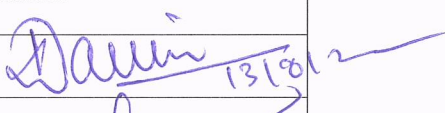
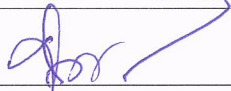
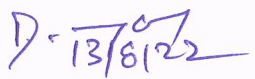
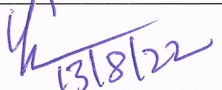


## Minutes of the meeting of Board of Studies in Microbiology (Dated: 13-08-2022)

A meeting of the BoS in Microbiology was held today at 11:30 am to consider following agenda:

Following members were present :

| SN | Members                                                                                                        | Signatures                                                                           |
|----|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1. | Prof. Naveen Kango, Chairman, BoS                                                                              |   |
| 2. | Prof. N.C. Gautam, Ex Vice-Chancellor, Mahatma Gandhi Chitrakoot Vishwavidyalaya, Chitrakoot (MP), Ext. Member |   |
| 3. | Prof. A.K. Pandey, Vice-Chancellor, Vikram University, Ujjain (M.P.), Ext. Member                              | On-line                                                                              |
| 4. | Prof. Deepak Vyas, Department of Botany, Dr. H.S. Gour V.V. Sagar (M.P.), Member                               |    |
| 5. | Prof. Shweta Yadav, Department of Zoology, Dr. H.S. Gour V.V. Sagar (M.P.), Member                             |   |
| 6. | Dr. Y. Bhargava, Dept of Microbiology, Dr. H.S. Gour V.V. Sagar (M.P.), Member                                 |  |

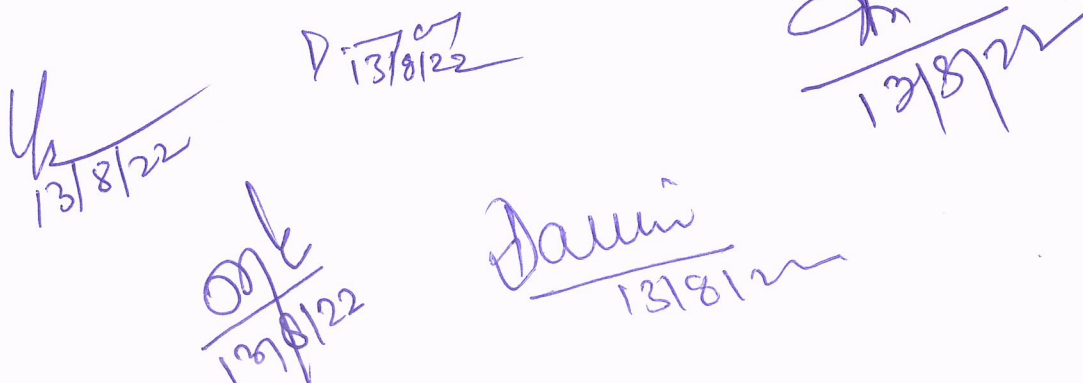
At the outset Prof. Naveen Kango, Chairman BoS welcomed all the members to the first meeting of the newly constituted BoS. He updated the board about the agenda, especially, implementation of the NEP 2020 in M.Sc. Microbiology curriculum.

**The members deliberated the agenda items at length and resolved the following unanimously:**

1. The syllabus of the **M.Sc. Microbiology as per NEP 2020** was approved.
2. The syllabus of the **PhD Microbiology Course Work** was approved.
3. BoS authorized local members to make necessary minor changes
4. **Research advisory committee** of Ms. Laxmi Kurmi was reconstituted as the earlier member. Dr. Rajaneesh Anupam has left the university.

|    |                                                                |
|----|----------------------------------------------------------------|
| 1. | Dr. Y. Bhargava, Dept of Microbiology, Supervisor and Convener |
| 2. | Prof. Naveen Kango, Dept of Microbiology, Member               |
| 3. | Dr. Pushpal Ghosh, Dept of Chemistry, External Member          |

At the end of the meeting, Dr. Yogesh Bhargava extended a formal vote of thanks to all the members.



