

**Syllabus  
MICROBIOLOGY  
(UG courses)  
Admitted Batch 2010 -2011**



**May 2011  
A.P. State Council of Higher Education**

**SUBJECT COMMITTEE**

Dr. K. Mythili : Convener  
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Govt College for Women  
SRIKAKULAM 532001

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## STRUCTURE OF MODEL CURRICULUM

## MICROBIOLOGY

Year	Paper No. Theory/Lab	Title	Work load Hrs/Week	Exam Duration Hrs	Marks
I	I Theory	Introductory Microbiology	4 Hrs	3 Hrs	100
	I Lab	Introductory Microbiology	3 Hrs	3 Hrs	50
II	II Theory	Microbial physiology and Genetics	4 Hrs	3 Hrs	100
	II Lab	Microbial Physiology and Genetics	3 Hrs	3 Hrs	50
III	III Theory	Immunology and Medical Microbiology	3 Hrs	3 Hrs	100
	III Lab	Immunology and Medical Microbiology	3 Hrs	3 Hrs	50
	IV Theory	Applied Microbiology	3 Hrs	3 Hrs	100
	IV Lab	Applied Microbiology	3 Hrs	3 Hrs	50

**Total number of hours for theory papers and labs in an academic year:**

Theory Paper I :	120 Hrs	Lab I:	90 Hrs (30 sessions)
Theory Paper II :	120 Hrs	Lab II:	90 Hrs (30 sessions)
Theory Paper III :	90 Hrs	Lab III:	90 Hrs (30 sessions)
Theory Paper IV :	90 Hrs	Lab IV:	90 Hrs (30 sessions)

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III Year B.Sc. MICROBIOLOGY SYLLABUS 2010-11

Paper III: IMMUNOLOGY AND MEDICAL MICROBIOLOGY

90 hrs  
(3 hrs/ week)

**UNIT – I History of Immunology and Immune System 22 Hrs**

Development of immunology.

Types of immunity – innate and acquired; active and passive; humoral and cell-mediated immunity.

Primary and secondary organs of immune system – thymus, bursa fabricus, bone marrow, spleen and lymph nodes.

Cells of immune system.

Identification and function of B and T lymphocytes, null cells, monocytes, macrophages, neutrophils, basophils and eosinophils.

**UNIT – II Basics of Immunology 22 Hrs**

Antigens – types, chemical nature, antigenic determinants, haptens.

Factors affecting antigenicity. Antibodies – basic structure, types, properties and functions of immunoglobulins.

Components of complement and activation of complement.

Types of antigen-antibody reactions – agglutination, blood groups, precipitation, neutralization, complement fixation.

Labeled antibody based techniques – ELISA and Immunofluorescence. Polyclonal and monoclonal antibodies – production and applications.

Types of hypersensitivity – immediate and delayed.

Autoimmunity and its significance.

**UNIT – III Clinical Microbiology 23 Hrs**

History of medical microbiology.

Normal flora of human body.

Definition of infection, non-specific defense mechanisms, antagonism of indigenous flora.

Anti-bacterial substances – lysozyme, complement, properdin, phagocytosis.

General principles of diagnostic microbiology.

Collection, transport and processing of clinical samples.

General methods of laboratory diagnosis – cultural, biochemical, serological and molecular methods.

Tests for antimicrobial susceptibility.

Antiviral agents – interferon and base analogues.

Host-pathogen interactions. Bacterial toxins, virulence and attenuation.

**UNIT – IV Microorganisms and Diseases**

**23 Hrs**

Elements of chemotherapy – therapeutic drugs. Drug resistance.

Mode of action of penicillin and sulpha drugs, and their clinical use.

Preventive control of diseases – active and passive immunization.  
natural and recombinant.

