle, construction and applications of moist heat sterilization Boiling, Pasteurization, Fractional sterilization-Tyndallization and autoclave. Dry heat sterilization-Incineration and hot air oven. Filtration –Diatomaceous earth filter, seitz filter, membrane filter and	11

	HEPA; Radiation: Ionizing radiation-γ rays and non-ionizing radiation- UV-rays Chemical methods: Alcohol, aldehydes, phenols, halogen, metallic salts, Quaternary ammonium compounds and sterilizing gases as antimicrobial agents.	
3	**Microbiological techniques:** Culture Media: Components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media Pure culture methods: Serial dilution and plating methods (pour, spread, streak); cultivation, maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria	11
4	**Staining techniques:** Stains and staining techniques: Principles of staining, Types of stains-simple stains, structural stains and differential stains.	11
5	**Antimicrobial 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 Antibiotic resistance, MDR, XDR, MRSA, NDM-1 Antibiotic sensitivity testing methods: Disc and Agar well diffusion techniques	11

References:

1. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T. Brown Publishers.

2. Black JG. (2008). Microbiology: Principles and Explorations. 7th edition. Prentice Hall
3. Madigan MT, and Martinko JM. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J. Prentice Hall International, Inc.
4. Pelczar Jr MJ, Chan ECS, and Krieg NR. (2004). Microbiology. 5th edition Tata McGraw Hill.
5. Srivastava S and Srivastava PS. (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht
6. Stanier RY, Ingraham JL, Wheelis ML and Painter PR. (2005). General Microbiology. 5th edition McMillan.
7. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition Pearson Education.
8. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.
9. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited
10. Microbiology- Concepts and applications by Paul A. Ketchum, Wiley Publications
11. Fundamentals of Microbiology –Frobisher, Saunders & Toppan Publications
12. Introductory Biotechnology-R.B Singh C.B.D. India (1990)
13. Fundamentals of Bacteriology - Salley
14. Frontiers in Microbial technology-P.S. Bison, CBS Publishers.
15. Biotechnology, International Trends of perspectives A. T. Bull, G.
16. General Microbiology –C.B. Powar

DSC 2: Microbiological Methods Practical

Course Title:Microbiological Methods Practical	**Course code: 21BSC2C2MMP**
Total Contact Hours: 56 hrs	**Course Credits: 02**
Internal Assessment Marks: 25	**Duration of SEE: 03**
Semester End Examination Marks: 25	

Course Outcomes (CO's):

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

1. Describe the good lab practices and biosafety measures to be adopted while working ina microbiology lab and identify various instruments commonly used for microbiological experiments
2. Gaining knowledge and hands on experience on general microbiological concepts likestaining, enrichment and isolation of microbes
3. Demonstrate different cultivation methods for various microbial groups

DSC21BSC2C2BTP: Microbiological Methods Practical

List of Experiments

1. 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 and Biotechnology laboratory
2. Sterilization of medium using Autoclave and assessment for sterility
3. Sterilization of glassware using Hot Air Oven and assessment for sterility
4. Sterilization of heat sensitive material by membrane filtration and assessment for sterility
5. Preparation of culture media for bacteria, fungi and their cultivation
6. Plating techniques: Spread plate, pour plate and streak plate
7. Isolation of bacteria and fungi from soil, water and air
8. Study of Rhizopus, Penicillium, Aspergillus using temporary mounts
9. Colony characteristics study of bacteria from air exposure plate
10. Staining techniques: Bacteria– Gram, Negative, Capsule, Endospore staining, Fungi – Lactophenol cotton blue staining
11. Water analysis - MPN test
12. Biochemical Tests – IMViC, Starch hydrolysis, Catalase test, Gelatin hydrolysis
13. Bacterial cell motility - hanging drop technique

OEC:02 Applications of Biotechnology in Agriculture

Course Title:Applications of Biotechnology in Agriculture	**Course code: 21BSC2O2BT2**
Total Contact Hours: 56 hrs	**Course Credits: 03**
Internal Assessment Marks: 40	**Duration of SEE: 03**
Semester End Examination Marks: 60	

Course Outcomes (COs):

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

1. Understand how double cross breeding changed plants.
2. Recognize the developments that led to the Green Revolution.
3. Understand how technological advances led to genetic modification in modernagriculture