# **Proposed Syllabus and Structure For Ph.D. Microbiology**

Under  
Choice Based Credit System

**Ph.D. Course Work (One Semester)**

**Date of BoS: 13.08.2022**



**Department of Microbiology**  
**Dr. Harisingh Gour Vishwavidyalaya (A Central University)**  
**Sagar (M.P.) 470003**

## About the Department



The pioneering work done in the Microbiology and Mycology laboratory of the Botany department triggered a vision of initiating a full-fledged curriculum in Applied Microbiology and Biotechnology at Dr. Harisingh Gour Vishwavidyalaya, Sagar. The idea conceived by the founder head, Prof. S. C. Agrawal (Head:1996-2004) resulted in the start of this much awaited PG course in Life Science faculty in 1990-91.

Under the able directions and untiring efforts of Late Prof. P.C. Jain (Head: 2004-2012) the department could acquire the present status. Since then department has stood among the front runners in teaching and research in Microbiology and occupies a place of prominence in the field. In last ten years the department has witnessed a great deal of expansion with regards to infrastructure and facilities as a seat of higher learning in Microbiology. With the establishment of Central University in 2009, the department was renamed as Department of Microbiology and became a part of School of Biological Sciences(SBS).

**The department offers following courses:**

| S.No. | Course             | Intake |
|-------|--------------------|--------|
| 1.    | M.Sc. Microbiology | 19     |
| 2.    | Ph.D. Microbiology | 12* *  |

\*subject to availability of seats

The department has published significant number of publications in the leading national and international peer reviewed scientific journals. In past the department has also organized several hand'son workshops, national and international conferences. At the department of Microbiology research is being pursued in both basic and applied areas of Microbiology. With an inclination towards inter disciplinary research, faculty members in the department have forged active collaboration within and outside the university. Recently, laboratories of bioimaging, infection and immunity and host-pathogen interaction have been established. The major research fields encompass microbial hemicellulases, inulinases, L-asparaginase, thermophilic fungi, mycobacteria, host-pathogen interaction, enteric bacteria, bioimaging, biofilm and cancer biology.

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**Total Credits: 16**

- Credits through course work = 16
- 3 Courses X4 Credits = 12Credits through course work  
+ 04 Credits from scientific review writing
- Research and Publication Ethics = 02

| Paper   | Code       | Title                                                          | Credits |
|---------|------------|----------------------------------------------------------------|---------|
| Paper 1 | MIC CC 141 | Research Methodology                                           | 4       |
| Paper 2 | MIC CC 142 | Fundamentals of Biotechnology                                  | 4       |
| Paper 3 | MIC EC 141 | Techniques in Microbiology                                     | 4       |
|         | MIC EC 142 | Microbiology & Human Health                                    | 4       |
| Paper 4 | MIC CC 143 | Reviewing of Literature/ Scientific writing/ Presentations etc | 4       |
| Paper 5 | CPE-RPE    | Research and Publication Ethics                                | 2       |

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## MIC CC 141: Research Methodology

Total Credit: 4

60 hrs

### Unit –I

**Hypothesis & Research Design:** Defining, formulating & development of research hypothesis. Testing & development of working hypothesis. Types of research (descriptive, analytical, applied, fundamental, qualitative, conceptual and empirical) and research methods. Importance of literature review in defining a problem. Thrust area & innovation.

### Unit-II

**Computer Applications in Biological Research:** Basics, Programmes (Microsoft excel, Word & PPT) and software (SPSS etc) used in research. Networking and modelling. Data mining and interpretation by use of computer. Data repository in knowledge bank (Gene Bank, Shodh Ganga, INFLIBNET etc.).

### Unit-III

**Scientific Presentations & Writing:** Structure and components of scientific reports, Types of scientific reports and their preparation. Review, report, paper & Thesis writing. Bibliography, referencing and citation for scientific writing.