Vaccines –

General account of the following diseases – causal organisms, pathogenesis, epidemiology, diagnosis, prevention and control of:

Air-borne diseases	- Tuberculosis, Influenza
Food and water-borne diseases	- Cholera, Typhoid, Hepatitis- A Poliomyelitis, Amoebiasis
Insect-borne diseases	- Malaria, Filariasis, Dengue fever
Contact diseases	- Syphilis, Gonorrhoea
Zoonotic diseases	- Rabies, Anthrax
Blood-borne diseases	- Serum hepatitis, AIDS

General account of nosocomial infections.

**TEXT AND REFERENCE BOOKS:**

Reddy, S.R. and Reddy, K.R. (2006). **A Text Book of Microbiology - Immunology and Medical Microbiology**, Himalaya Publishing House, Mumbai.

Tizard, I.R. (1995). **Immunology : An Introduction**, WB Saunders, Philadelphia, USA.

Riott, I.M. (1998). **Essentials of Immunology**, ELBS and Black Well Scientific Publishers, England.

Goldsby, Kindt, T.J. and Osborne, B.A. (2004). **Kuby Immunology**, 6<sup>th</sup> Edition, W.H.Freeman and Company, New York.

Lydyard, P.M., Whelan, A. and Fanger, M.W. (2000). **Instant Notes in Immunology**, Viva Books Pvt. Ltd., New Delhi.

Chakraborty, B. (1998). **A Text Book of Microbiology**, New Central Book Agency (P) Ltd, Calcutta, India.

Ananthanarayana, R. and Panicker, C.K.S. (2000). **Text Book of Microbiology**, 6<sup>th</sup> Edition, Oriental Longman Publications, USA.

Gupte, S. (1995). **Short Text Book of Medical Microbiology**, 8<sup>th</sup> Edition, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.

- Annadurai, B. (2008). **A Textbook of Immunology and Immunotechnology**. S. Chand & Co. Ltd., New Delhi.
- Dey, N., T.K. and Sinha, D. (1999). **Medical Bacteriology Including Medical Mycology and AIDS**. New Central Book Agency (P) Ltd. Calcutta, India.
- Shetty, N. (1994). **Immunology – Introductory Textbook**. New Age International Pvt. Ltd., New Delhi.
- Singh, R.P. (2007). **Immunology and Medical Microbiology**. Kalyani Publishers, New Delhi.

**PRACTICAL PAPER - III**

**IMMUNOLOGY AND MEDICAL MICROBIOLOGY**

**90 hrs**  
(3 hrs/ week)

1. Blood tests – TC, DC and ESR.
2. Estimation of blood haemoglobin.
3. Determination of blood groups and Rh typing.
4. Antigen-antibody interactions in Widal test, VDRL test
5. Acid-fast staining of mycobacteria (stained/permanent slides).
6. Isolation and identification of medically important bacteria (E. coli, Klebsiella, Pseudomonas, Staphylococcus and Streptococcus) by cultural, microscopic and biochemical tests.
7. Antibiotic sensitivity testing – disc diffusion method.
8. Observation of fungal pathogen (Candida).
9. Tests for disinfectant (Phenol coefficient).
10. Project work on any of the following diseases prevalent in your area  
a) TB b) Hepatitis c) Malaria d) Filaria

**REFERENCE BOOKS FOR LAB:**

- Gopal Reddy, M., Reddy, M.N., Saigopal, DVR and Mallaiah, K.V. (2007). **Laboratory Experiments in Microbiology**, 2<sup>nd</sup> edition. Himalaya Publishing House, Mumbai.
- Talwar, G.P. and Gupta, S.K. (1992). **A Hand Book of Practical and Clinical Immunology**. CBS Publications, New Delhi.
- Baren, E.J. (1994). **Bailey and Scott's Diagnostic Microbiology**, 9<sup>th</sup> Edition, Mosby Publishers.
- Dubey, R.C. and Maheswari, D.K. (2002). **Practical Microbiology**, S. Chand & Co., New Delhi.
- Samuel, K.M. (Ed.) (1989). **Notes on Clinical Lab Techniques**, M.K.G. Iyyer & Son Publishers, Chennai.
- Wadher, B.J. and Reddy, G.L.B. (1995). **Manual of Diagnostic Microbiology**, Himalaya Publishing House, Mumbai.
- Dey, N.C., Dey, T.K., Dey, M. and Sinha, D. (1998). **Practical Microbiology, Protozoology, and Parasitology**. New Central Book Agency (P) Ltd. Calcutta.
- Mukherjee, K.L. (1996). **Medical Laboratory Technology**. Vol II. Tata Mc GrawHill Publishing Co. Ltd., New Delhi.

