SADAKATHULLAH APPA COLLEGE
(AUTONOMOUS)

(Reaccredited by NAAC with 'A' GRADE and ISO 9001: 2008 certified)

Rahmath Nagar, Tirunelveli – 627 011

DEPT. OF MICROBIOLOGY

B.Sc. (Microbiology)

UNITIZED SYLLABUS (CBCS)

FOR

(2011 - 2014)

(Applicable for students admitted in June 2011 and onwards)

(Updated as per the resolutions passed in the Academic Council Meeting held on 14-03-2013)

B.Sc. - MICROBIOLOGY (2011 – 2014)
COURSE STRUCTURE (CBCS)

ALLIED I - BIOCHEMISTRY **ALLIED II - BIOTECHNOLOGY**

I SEMESTER				II SEMESTER			
P		**H/W**	**C**	**P**	**COURSE**	**H/W**	**C**
I	Tamil / Arabic	6	3	**I**	Tamil / Arabic	6	3
II	English	6	3	**II**	English	6	3
III	Core - 1	4	5	**III**	Core - 2	4	5
	Core Practical - I	2	--		Core Practical - I	2	3
	Allied I - 1	4	4		Allied I - 2	4	4
	Allied I Practical	2	--		Allied I Practical	2	2
IV	Skill Based Elective - 1	3	2	**IV**	Skill Based Elective - 2	3	2
	Social Value Education	3	2		Environmental Studies	3	2
	TOTAL	**30**	**19**		**TOTAL**	**30**	**24**
III SEMESTER				**IV SEMESTER**			
I	Tamil / Arabic	6	3	**I**	Tamil / Arabic	6	3
II	English	6	3	**II**	English	6	3
III	Core - 3	4	5	**III**	Core - 4	4	5
	Core Practical - II	2	--		Core Practical - II	2	3
	Allied II - 1	4	4		Allied II - 2	4	4
	Allied II Practical	2	--		Allied II Practical	2	2
IV	Skill Based Elective - 3	3	2	**IV**	Skill Based Elective - 4	3	2
	Non Major Elective - 1	3	2		Non Major Elective - 2	3	2
	TOTAL	**30**	**19**		**TOTAL**	**30**	**24**
V SEMESTER				**VI SEMESTER**			
III	Core - 5	5	5	**III**	Core - 8	5	5
	Core - 6	5	5		Core - 9	5	5
	Core - 7	5	5		Core Practical - III	3	4
	Core Practical - III	3	--		Core Practical - IV	3	5
	Core Practical - IV	3	--		Project	5	5
	Core Elective - 1	4	4		Core Elective - 2	4	4
	Core Elective Practical	2	--		Core Elective Practical	2	2
IV	Skill Based Elective - 5	3	2	**IV**	Skill Based Elective - 6	3	2
	TOTAL	**30**	**21**		**TOTAL**	**30**	**32**

B.Sc. - MICROBIOLOGY (2011 – 2014)					
DISTRIBUTION OF CREDITS, NO. OF PAPERS & MARKS					
PART	**COURSE**	**SEMESTER**	**CREDITS**	**NO.OF PAPERS**	**MARKS**
I	Tamil / Arabic	I to IV	12	4	400
II	English	I to IV	12	4	400
III	Core + Core Practical	I to VI	60	9 + 4	1300
	Core Elective + CE Practical + Project	V & VI	15	2 + 1 + 1	400
	Allied + Practical	I to IV	20	4 + 2	600
IV	Social Value Education	I	2	1	100
	Environmental Studies	II	2	1	100
	Skilled Based Elective	I to VI	12	6	600
	Non Major Elective	III & IV	4	2	200
V	Extension Activities	I to IV	1	--	100
		TOTAL	**140**	**41**	**4200**

SEMESTER WISE DISTRIBUTION OF HOURS

PART	**I**	**II**	**III**				**IV**			**TOT.**
SEM	**T/A**	**ENG**	**CORE**	**CE**	**PRO**	**AL**	**SBE**	**NME**	**SVE/ES**	
I	6	6	4+ 2	-	-	4+ 2	3	-	3	**30**
II	6	6	4+ 2	-	-	4+ 2	3	-	3	**30**
III	6	6	4+ 2	-	-	4+ 2	3	3	-	**30**
IV	6	6	4+ 2	-	-	4+ 2	3	3	-	**30**
V	-	-	15+ 6	4+ 2	-	-	3	-	-	**30**
VI	-	-	10+ 6	4+ 2	5	-	3	-	-	**30**
TOT	**24**	**24**	**61**	**12**	**5**	**24**	**18**	**6**	**6**	**180**

