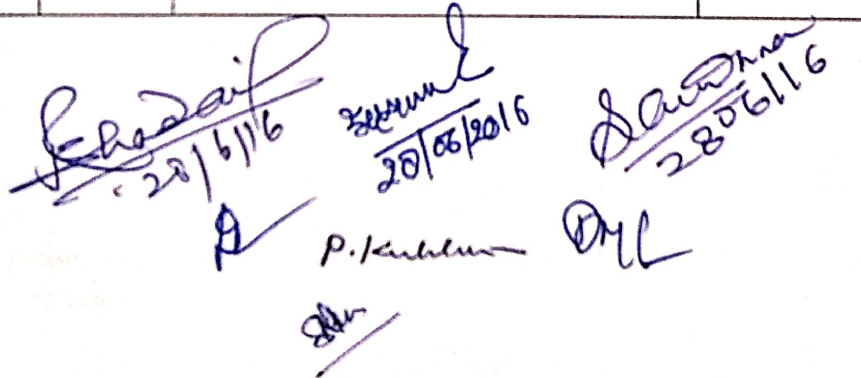


**SYLLABUS 2016-19**  
**Microbiology**  
**Scheme of B.Sc. Semester course**

	Semester	Paper	Max. Marks
I YEAR	I Semester	MB101 Fundamentals of Microbiology and techniques	85+15
		MB102: Lab Course I	50
	II Semester	MB201: Biochemistry and Microbial Physiology	85+15
		MB203: Lab Course II	50
II YEAR	III Semester	MB301: Molecular biology and RDT	85+15
		MB303: Lab Course III	50
	IV Semester	MB401: Food Microbiology & Fermentation technology	85+15
		MB403 Lab Course IV	50
III YEAR	V Semester	MB501: Enzymology & Immunotechnology	85+15
		MB503: Lab course V	50
	VI Semester	MB601: Environmental Microbiology & Biostatistics	85+15
		MB603: Project Work	50


  
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P. K. Kulkarni      DML

## SEMESTER I

### **MB101: Fundamentals of Microbiology and Techniques**

#### **Unit I**

Definition and scope of Microbiology, History of Microbiology – Spontaneous generation Vs Biogenesis. Contribution of scientists; A. Leeuwenhoek, L. Pasteur, R. Koch and E. Jenner. Classification of microorganisms: Three Kingdom and Whittaker's five kingdom system of classification, three domain concept of Carl Woese.

#### **Unit II**

Diversity of microbial world – General characteristics of Bacteria; (Archaeobacteria, Cyanobacteria, Mycoplasma, Actinomycetes), Fungi (Yeasts & moulds), Protozoa and Viruses. Ultra structure of bacteria, morphological types, cell wall of Archaeobacteria, Gram negative & positive bacteria.

#### **Unit III**

Growth Kinetics of Bacteria. Nutritional requirements of microorganisms, definition & examples of various types of growth media viz. natural, synthetic, complex, enriched, selective and differential media.. Sterilization; control of microorganisms- Physical and Chemical methods.

#### **Unit IV**

Inoculation and transfer techniques – Pure culture technique, Stains and Staining techniques – Simple, Gram's, Acid fast, Capsular, Endospore and Flagellar staining. Methods of preservation of microbial cultures.

#### **Unit V**

Microscopic Techniques: principle and applications of Light and Dark field Microscopy Electron microscopy – Transmission and Scanning electron Microscope. Basic principles & applications of pH meter, Colorimeter, Spectrophotometer.

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## MB 102 Lab Course I: Fundamental of Microbiology and Techniques

### Practical work:

The practical work will, in general, be based on the prescribed syllabus in theory & the candidates will be required to show the knowledge of the following:

1. Preparation of media, autoclaving and sterilization of glassware.
2. Isolation of phyto- pathogens.
3. Isolation of Microorganisms from soil and water: Bacteria, Fungi and Algae.
4. Purification of microbial cultures.
5. Camera Lucida Drawing.
6. Standard Plate Count.
7. Haemocytometer.
8. Chromatographic techniques: Separation of amino acids by paper and thin layer chromatography.
9. Measurement of pH of fruit juice.
10. Estimation of Protein by colorimeter.