OEC 21BSC2O2BT1: Applications of Biotechnology in Agriculture

Unit	Description	Hours
1	**Agricultural Biotechnology:** Concepts and scope of biotechnology in Agriculture. Plant tissue culture, micro propagation, entrepreneurship in commercial plant tissue culture. Banana tissue culture - primary and secondary commercial setups, small scale bio enterprises: Mushroom cultivation.	11
2	**Transgenic plants:** The GM crop debate – safety, ethics, perception and acceptance of GM crops, GM crops case study: Bt cotton, Bt brinjal, Plants asbio-factories for molecular pharming : edible vaccines, plantibodies, nutraceuticals.	11
3	**Bt based pesticides:** Baculovirus pesticides, Mycopesticides. Post-harvest Protection: Antisense RNA technology for extending shelf life of fruits and shelf life of flowers.Genetic Engineering for quality improvement: Seed storage proteins, Flavours–capsaicin, vanillin.	11
4	**Biofertilizers:** Biofertilizers-types, production, VAM, Rhizobium, Azotobacter, Mycorhiza, Actinorhiza Vermicomposting technology. Biopesticides.	11
5	**Post-harvest technology:** RNAi and antisense RNA technology for extending shelf life of fruits and flowers (ACC synthase gene and polygalactoronase); delay of softening and ripening of fleshy fruits (tomato, banana, watermelons).	12

	Post-harvest protection of cereals, millets and pulses	

References

1. Chrispeels M.J.et al. Plants, Genes and Agriculture-Jones and Bartlett Publishers, Boston.1994.
2. Gamborg O.L. and Philips G.C.Plant cell, tissue and organ culture (2nd Ed.) Narosa Publishing House. New Delhi.1998.
3. Hammound J, P McGravey&Yusibov.V. Plant Biotechnology, Springer verlag.2000.
4. Heldt. Plant Biochemistry and Molecular Biology.Oxford and IBH Publishing Co. Pvt.Ltd. Delhi. 1997.
5. LydianeKyte and John Kleyn.Plants from test tubes. An introduction to
6. Micropropagation (3 rd. Ed.). Timber Press, Portland. 1996.
7. Murray D.R. Advanced methods in plant breeding and biotechnology.Panima Publishing Corporation.1996.
8. NickoloffJ.A.Methods in molecular biology, Plant cell electroporation and electrofusion protocols-Humana press incorp, USA. 1995.
9. Sawahel W.A. Plant genetic transformation technology.Daya Publishing House, Delhi.1997.
10. Gistou, P and Klu, H.Hand book of Plant Biotechnology (Vol. I & II).John Publication.2004.

Question Paper Pattern for UG Semester End Examination with effect from the AY 2021-22

Languages /Discipline Core Courses (DSC) & Open Elective Courses (OEC)

Paper Code: **Paper Title:**

Time: 3 Hours **Max. Marks: 60**

Instruction: Answer all Sections

SECTION-A

1. Answer the following sub-questions, each sub-question carries **ONE** mark. (10X1=10)

a).

b).

c).

.

.

j).

Note for Section-A: Two sub-questions from each unit.

SECTION-B

Answer any **FOUR** of the following questions, each question carries **FIVE** marks. (4X5=20)

2.

3.

4.

5.

6.

7.

Note for Section-B: Minimum One question from each unit (Q No 2 to 6) and remaining one question from unit II to V (Q.No. 7)

SECTION-C

Answer any **THREE** of the following questions, each question carries **TEN** marks. (3X10=30)

8.

9.

10.

11.

12.

Note for Section- C: One question from each unit. Sub-questions such as 'a' and 'b' may be given for a question in section-C only.

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SEC & AECC Subjects

Paper Code: **Paper Title:**

Time: 1 Hours **Max. Marks: 30**

There shall be Theory examinations of **Multiple Choice Based Questions [MCQs]with Question Paper of A, B, C and D Series** at the end of each semester for **AECCs (Environmental Studies and (ii) Constitution of India) and SECs (SEC-1: Digital Fluency, SEC-2: Artificial Intelligence, SEC-3: Cyber Security and SEC-4: Societal Communication) for the duration of One hour (First Fifteen Minutes for the Readiness of OMR and remaining Forty-Five Minutes for Answering thirty Questions). The Answer Paper is of OMR (Optical Mark Reader) Sheet.**

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VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY, BALLARI-583 105
B. Sc. ……(DSCC) SEMESTER PRACTICAL
SUBJECT - BIOTECHNOLOGY

Paper Code: **Paper Title:**

Time: 3 Hours **Max Marks: 25**

Q. 1. Write a Principle, procedure and perform the given experiment…….. and write a report on result obtained (Major experiment) - 8M

Q. 2. Perform Minor experiment-1 - 4M

Q. 3. Perform Minor experiment-2/Answer the given problem/…… - 4M

Q. 4. Identification - 6M

4A. Identify & comment
4B. Identify & comment
4C. Identify & comment

Q. 5. Journal submission - 3M

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