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Paper IV: APPLIED MICROBIOLOGY SYLLABUS 2010-11 90 hrs  
(3 hrs/ week)

**UNIT - I Agricultural Microbiology 23 Hrs**

Physical and chemical characteristics of soil.

Rhizosphere and phyllosphere.

Plant growth-promoting microorganisms -mycorrhizae, rhizobia, Azospirillum, Azotobacter, cyanobacteria, Frankia and phosphate-solubilizing microorganisms. Outlines of biological nitrogen fixation (symbiotic, non-symbiotic).

Biofertilizers – Rhizobium, Azotobacter, Cyanobacteria

Concept of disease in plants.

Symptoms of plant diseases caused by fungi, bacteria, and viruses.

Plant diseases caused by fungi, bacteria and viruses.

Principles of plant disease control.

Biological control of plant diseases. Biopesticides – Bacillus thuringiensis, Nuclear polyhedrosis virus (NPV), Trichoderma.

**UNIT – II Environmental Microbiology 22 Hrs**

Microorganisms of environment (soil, water and air).

Role of microorganisms in nutrient cycling (carbon, nitrogen, sulphur).

Microbial interactions – mutualism, commensalism, antagonism, competition, parasitism, predation.

Microbiology of potable water-Water purification, Determination of water potability, Coliform detection. E. coli and Streptococcus faecalis as indicators of water pollution. Sanitation of potable water.

Microbiology of polluted water- Sewage treatment (primary, secondary and tertiary).

Outlines of biodegradation of environmental pollutants – pesticides. Solid waste disposal – sanitary land fills, composting.

Microbiology of air and air sampling methods.

**UNIT – III Food Microbiology 23 Hrs**

Microorganisms of food spoilage and their sources.

Spoilage of different food materials - fruits, vegetables, meat, fish.

Canned foods. Food intoxication (botulism and staph poisoning), food-borne diseases (salmonellosis and shigellosis) and their detection.

General account of food preservation.

Microbiological production of fermented foods – bread, cheese, yogurt.



Biochemical activities of microbes in milk.

Microorganisms as food – SCP, edible mushrooms (white button, oyster and paddy straw)

Concept of probiotics.

**UNIT – IV Industrial Microbiology**

**22 Hrs**

Microorganisms of industrial importance – yeasts, moulds, bacteria, actinomycetes.

Screening and isolation of industrially-important microorganisms.

Concept of strain improvement.

Types of fermentation – aerobic, anaerobic, batch, continuous, submerged, surface, solid state.

Design of a stirred tank reactor fermentor. Fermentation media.

Industrial production of alcohols (ethyl alcohol), beverages (beer), enzymes (amylases), antibiotics (penicillin), amino acids (glutamic acid), organic acids (citric acid), vitamins (B12), biofuels (biogas - methane)

**TEXT AND REFERENCE BOOKS:**

Stanbury, P.F., Whitaker, A. and Hall, S.J. (1997). **Principles of Fermentation Technology**, Aditya Books (P) Ltd. New Delhi.

Doyle, M.P., Beuchat, L.R. and Montville, T.J. (1997). **Food Microbiology: Fundamentals and Frontiers**. ASM Press, Washington D.C., USA.