### Recommended Books:

1. General Microbiology, Vol. II by Powar and Dagainawala, Himalaya publication New Delhi.
2. Microbiology by Pelczar, Reid and Chan, Tata Mc Graw Hill, New Delhi.
3. General microbiology by Davis and Harper
4. A Treatise on Media and Methods used in Bacteriological Techniques by Monika Cbrock.
5. Introductory Mycology by C.J. Alexopoulos & Mims, Wiley publication New Delhi.
6. Microbiology by P.D. Sharma

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## SEMESTER II

### **MB201: Microbial Biochemistry and Physiology**

#### **Unit I:**

Carbohydrates: Structure, properties & functions of monosaccharide, oligosaccharides & polysaccharides. Lipids; saturated & unsaturated fatty acids.

#### **Unit II :**

Structure, properties & functions of amino acids, essential & non-essential amino acids. Proteins; Primary, Secondary and Tertiary Structure. Nucleic Acids: types and function, Structure of nucleic acids – nucleosides, nucleotides, double stranded model of DNA.

#### **Unit III:**

Metabolism : ATP Cycle, Photophosphorylation, Oxidative phosphorylation, Substrate level phosphorylation. Major metabolic pathways – Glycolysis, Pentose phosphate pathway, TCA and Glyoxalate cycle.

#### **Unit IV:**

Photosynthesis: Photosynthetic bacteria and cyanobacteria, Autotrophic CO<sub>2</sub> fixation and mechanisms of photosynthesis, oxygenic & non-oxygenic reaction centre, Electron transport System, Calvin cycle, Effect of various factors on rate of photosynthesis.

#### **Unit V**

Methanogens and Methylotrophs. Sulphur utilizing bacteria. Sulphate reduction pathway, Economic importance of Methylotrophs & sulphur utilizing bacteria.

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## MB 202 Lab Course I: Microbial Physiology, Biochemistry & Physiology

The practical work will, in general, be based on the syllabus prescribed in theory. The candidates will be required to show the knowledge of the following:

- 1 Qualitative estimation of carbohydrates
- 2 Qualitative estimation of lipids
- 3 Qualitative estimation of proteins
- 4 Estimation of glycogen in bacterial cells.
- 5 Measurement of cellulose activity by viscometric technique.
- 6 Determination of cellulose and amylase activity by reducing sugar assay test.
- 7 Measurement of  $\alpha$ - amylase activity in extra-cellular fraction of microbial cultures.
- 8 Estimation of alkaline phosphates activity.

### Recommended Books:

1. General MicroBiology by Powar, Himalaya publication New delhi.
2. General Microbiology Vol II by Powar & Daginawala, publication New delhi.
3. Microbial physiology and Biochemistry by Moat.
4. Principles of Biochemistry by Rama Rao
5. Text Book of Biochemistry by O.P. Agrawal
6. Principles of Biochemistry by Lehninger, CBS Publication New Delhi.
7. Biochemistry by Harper, Prentice hall Singapore.

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## SEMESTER III

### **MB301: Molecular Biology & Recombinant DNA Technology**

#### **Unit I:**

Discovery of DNA structure, circular & super helical, DNA - RNA as genetic material,. Concept of gene. Gene transfer mechanisms: Transformation, conjugation and Transduction, DNA Replication – Origin and Mechanism of DNA Replication in prokaryotes & eukaryotes.

#### **Unit II:**

Mechanism of transcription: initiation, elongation & termination. Upstream & downstream RNA promoters. Transcription in eukaryotes. Genetic code; Properties of genetic code, Evidence for triplet codon, Wobble hypothesis, Protein Synthesis: mechanism of translation in prokaryotes & eukaryotes.

#### **Unit III:**

The Operon: Lac operon, Positive & negative control of transcription. Transposons. Mutation : types of mutation, Molecular basis of mutation, Mutagenesis, Detection of mutants – Ames test, DNA repair mechanisms.

#### **Unit IV:**

An introduction of recombinant DNA technology, Cloning vector of r DNA: - Plasmids, Cosmid, Phagmids vector. Enzymes used in Genetic Engineering – Restriction endonucleases, ligases, Alkaline phosphatase, polynucleotide kinase, Taq polymerase, Reverse transcriptase.

#### **UNIT V.**

Gene cloning in prokaryotes: Cloning strategies: Construction of genomic libraries and cDNA libraries – Techniques used in RDT- western, northern, and southern blotting. fluroscent *in situ* hybridization, polymerase chain reaction, DNA finger printing.