B.Sc. - MICROBIOLOGY (2011 – 2014)

TITLE OF THE PAPERS, CREDITS & MARKS

P	SUB	TITLE OF THE PAPER	S.CODE	H/W	C	MARKS		
						I	E	T
I SEMESTER								
I	TA 1	இக்காலத் தமிழ்	11ULTA11	6	3	25	75	100
	AR 1	Applied Grammar and Translation	11ULAR11					
II	EN 1	Prose, Poetry and functional Grammar – I	11ULEN11	6	3	25	75	100
III	C 1	Introduction to Microbial World	11UCMB11	3	5	25	75	100
	CP I	Core Practical I	--	3	--	EXAM II SEM		
	AI - 1	Introduction to Biotechnology	11UABT11	4	4	25	75	100
	AI P	Allied I Practical	--	2	--	EXAM II SEM		
IV	SBE 1	Medical Biochemistry	11SEMB11	3	2	25	75	100
	SVE	Social Value Education	11USVE11	3	2	25	75	100
TOTAL				**30**	**19**	**150**	**450**	**600**
II SEMESTER								
I	TA 2	சமயத் தமிழ்	11ULTA21	6	3	25	75	100
	AR 2	Functional Arabic and Translation	11ULAR21					
II	EN 2	Prose, Poetry and functional Grammar – II	11ULEN21	6	3	25	75	100
III	C 2	Microbial Diversity	11UCMB21	3	5	25	75	100
	CP I	Core Practical I	11UCMB2P	3	3	40	60	100
	AI - 2	Basic Biotechnology	11UABT21	4	4	25	75	100
	AI P	Allied I Practical	11UABC2P	2	2	40	60	100
IV	SBE 2	Haematology	11SEMB21	3	2	25	75	100
	ES	Environmental Studies	11UENS21	3	2	25	75	100
TOTAL				**30**	**24**	**230**	**570**	**800**
III SEMESTER								
I	TA 3	பயன் பாட்டுத் தமிழ்	11ULTA31	6	3	25	75	100
	AR 3	Conversational Arabic	11ULAR31					
II	EN 3	One Act Plays and Word Power	11ULEN31	6	3	25	75	100
III	C 3	Environmental & Agricultural Microbiology	11UCMB31	4	5	25	75	100
	CP II	Core Practical II	--	2	--	EXAM IV SEM		
	A II - 1	Animal Biotechnology	11UABT31	4	4	25	75	100
	A II P	Allied II Practical	--	2	--	EXAM IV SEM		
IV	SBE 3	Clinical Pathology	11SEMB31	3	2	25	75	100
	NME 1	Choose any one from the list	--	3	2	25	75	100
TOTAL				**30**	**19**	**150**	**450**	**600**

B.Sc. - MICROBIOLOGY (2011 – 2014)

P	SUB	TITLE OF THE PAPER	S.CODE	H/W	C	MARKS		
						I	E	T
IV SEMESTER								
I	TA 4	அறிவியல் தமிழ்	08ULTA41	6	3	25	75	100
	AR 4	Quran , Hadeeth and Grammar	08ULAR41					
II	EN 4	A Course in Spoken English	08ULEN41	6	3	40	60	100
III	C 4	Microbial Physiology & Metabolism	08UCMB41	4	5	25	75	100
	CP II	Core Practical II	08UCMB4P	2	3	40	60	100
	A II - 2	Applied Biotechnology	08UABT41	4	4	25	75	100
	A II P	Allied II Practical	08UABT4P	2	2	40	60	100
IV	SBE 4	Transfusionology & Serology	08SEMB41	3	2	25	75	100
	NME 2	Choose any one from the list	--	3	2	25	75	100
TOTAL				**30**	**24**	**245**	**555**	**800**
V SEMESTER								
III	C 5	Basic Immunology	08UCMB51	5	5	25	75	100
	C 6	Clinical Microbiology	08UCMB52	5	5	25	75	100
	C 7	Microbial Genetics	08UCMB53	5	5	25	75	100
	CE 1	Microbial Biotechnology **OR**	08UEMB5A	4	4	25	75	100
		Veterinary Microbiology	08UEMB5B					
	CP III	Core Practical III	--	3	--	EXAM VI SEM		
	CP IV	Core Practical IV	--	3	--	EXAM VI SEM		
	CE P	Core Elective Practical	--	2	--	EXAM VI SEM		
IV	SBE 5	Applied Microbiology I	08SEMB51	3	2	25	75	100
TOTAL				**30**	**21**	**125**	**375**	**500**
VI SEMESTER								
III	C 8	Food Microbiology	08UCMB61	5	5	25	75	100
	C 9	Industrial Microbiology	08UCMB62	5	5	25	75	100
	CE 2	Biodegradation of Waste Material **OR**	08UEMB6A	4	4	25	75	100
		Diary Microbiology	08UEMB6B					
	P	Project	08UPMB61	5	5	--	100	100
	CP III	Core Practical III	08UCMB6P1	3	4	40	60	100
	CP IV	Core Practical IV	08UCMB6P2	3	5	40	60	100
	CE P	Core Elective Practical	08UEMB6P	2	2	40	60	100
IV	SBE 6	Applied Microbiology II	08SEMB61	3	2	25	75	100
TOTAL				**30**	**32**	**220**	**580**	**800**