### Unit-IV

**Basics principle, applications & techniques of sophisticated instruments used in biological research:** Microscopy (Confocal, Phase contrast, TEM, SEM) Centrifuge, Chromatography, Spectroscopy, Immunochemical techniques (ELISA), Electrophoresis (DNA, Protein), PCR (routine & Real time)

### Unit-V

**Bio safety and Good Laboratory Practices:** International standards and concept of bio safety, bio safety levels & biohazards. Chemical & radiological hazards. Removal and disposal of biohazards. Concept of good laboratory practices. Safety related with genetically modified organisms.

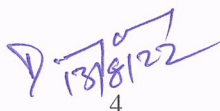
#### Essential Readings

- 1) Kothari, C.R. 2004. Research methodology methods and techniques. New Delhi: New Age International Limited
- 2) Research Design: Qualitative, Quantitative, and Mixed Methods Approaches
- 3) Statistics: Concepts and Applications by Pal and Sarkar.

#### Suggested Readings

1. Basic of Statistics by Dhiraj Nagar
2. Seltman, H.J. 2014. Experimental design and analysis. Carnegie Mellon University.

  
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## MIC CC 142: Fundamentals of Biotechnology

**Total Credit: 4**

**60 hrs**

### Unit-I

**(12 hrs.)**

Microbial Growth: Mathematical nature and expression of microbial growth. Generation time. Growth rate measurement based on nucleotide incorporation and cell numbers.

### Unit 2:

Bacterial Technology: Application of bacteria in recombinant DNA technology and expression in bacteria: Concept of gene regulation in bacteria: lac-operon in bacteria (positive and negative regulation), structural gene clusters, role of inducer and repressor. Introduction of pET expression vectors for expression of recombinant proteins in bacteria.

### Unit 3:

**(12 hrs.)**

Fungal Technology: Importance of fungal over bacterial expression systems used in recombinant DNA technology. Fungal vector systems. Steps used in cloning of recombinant genes in fungal vectors. Yeast Two Hybrid Systems (YTHS).

### Unit 4:

**(12 hrs.)**

Metabolic Engineering: Fundamentals pathways of Pyruvate formation (Embden-Meyerhof pathway (EMP) /glycolytic pathways, Pentose phosphate pathway (PPP) /hexose monophosphate shunt, Entner-Doudoroff pathway). Metabolic engineering of lactic acid bacteria (LAB), Concept of Flavour, aroma and texture of dairy products.

### Unit 5:

**(12 hrs.)**

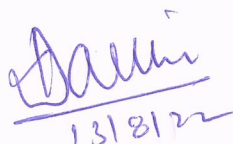
Bio imaging: Properties of Light and Lamps using in bioimaging, components of compound and fluorescence microscope. Types of fluorescent objectives, refractive index, numerical aperture. Introduction to live cell imaging.

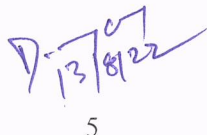
### Suggested Readings:

1. Microbiology By Pelczar M., Chan E.C.S. and Krieg, N.R. Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.
2. An Introduction to Mycology By Mehrotra, R.S. and K.R. Aneja New Age International Press, New Delhi.
3. Green Fluorescent Protein, By Barry W. Hicks, Humana Press, 10-Nov-2010

### Essential Readings:

- 1) The Microbial World By Stainier R.V., Ingraham, J.L., Wheelis, M.L. and Painter P.R., Printice-Hall of India (Pvt.) Ltd., New Delhi
- 2) Methods of Biochemical Analysis, Green Fluorescent Protein: Properties, Applications and Protocols, By Martin Chalfie, Steven R. Kain, John Wiley & Sons, 18-Nov-2005.
- 3) Principles of Fluorescence Spectroscopy, 2007, 3e, By Joseph R. Lakowicz, Springer Publication

  
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## MIC EC 141: Techniques in Microbiology

Total Credit: 4

60 hrs

### Unit-I

(12 hrs.)