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**MB 302 Lab Course I: Molecular Biology Recombinant & DNA Technology**

*Extraction*

1. Isolation of DNA
2. *Extraction*  
Isolation of plasmid DNA
3. Isolation of antibiotics resistant bacteria.
4. Effect of UV radiation on bacterial growth.
5. DNA amplification using Polymerase chain reaction (PCR).

**Recommended Books:**

- 1 General Microbiology, Vol. II, by Powar and Dagainawala ,Himalaya publication New Delhi.
- 2 Molecular Biology and Biotechnology by H.O. Kumar
- 3 Elements of Biotechnology by P.K. Gupta, Rastogi publication Merrut.

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## SEMESTER IV

### MB 401: Food Microbiology & Fermentation Technology

#### Unit I:

*Foodborne microorganisms*  
Introduction to (microorganisms in food) – historical developments. Microorganisms associated with food, factors affecting growth of micro-organisms in food, Development of Novel Food and food Ingredients: Single cell protein. Importance of microorganisms in dairy industries..

#### UNIT II:

Contamination & spoilage – cereals, vegetables & fruits, Meat & meat products, milk & milk products, fish & sea foods, Egg & Poultry products, Spoilage of canned foods. Detection of spoilage & Characterization. Food preservation – Principles, Asepsis (anaerobic condition, high temperature, low temperature & drying), Food additives, Canning. Role of radiation in food preservation

#### UNIT III:

Food borne diseases caused by bacteria viz. Brucella, Bacillus, Clostridium, Escherichia, Salmonella, Staphylococcus, and Vibrio. Fermented foods and dairy products (Cheese, Bread, Butter), Vegetable (Sauerkraut). Production of cheese, Butter milk, & in Bakery industries – leavening of bread, Indian fermented foods.

#### UNIT IV.

Fermentation equipment and production process. Principal & types of fermenters. The batch fermenters, continuous stirred tank fermenters. Computer control of fermentation process. Strain improvement process. Industrial production of organic acids – Lactic & citric acid.

#### Unit- V:

Production of alcohol, wine, beer. Production of antibiotics – Penicillin & Streptomycin. Industrial production of vitamins – vitamin B12 and Riboflavin. Role of international organization in biotechnology. Government programs for biotechnology development. Hazardous Industrial wastes, Mycotoxin hazards in the production of fungal products.. Patenting of the products in Industries.

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## MB 402 Lab Course IV: Food Microbiology & Fermentation Technology

### Practical:

- 1 Study of microbial diseases of crop plants.
- 2 Study of effect of fungicides and insecticides on microorganisms.
- 3 Study of antagonistic activities amongst microorganisms.
- 4 Study of fungal contaminants from stored agricultural products.
- 5 Study of food spoilage microorganisms from sweets and bakery products.
- 6 Study of effect of the preservatives on the growth of microorganisms.
- 7 Study of UV radiations on microorganisms.
- 8 Study of the effect of agrochemicals on soil inhabiting microorganisms.

### Recommended Books:

- 1 Modern Plant Pathology by Bilgramy and Dubey.
- 2 Food Microbiology by Frazier, Mc graw hill New Delhi.
- 3 Microbiology by S.S. Purohit, Agrobiosis Jodhpur
- 4 Microbiology by P.D. Sharma.
- 5 Industrial Microbiology by L.E. Casida New age publication New Delhi.
- 6 Fermentation Technology by Whittaker A.ditya book publication New delhi

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## Semester V

### **MB501: Enzymology & Immunotechnology**

#### **Unit I:**

Enzyme: Nomenclature & classification of enzymes. Mechanism of Enzyme action: Enzyme specificity, Active site, Effect of pH, temperature on enzymatic reactions. Coenzymes & Cofactors, substrate enzyme relationship, structure and function of conenzymes ; CoA, NAD/NADP, FMN/FAD, Biotin, Folic acid, vit. B12,

#### **Unit II:**

Enzyme Technology : Microbial Production of Industrial enzymes: Cellulase, amylase & protease. Application of enzymes in food & pharmaceutical industries- large scale enzyme extraction, purification & stabilization. Clinical enzymology – Serum enzymes in health and diseases.

#### **Unit III:**

History & development of Immunology. Infection: types and sources of infection. Active & passive immunity, Brief introduction to humoral & cellular immunity. Clonal selection theory.