Frazier, W.C. and Westhoff, D.C. (1988). **Food Microbiology**, Mc Graw-Hill, New York.

Jay, J.M. (1996). **Modern Food Microbiology**, Chapman and Hall, New York.

Ray, B. (1996). **Fundamentals of Food Microbiology**, CRC Press, USA.

Subba Rao, N.S. (1993). **Biofertilizers in Agriculture and Forestry**, 3<sup>rd</sup> Edition Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Rangaswami, G. and Bhagyaraj, D.J. (2001). **Agricultural Microbiology**, 2<sup>nd</sup> Edition, Prentice Hall of India, New Delhi.

Atlas, R.M. and Bartha, R. (1998). **Microbial Ecology - Fundamentals and Applications**, Addison Wesley Longman, Inc., USA

Paul, E.A. and Clark, F.E. (1989). **Soil Microbiology and Biochemistry**, Academic Press, USA.

Lynch, J.M. and Poole, N.J. (1979). **Microbial Ecology – A Conceptual Approach**, Blackwell Scientific Publications, USA

- Alexander, M. (1985). **Introduction to Soil Microbiology**, 3<sup>rd</sup> Edition. Wiley Eastern Ltd., New Delhi.
- Adams, M.R. and Moss, M.O. (1996). **Food Microbiology**, New Age International (P) Ltd, New Delhi.
- Banwart, G.J. (1987). **Basic Food Microbiology**, CBS Publishers and Distributors, New Delhi.
- Patel, A.H. (1984). **Industrial Microbiology**, Mac Milan India Ltd., Hyderabad.
- Cassida, L.E. (1968). **Industrial Microbiology**, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.
- Crueger, W. and Crueger, A. (2000). **Biotechnology – A Text Book of Industrial Microbiology**, Panima Publishing Corporation, New Delhi
- Reed, G. (Ed.) (1987). **Prescott & Dunn’s Industrial Microbiology**, 4<sup>th</sup> Edition, CBS Publishers & Distributors, New Delhi.
- Subba Rao, N.S. (1999). **Soil Microorganisms and Plant Growth**. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- Reddy, S.R. and Singara Charya, M.A. (2007). **A Text Book of Microbiology - Applied Microbiology**. Himalaya Publishing House, Mumbai.
- Singh, R.P. (2007). **Applied Microbiology**. Kalyani Publishers, New Delhi.
- Demain, A.L. and Davies, J.E. (1999). **Manual of Industrial Microbiology and Biotechnology**, ASM Press, Washington, D.C., USA.

PRACTICAL PAPER - IV

APPLIED MICROBIOLOGY

90 hrs  
(3 hrs/ week)

1. Isolation and enumeration of major groups of microorganisms from rhizosphere and nonrhizosphere.
2. Study of root nodules and isolation of Rhizobium from legume root nodules.
3. Isolation of Azospirillum / Azotobacter.
4. Staining and observation of vesicular-arbuscular mycorrhizal (VAM) fungi.
5. Observation of plant diseases of local importance – Rusts, smuts, powdery mildews, tikka disease of groundnut, citrus canker, bhendi yellow vein mosaic, tomato leaf curl, little leaf of brinjal.
6. Isolation of antagonistic microorganisms by crowded plate technique.
7. Isolation of microorganisms of air by Petri plate exposure method.
8. Determination of biological oxygen demand (BOD) of polluted water.
9. Microbial testing of water by coliform test (multiple tube fermentation method).
10. Determination of microbiological quality of milk – MBRT.
11. Observation of different spoiled foods.
12. Isolation of fungi and bacteria from spoiled fruits and vegetables.
13. Alcohol production and estimation; Calculation of fermentation efficiency.
14. Estimation of ascorbic acid from fruit juices.
15. Visit an Industry and submit Report during final practical examination (Compulsary)

REFERENCE BOOKS FOR LAB:

- Gopal Reddy, M., Reddy, M.N., Saigopal, DVR and Mallaiah, K.V. (2007). **Laboratory Experiments in Microbiology**, 2<sup>nd</sup> edition. Himalaya Publishing House, Mumbai.
- Reddy, S.M. and Reddy, S.R. (1998). **Microbiology – Practical Manual**, 3<sup>rd</sup> Edition, Sri Padmavathi Publications, Hyderabad
- Aneja, K.R. (2001). **Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom Production Technology**, 3<sup>rd</sup> Edition, New Age International (P) Ltd., New Delhi.
- Dubey, R.C. and Maheswari, D.K. (2002). **Practical Microbiology**, S. Chand & Co., New Delhi.
- Burns, R.G. and Slater, J.H. (1982). **Experimental Microbiology and Ecology**. Blackwell Scientific Publications, USA.
- Peppler, I.L. and Gerba, C.P. (2004). **Environmental Microbiology – A Laboratory Manual**. Academic Press. New York.
- Gupte, S. (1995). **Practical Microbiology**. Jaypee Brothers Medical Publishers Pvt. Ltd.
- Kannan, N. (2003). **Hand Book of Laboratory Culture Medias, Reagents, Stains and Buffers**. Panima Publishing Co., New Delhi.

MODEL QUESTION PAPER FOR THEORY

B.Sc DEGREE EXAMINATION,

Third Year

MICROBIOLOGY PAPER III - 2012-2013

**PAPER-III IMMUNOLOGY AND MEDICAL MICROBIOLOGY**

Time: 3 Hrs

Maximum Marks: 100

**PART-A**

**(4x15 =60)**

**Answer all questions**

- 1) (a) Give a detailed note on types of immunity

వ్యాధి నిరోధక శక్తిలో రకాలు గూర్చి వివరించండి.

Or

- (b) Write an essay on cells of immune system

వ్యాధి నిరోధకత వ్యవస్థలోని కణాలను గురించి వ్రాయండి.

- 2) (a) Write an essay on immunoglobulins

ఇమ్ములో గ్లోబ్యులిన్స్ గూర్చి వివరించండి.

Or

- (b) Give a detailed note on Hypersensitivity

అతిసున్నితత్వం గురించి వివరించండి.

- 3) (a) Write an essay on normal flora of human body

ప్రయోగశాలలో వ్యాధి నార్ధారణ పద్ధతుల గురించి వివరించండి.

Or

- (b) Write an essay on general methods of laboratory diagnosis

అంటుకునే వ్యధుల గురించి వ్రాయండి.

- 4) (a) Write an essay on vaccines

Or

(b) Explain in detail about contact diseases

**PART-B (6x4 =24)**

**Answer any SIX questions**

5) Spleen

ఘీహం

6) Function of Lymphocytes

లింఫోసైట్స్ విధులు.

7) Antigens

ప్రతిజనకాలు

8) Monoclonal antibodies

మోనోక్లోనల్ ఆంటీబాడీస్

9) Phagocytosis

భక్షణ ప్రక్రియ

10) Bacterial toxins

బాక్టీరియా విషపదార్థాలు.

11) Mode of action of penicillin

పెన్సిలిన్ చర్యావిధానము.

12) Dengue fever

డెంగూ ఫీవర్.

**PART- C (8x2 =16)**

**Answer all questions**

13) Define immunity

వ్యాధినిరోధకత నిర్వచనము.

14) Edward Jenner

ఎడ్వార్డ్జెన్నర్

15) ELISA

ELISA

16) Agglutination

గుచ్చీకరణం

17) Lysozyme

లైసోజైమ్

18) Virulence

విరులెన్స్

19) Chemotherapy

కీమిథెరస్

20) Passive immunization

విస్తీజిత వ్యాధినిరోధకత

MODEL QUESTION PAPER FOR THEORY

B.Sc DEGREE EXAMINATION,

Third Year

MICROBIOLOGY PAPER IV - 2012-2013

PAPER-IV APPLIED MICROBIOLOGY

Time: 3 Hrs

Maximum Marks: 100

**PART- A (4x15 =60)**

**Answer all questions**

1) (a) Write an essay on Biofertilizers

జీవ ఎరువులు గూర్చి వివరించండి.