Methods of purification of microbial cultures- pour plate, streak plate, spread plate serial dilution. Culture media: preparation, differential media, selective media, enriched media, basal media, minimal media.

### Unit-2

(12 hrs.)

Sterilization: Principle and methods of sterilization- Dry heat, moist heat, radiation, filtration, chemical methods for sterilization, Maintenance and preservation of microbial cultures.

### Unit-3

(12 hrs.)

**Immunological techniques:** Antigen-antibody interaction- RID, DID, Rocket electrophoresis, agglutination- active and passive, measurement of antigen and antibody, preparation anti-sera and antibodies.

### Unit-4

(12 hrs.)

**Molecular techniques:** Principal and applications of electrophoresis, microarray technology, Polymerase Chain Reaction, Transformation, Restriction enzyme, blotting techniques, gene cloning.

### Unit-5

(12 hrs.)

**Instruments:** Incubators, pH meter, balance, centrifuge, Laminar flow, electroporator, spectrophotometer, transilluminator, Microscope, colony counter.

### Essential Readings:

- 1) Biophysical Chemistry by Upadhyay, Upadhyay, and Nath.
- 2) Cuby Immunology by Kindt, Goldsby and Osborne, W. H. Freeman publication.
- 3) Immunology by David Male, Jonathan Brostoff, David B Roth and Ivon Roit, Lange publication.
- 4) Manual of methods for general bacteriology By Phillip. G.
- 5) Microbiology By Pelczar M., Chan E.C.S. and Krieg, N.R. Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.

### Suggested Readings:

1. Biochemistry, Stryer 5<sup>th</sup> edition W.H. Freeman 2001.
2. Principles of Biochemistry, Lehninger, 3<sup>rd</sup> edition by Nelson and Cox (Worth) 2000. Publisher
3. Genetics By Gardner.
4. Molecular cloning Vol I, II and III Maniatis, Sambrook and Ffritz.
5. Microbial Genetics By David Freifelder.

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## MIC EC 142: Microbiology & Human Health

**Total Credit: 4**

**60 hrs**

### Unit-I

**(12 hrs.)**

**Public Health Microbiology:** Microorganisms of clinical and public health significance. Role of microorganisms to cause diseases (from normal to severe). Factors associated with disease development & transmission.

### Unit-2:

**(12 hrs.)**

Isolation, sampling and issues of specimen receiving and processing in lab. Lab diagnosis of infectious agents and antimicrobial susceptibility testing. Laboratory management & novel approaches to detect infectious agents.

### Unit-3

**(12 hrs.)**

**Epidemiology of Infectious Disease:** Basic methods to studying the epidemiology of infectious diseases and reviews infectious diseases of major public health importance. Principle of disease surveillance & outbreak investigation. Identify research questions and design a project related to epidemiology.

### Unit-4

**(12 hrs.)**

Prevention and control of infectious diseases impacting local, national, and global community health. Epidemiology methods used in disease surveillance and measures used in slowing or preventing spread of disease.

### Unit-5

**(12 hrs.)**

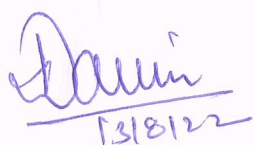
**Environment & Human Health.** Impact of environmental problems on human health; biological hazards to human health from air and water pollution; radiation; pesticides; noise; problems related to food; occupation and environment of the workplace; accidents.

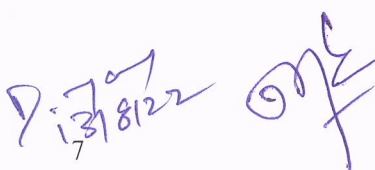
#### Essential Readings:

- 1) Principle of Public Health Microbiology by R S Burlage
- 2) Principles of Epidemiology in Public Health Practice, Third Edition; Richard Dicker, et al. - CDC, 2006
- 3) Foodborne disease outbreaks: Guidelines for investigation and control; World Health Organization, 2009
- 4) Essentials Of Environmental Health (Essential Public Health) 2nd Edition; Robert H Farriss-2016