#### **Unit IV.**

Antigens: definition and determination of antigenicity. Structure, <sup>and types</sup> & function of immunoglobulins. Antigen - antibody reaction, Immunological techniques: RIA, ELISA.

#### **Unit V:**

<sup>Technology</sup> Hybridoma techniques: monoclonal antibody production & their applications. Vaccines: types of vaccines, prophylaxis against diseases.

#### **Recommended Books:**

1. Biochemistry by Lehninger
2. Enzyme: Biochemistry and Biotechnology Palmer and Trevor
3. Immunology by Kubey.
4. Immunology by G.P. Talwar.

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**MB502: Practical work:**

1. Detection of blood group.
2. Detection of antigen or antibody in serum.
3. Cell counting in blood.
4. Enzyme production by microorganisms.
5. Effect of various parameters viz pH, temperature on enzyme activity.

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## Semester VI

### **MB601: Environmental Microbiology & Biostatistics**

#### **Unit I:**

Soil microorganisms: Types of microbial communities in air, water and soil, microbial diversity: Rhizosphere & phyllosphere. Microbial interaction between microbes – neutralism, commensalism, synergism, mutualism, ammensalism, competition, parasitism and predation. Biogeochemical cycling – Carbon, Nitrogen, Sulphur and Phosphorus.

#### **Unit II:**

Microbiology of air and water – Aeromicrobial pathways – Enumeration of bacteria from air. Nitrogen fixation by symbiotic and non-symbiotic microorganisms. Use of microorganisms as biofertilizers. Mass cultivation of *Rhizobium* and *Azotobacter*. Use of blue-green algae as biofertilizers..

#### **Unit III:**

Liquid waste disposal. Nature of domestic and municipal waste and sewage. Sewage treatments, Solid waste disposal, Methods of disposal of Agricultural waste. Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Dissolve Oxygen (DO), Bioremediation, Environmental Protection Agency (EPA).

#### **Unit IV:.**

Biodegradation of herbicide & pesticides. Microbial products & plant health: PGPR (plant growth promoting rhizobacteria). Control of plant diseases: Chemical & biological control of plant diseases. Significance of mycorrhizae, toxin producing microbes (antibiotics, aflatoxins etc.), microbial herbicides, and biological control.

#### **Unit V:**

Define statistics & its uses. Central tendency: Mean Mode & median. Standard deviation, Standard Error. T- test, Chi square test, Applications of statistical methods in research.

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## Recommended Books:

- 1 Introduction to Soil Microbiology by Martin Alexander.
- 2 General Microbiology by Pelczar, Pied & Chan
- 3 Biofertilizers in Agriculture by N.S. Subha Rao.
- 4 Statistics by Mishra & Mishra
- 5 General Microbiology, Vo. II, by Powar & Daginawala, Himalaya publication New Delhi.
- 6 Cell Biology by Powar, Himalaya publication New Delhi.
- 7 General Microbiology, Vol. II, by Powar and Daginawala Himalaya publication New Delhi.

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20/06/2016

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602 :Project Work

To be carried out on a specific defined objective under the supervision of a Teacher the compiled work is to be submitted in the form of dissertation.