PART III CORE , CORE ELECTIVE & PROJECT (FOR B.Sc. - MICROBIOLOGY MAJOR)								
SEM	**P**	**TITLE OF THE PAPER**	**S.CODE**	**H/W**	**C**	**MARKS**		
						I	**E**	**T**
I	C1	Introduction to Microbial World	11UCMB11	3	5	25	75	100
	CP	Core Practical I	--	3	--	EXAM II SEM		
II	C2	Microbial Diversity	11UCMB21	3	5	25	75	100
	CP	Core Practical I	11UCMB2P	3	3	40	60	100
III	C3	Environmental & Agricultural Microbiology	11UCMB31	4	5	25	75	100
	CP	Core Practical II	--	2	--	EXAM IV SEM		
IV	C4	Microbial Physiology and Metabolism	11UCMB41	4	5	25	75	100
	CP	Core Practical II	11UCMB4P	2	3	40	60	100
V	C5	Basic Immunology	11UCMB51	5	5	25	75	100
	C6	Clinical Microbiology	11UCMB52	5	5	25	75	100
	C7	Microbial Genetics	11UCMB53	5	5	25	75	100
	CE1	Microbial Biotechnology **OR**	11UEMB5A	4	4	25	75	100
		Veterinary Microbiology	11UEMB5B					
	CP	Core Practical III	--	3	--	EXAM VI SEM		
		Core Practical IV	--	3	--	EXAM VI SEM		
	CEP	Core Elective Practical	--	2	--	EXAM VI SEM		
VI	C8	Food Microbiology	11UCMB61	5	5	25	75	100
	C9	Industrial Microbiology	11UCMB62	5	5	25	75	100
	CE2	Biodegradation of Waste Material **OR**	11UEMB6A	4	4	25	75	100
		Diary Microbiology	11UEMB6B					
	P	Project	11UPMB61	5	5	--	100	100
	CP	Core Practical III	11UCMB6P1	3	4	40	60	100
		Core Practical IV	11UCMB6P2	3	5	40	60	100
	CEP	Core Elective Practical	11UEMB6P	2	2	40	60	100
			TOTAL	**78**	**75**	**475**	**1225**	**1700**

DEPT. OF MICROBIOLOGY CBCS SYLLABUS (2011- 2014)								
PART III - ALLIED II - BIOTECHNOLOGY (FOR B.Sc. - MICROBIOLOGY MAJOR)								
SEM	**P**	**TITLE OF THE PAPER**	**S.CODE**	**H/W**	**C**	**MARKS**		
						I	**E**	**T**
I	1	Introduction to Biotechnology ,Basic Biotechnology	11UABT11, 11UAB21	4	4	25	75	100
		Allied II Practical	--	2	--	EXAM II SEM		
II	2	Animal Biotechnology, Applied Biotechnology	11UABT31, 11UABT41,	4	4	25	75	100
		Allied II Practical	11UABT4P	2	2	40	60	100
			TOTAL	**12**	**10**	**90**	**210**	**300**
PART IV - SKILL BASED ELECTIVE (FOR B.Sc. - MICROBIOLOGY MAJOR)								
I	1	Medical Biochemistry	11SEMB11	3	2	25	75	100
II	2	Haematology	11SEMB21	3	2	25	75	100
III	3	Clinical Pathology	11SEMB31	3	2	25	75	100
IV	4	Transfusionology & Serology	11SEMB41	3	2	25	75	100
V	5	Applied Microbiology I	11SEMB51	3	2	25	75	100
VI	6	Applied Microbiology II	11SEMB61	3	2	25	75	100
			TOTAL	**18**	**12**	**150**	**450**	**600**
PART IV - NON MAJOR ELECTIVE (FOR OTHER MAJORS)								
III	1	General Microbiology	11NEMB31	3	2	25	75	100
IV	2	Medical Microbiology	11NEMB41	3	2	25	75	100
			TOTAL	**6**	**4**	**50**	**150**	**200**
PART IV - SVE & ES (FOR ALL MAJORS)								
I	1	Social Value Education	11USVE11	3	2	25	75	100
II	2	Environmental Studies	11UENS21	3	2	25	75	100
			TOTAL	**6**	**4**	**50**	**150**	**200**
PART - V								
I to IV		Extension Activities		**-**	**1**	**100**	**-**	**100**