#### Suggested Readings

1. Public Health Microbiology: Methods and Proto Protocols by John F T Spencer & S P Alecia; Springer Science & Business Media
2. Global Health: A Challenge for Interdisciplinary Research; M. Kappas, U. Gross, D. Kelleher (eds.) – Universitätsverlag Göttingen, 2012
3. Public Health Systems and Emerging Infections; Jonathan R Davis, Joshua Lederberg (ed.) - National Academies Press, 2000

  
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## MIC CC 143 Review of Literature

|         |           |                                                                       |           |
|---------|-----------|-----------------------------------------------------------------------|-----------|
| Paper 4 | MIC C 143 | Reviewing of Literature/<br>Scientific writing/<br>Presentations etc. | Credits 4 |
|---------|-----------|-----------------------------------------------------------------------|-----------|

In this paper, the students are encouraged to write a review on a specific topic to expertise in reading and writing in to the scientific field. They have to present their piece of writing work.

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|----------------|----------------|----------------------------------------|----------|
| <b>Paper 5</b> | <b>CPE-RPE</b> | <b>Research and Publication Ethics</b> | <b>2</b> |
|----------------|----------------|----------------------------------------|----------|

**Course structure**

- The course comprises of six modules listed in table below. Each module has 4-5 units.

| Modules         | Unit title                            | Teaching Hours |
|-----------------|---------------------------------------|----------------|
| <b>Theory</b>   |                                       |                |
| <b>RPE01</b>    | <b>Philosophy and Ethics</b>          | <b>4</b>       |
| <b>RPE02</b>    | <b>Scientific Conduct</b>             | <b>4</b>       |
| <b>RPE03</b>    | <b>Publication Ethics</b>             | <b>7</b>       |
| <b>Practice</b> |                                       |                |
| <b>RPE04</b>    | <b>Open Access Publishing</b>         | <b>4</b>       |
| <b>RPE05</b>    | <b>Publication Misconduct</b>         | <b>4</b>       |
| <b>RPE06</b>    | <b>Databases and Research Metrics</b> | <b>7</b>       |
| <b>Total</b>    | <b>30</b>                             | <b>30</b>      |

**Syllabus in detail****THEORY****RPE 01: PHILOSOPHY AND ETHICS (3 hrs.)**

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions

**RPE 02: SCIENTIFIC CONDUCT (5hrs.)**

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

**RPE 03: PUBLICATION ETHICS (7 hrs.)**

1. Publication ethics: definition, introduction and importance
2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

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## PRACTICE

### RPE 04: OPEN ACCESS PUBLISHING(4 hrs.)

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder/ journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

### RPE 05: PUBLICATION MISCONDUCT (4hrs.)

#### A. Group Discussions (2 hrs.)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

#### B. Software tools (2 hrs.)

Use of plagiarism software like Turnitin, Urkund and other open source software tools

### RPE 06: DATABASES AND RESEARCH METRICS (7hrs.)

#### A. Databases (4 hrs.)

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

#### B. Research Metrics (3 hrs.)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g index, i10 index, altmetrics

## References

Bird, A. (2006). *Philosophy of Science*. Routledge. MacIntyre, Alasdair (1967) *A Short History of Ethics*. London. P. Chaddah, (2018) *Ethics in Competitive Research: Do not get scooped; do not get plagiarized*, ISBN:978-9387480865

National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). *On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition*. National Academies Press.

Resnik, D. B. (2011). What is ethics in research & why is it important. *National Institute of Environmental Health Sciences*, 1-10. Retrieved from <https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>

Beall, J. (2012). Predatory publishers are corrupting open access. *Nature*, 489(7415), 179-179. <https://doi.org/10.1038/489179a>

Indian National Science Academy (INSA), *Ethics in Science Education, Research and Governance*(2019) , ISBN:978-81-939482-1-7. <http://www.insaindia.res.in/pdf/EthicsBook.pdf>

*Harish*  
13/8/22

*Dr. P. Chaddah*  
13/8/22