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28/6/16

Sumit  
29/06/2016  
P. I. Arshad  
28/06/16

P. I. Arshad

~~Sumit~~

**INDUSTRIAL MICROBIOLOGY**  
(UG Self finance Course) 2016-17

**LIST OF EXAMINERS**

Sr. No.	Name	Address	Mob. No.
1	Prof Shashi Chauhan	Retd.Prof. SOS Jiwaji Uni. Gwl	
2	Prof. Rekha Bhadoria	Prof. SOS Jiwaji Uni. Gwl	
3	Prof. R.M.Agrawal	Prof. SOS Jiwaji Uni. Gwl	
4	Prof. Avinash Tiwari	Prof. SOS Jiwaji Uni. Gwl	
5	Prof. M.K.Gupta	Prof. SOS Jiwaji Uni. Gwl	
6	Dr. Sushil Manderia	SOS Jiwaji Uni. Gwl	
7	Dr. Sapan Patel	SOS Jiwaji Uni. Gwl	
8	Dr. Archana Shrivastava	Director, CHRI Gwalior	
9	Dr. R.A.S. Chauhan	PG College Ambah	
10	Prof. B.M.Kulshreshtha	Govt. KRG College Gwalior	
11	Prof. Madhu Laxmi Sharma	Govt. KRG College Gwalior	
12	Prof. Sadhna Pandey	Govt. KRG College Gwalior	
13	Mrs. Charanjit Mehta	Govt. VRS College Morar	
14	Dr. D.S.Rathore	Govt. KRG College Gwalior	
15	Dr. Preeti Kulshreshtha	Govt. KRG College Gwalior	
16	Dr. S.H.Qureshi	Govt. PG College Shivpuri	
17	Dr. A.C.raghuvanshi	Govt. Sci. College Gwalior	
18	Dr. H.O.Sharma	Govt. Sci. College Gwalior	
19	Dr. R.K.S. Kushwaha	Govt. PG College Morena	
20	Dr. R.K.Khare	Govt. Sci. College Gwalior	
21	Dr. V.K.Sewaria	Govt. Sci. College Gwalior	
22	Dr. D.P.Sharma	Govt. Sci. College Gwalior	
23	Prof. Deep Azad	Govt. SLP College Morar	
24	Dr. B.B.Gupta	Govt. SLP College Morar	
25	Dr. J.K.Mishra	Govt. PG College Morena	
26	Dr.R.P.Singh	Govt. PG College Morena	
27	Dr.S.K.Raina	Retd. Prof. PGV College Gwl	
28	Dr. Rajbeer Singh	K.K.College Etawah	
29	Dr. Reena Jain	Boston College Gwalior	
30	Dr. Madhu Gupta	CHRI Gwalior	
31	Dr. Usha Duseja	CHRI Gwalior	
32	Dr. P.P.Deo	Govt. Sci. College Gwalior	
33	Dr. Kusum kashyap	Govt. Girls College Chhatarpur	
34	Dr. K.K.Dubey	Retd. Prof.	
35	Dr. Sushil Sharma	Scientist, DRDO Gwalior	
36	Prof. Ragini Gothwal	Barkatullah Uni. BPL	
37	Dr. Surnhi Shrivastava	Gargi College Delhi	
38	Dr. Sangeeta Shrivatava	Pri. Sci. Indian Institute of Sugarcan Research Lucknow	
39	Dr. Sanjeev Kumar	Pri. Sci. Indian Institute of Sugarcan Research Lucknow	
40	Dr. Alka Pandey	Govt. PG College Betul	

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5. यदि विभाग में स्ववित्तीय योजना के तहत कोई पाठ्यक्रम/अतिरिक्त विषय/डिप्लोमा कोर्स/सर्टिफिकेट कोर्स प्रारंभ करने की योजना हो तो उसका विवरण एवं अनुशंसा।

~~Food processing~~ <sup>Food Basis food Sci & Food processing Dept of HSE.</sup>

6. यदि अन्य कोई विषय हो तो उसका विवरण एवं अनुशंसा।

1) Industrial visit to C. B. Manghazani  
Cacharijs, Gwalior

2) S.F.R.I., Jabalpur

हस्ताक्षर अध्ययन मंडल अध्यक्ष एवं समस्त सदस्य

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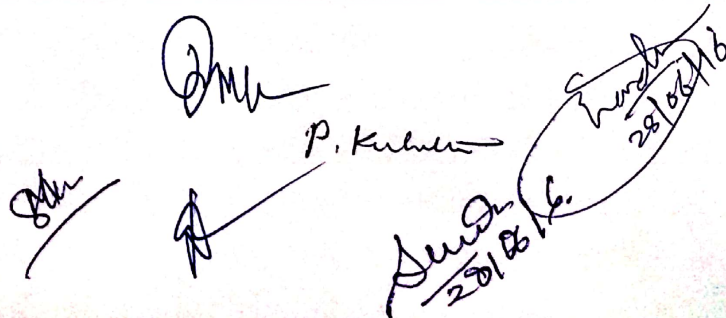
Shadain