Or

(b) Write an essay on Biopesticides

బయోపెస్టిసైడ్స్ పై ఒక వ్యాసం వ్రాయండి.

2) (a) Give a detailed note on Sewage treatment

మురుగు నీటిని శుభ్రపరిచే విధానం గురించి వ్రాయండి.

Or

(b) Write an essay on microbiology of air and air sampling methods

గాలి యొక్క సూక్ష్మజీవ శాస్త్రాన్ని గూర్చి వివరిస్తు.

3) (a) Write an essay on Food Preservation

ఆహార నిల్వ పద్ధతులు గూర్చి వివరించండి.

Or

(b) Write an essay on mushroom production

పుట్టుగొడుగులు తయారు చేయు పద్ధతి గూర్చి వివరించండి.

5) (a) How do you perform screening technique for the isolation of industrially important microorganisms

పారిశ్రామిక ప్రాముఖ్యత కలిగిన సూక్ష్మజీవులను వేరు పరిచే స్క్రీనింగ్ విధానాలను తెలుపుము

Or

(b) Write an essay on industrial production of penicillin

పరిశ్రమలలో పెన్సిలిన్ ను తయారు చేయు పద్ధతిని గూర్చి వివరించండి.

**PART-B (6x4 =24)**

**Answer any SIX questions**

5) Rhizosphere

రైజోస్ఫియర్

6) Plant diseases caused by bacteria

బాక్టీరియా వలన మొక్కలకు కలిగే వ్యాధులు.

7) Carbon cycle

కరంబన వలయం

8) Composting

కంపోస్టింగ్

9) Yogurt

యోగర్ట్

10) Botulism

బొట్యులిసమ్

11) Design of Fermentor

కిణ్య ప్రక్రియ పరికరం మొక్కడిజైన్

12) Solid state Fermentation

ఝనస్థితి కిణ్యప్రక్రియ

**PART- C (8x2 =16)**

**Answer all questions**

13) Azotobacter

ఎజొటోబేక్టర్

14) Smut

స్ముట్

15) Commensalism

సహభోజకత్వం

16) Biodegradation

జీవవిభిన్నిత

17) Ropiness in milk

పాలరోపీన్స్

18) Probiotic

ప్రోబయాటిక్

19) Strain improvement



స్ట్రీన్ అభివృద్ధి

20) Molasses

మొలాసెస్

MODEL QUESTION PAPER FOR PRACTICAL  
B.Sc DEGREE EXAMINATION,

Third Year

MICROBIOLOGY PAPER III - 2012-2013

**PAPER-III IMMUNOLOGY AND MEDICAL MICROBIOLOGY**

Time: **3 Hrs**

Maximum Marks: **50**

- |                             |          |
|-----------------------------|----------|
| 1) Experiment on Immunology | 10 marks |
| 2) Experiment on Hematology | 10 marks |
| 3) Project Work             | 20 marks |
| 4) Record                   | 05 marks |

5) Viva voce

05 marks

MODEL QUESTION PAPER FOR PRACTICAL  
B.Sc DEGREE EXAMINATION,  
Third Year  
MICROBIOLOGY PAPER IV - 2012-2013  
**PAPER-IV APPLIED MICROBIOLOGY**

Time: **3 Hrs**

Maximum Marks: **50**

- |   |          |
|---|----------|
| 1) Report on Industrial visit               | 10 marks |
| 2) Experiment on Food Microbiology          | 10 marks |
| 3) Experiment on Agricultural Microbiology  | 10 marks |
| 4) Experiment on Environmental Microbiology | 10 marks |

5) Record

05 marks

6) viva voce

05 marks