**BIOINFORMATICS**  
(UG Self finance Course) 2016-17

**LIST OF EXAMINERS**

Sr. No.	Name	Address	Mob. No.
1	Prof Shashi Chauhan	Retd.Prof. SOS Jiwaji Uni. Gwl	
2	Prof. Rekha Bhadoria	Prof. SOS Jiwaji Uni. Gwl	
3	Prof. R.M.Agrawal	Prof. SOS Jiwaji Uni. Gwl	
4	Prof. Avinash Tiwari	Prof. SOS Jiwaji Uni. Gwl	
5	Prof. M.K.Gupta	Prof. SOS Jiwaji Uni. Gwl	
6	Dr. Sushil Manderia	SOS Jiwaji Uni. Gwl	
7	Dr. Sapan Patel	SOS Jiwaji Uni. Gwl	
8	Dr. Archana Shrivastava	Director, CHRI Gwalior	
9	Dr. R.A.S. Chauhan	PG College Ambah	
10	Prof. B.M.Kulshreshtha	Govt. KRG College Gwalior	
11	Prof. Madhu Laxmi Sharma	Govt. KRG College Gwalior	
12	Prof. Sadhna Pandey	Govt. KRG College Gwalior	
13	Mrs. Charanjit Mehta	Govt. VRS College Morar	
14	Dr. D.S.Rathore	Govt. KRG College Gwalior	
15	Dr. Preeti Kulshreshtha	Govt. KRG College Gwalior	
16	Dr. S.H.Qureshi	Govt. PG College Shivpuri	
17	Dr. A.C.raghuvanshi	Govt. Sci. College Gwalior	
18	Dr. H.O.Sharma	Govt. Sci. College Gwalior	
19	Dr. R.K.S. Kushwaha	Govt. PG College Morena	
20	Dr. R.K.Khare	Govt. Sci. College Gwalior	
21	Dr. V.K.Sewaria	Govt. Sci. College Gwalior	
22	Dr. D.P.Sharma	Govt. Sci. College Gwalior	
23	Prof. Deep Azad	Govt. SLP College Morar	
24	Dr. B.B.Gupta	Govt. SLP College Morar	
25	Dr. J.K.Mishra	Govt. PG College Morena	
26	Dr.R.P.Singh	Govt. PG College Morena	
27	Dr.S.K.Raina	Retd. Prof. PGV College Gwl	
28	Dr. Rajbeer Singh	K.K.College Etawah	
29	Dr. Reena Jain	Boston College Gwalior	
30	Dr. Madhu Gupta	CHRI Gwalior	
31	Dr. Usha Duseja	CHRI Gwalior	
32	Dr. P.P.Deo	Govt. Sci. College Gwalior	
33	Dr. Kusum kashyap	Govt. Girls College Chhatarpur	
34	Dr. K.K.Dubey	Retd . Prof.	
35	Dr. Sushil Sharma	Scientist, DRDO Gwalior	
36	Prof. Ragini Gothwal	Barkatullah Uni. BPL	
37	Dr. Surnhi Shrivastava	Gargi College Delhi	
38	Dr. Sangeeta Shrivatava	Pri. Sci. Indian Institute of Sugarcane Research Lucknow	
39	Dr. Sanjeev Kumar	Pri. Sci. Indian Institute of Sugarcane Research Lucknow	
40	Dr. Kishore Shende	Barkatullah Uni. BPL	9424917855
41	Dr. Ashok Verma	Tata Cancer Res. Institute Mumbai	


  
 P. Kulshreshtha  
 28/06/16  
 28/06/16

कार्यालय प्राचार्य, शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय, खालियर

दिनांक 28 जून, 2016

Microbiology - विभाग

अध्ययन मंडल की बैठक का कार्यवाही विवरण

नवीन सत्र 2016-17 हेतु Microbiology विषय से सम्बंधित

अध्ययन मण्डल की बैठक आज दिनांक 28 जून, 2016 को प्रातः 11:00 बजे

Botany विभाग में आयोजित की गई, जिसमें निम्नानुसार उपस्थिति रही -

1. डॉ. Sadhna Pandey. Sadhna Pandey  
28/6/16
2. डॉ. Rekha Bhadauriya. Rekha Bhadauriya  
28/6/16
3. डॉ. Sushil Kumar Sharma. Sushil Kumar Sharma  
28/6/16
4. डॉ. B.M. Kushrothe. B.M. Kushrothe  
28/6/16
5. डॉ. Dr. Madhu Laxmi Sharma. Madhu Laxmi Sharma  
28.6.16
6. डॉ. Dr. D.S. Rehan. D.S. Rehan  
28.6.16
7. डॉ. Dr. Preeti Kulkarni. P. Kulkarni  
28/6/16
8. डॉ.
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