PART III – CORE, CORE ELECTIVE & PROJECT			
I SEMESTER			
C- 1	**INTRODUCTION TO MICROBIAL WORLD**		**11UCMB11**
Hrs/Week: 4	**Hrs / Sem : 4x 15 = 60**	**Hrs/unit:12**	**Credits: 5**

UNIT I

Scope of microbiology – History and development of microbiology-contribution by pioneers – Antony Van Leewenhock, Spallanzani, Louis Pasteur, Joseph Lister, Robert koch, Edward Jenner, Ivanovsky, Alexander Fleming, Beijerinick, Winogradsky and John Tyndall.-Recent contributors-Watson and Crick, Barbara McClintock.

UNIT II

Difference between the prokaryotic and eukaryotic microorganisms. Classification of microorganisms – general principles and nomenclature – Haeckel's three kingdom concept, Whittaker's five kingdom concept.

UNIT III

Microscopy: Principles and applications of simple, compound, bright field, dark field, phase contrast, fluorescent and electron microscopy. Principles of staining: Nature of dyes, types of staining simple, differential Gram, Acidfast, Spore and Capsule .

UNIT IV

Sterilization: Instruments,Principles and methods – physical (moist heat, dry heat, filtration, pasteurization, tyndallization, radiations) and chemical (alcohols, aldehydes, phenols, halogens and hypochlorites) , Antimicrobial chemotherapy

UNIT V

Culture techniques: Types of media simple, defined, enriched and transport media with specific examples for each type. Isolation and purification of microorganisms. Methods of maintenance and preservation of cultures

TEXT BOOKS:

1. Pelczar Jr. M.J.Chan E.C.S. and Kreig N.R. (1993). Microbiology – McGraw Hill, Inc., New York.
2. Stainer R.Y., Ingraham J.L., Wheelis M.L., and Painter P.R.(1986). General Microbiology, MacMillan Education Ltd., London.
3. Starr, M.P.Stolp,H.,Truper, H.C.Balows. A & Schegel, H.C.(1991). The Prokaryotes. A hand book of Habitats, Isolation and Identification of Bacteria. Springer Verleg.
4. Microbiology – Jeeva.

REFERENCE BOOKS:

1. Holt J.S.Krieg N.R.Sneath P.H.A. and Williams S.T (1994). Bergey's Mannual of Determinative Bacteriology. (9th edition) – William & Wilkins, Baltimore.
2. Brige E.A.(1992). Modern Microbiology – Win C.Brown Publishers, Dubuque,U.S.A.
3. Goodfellow M., and O'Dennell A.C(1994). Chemical Methods in Prokaryotic Systematics – John Wiley & Sons, New York
4. Murray R.K. Granner M.D., Mayes P.A.and Rodwell V.W (1990) Biochemistry
5. L.N.Prescott, J.P.Hartley and D.A.Klein .1993.Microbiology.Wm.c.I Inc,

II SEMESTER			
C-2	**MICROBIAL DIVERSITY**		**11UCMB12**
Hrs/Week: 4	**Hrs / Sem : 4x 15 = 60**	**Hrs/unit:12**	**Credits: 5**

UNIT I

Archaebacteria and other special groups – general characteristics – methonogens and extremophiles: special groups – Gliding sheathed, budding, and appendaged bacteria. Sulphur bacteria, S*pirochetes*, Mycoplasma and R*ickettsia*. *Actinomycetes*- S*treptomycetes*

UNIT II

Bacteria-structure and function of cell wall, cilia, flagella, capsule, pili, cytoplasmic membrane and cytoplasmic inclusions, sporulation. Bacteria - Aerobic Gram positive (cocci - S*taphylococcus* sp, rod-*Bacillus* sp) - Gram negative (cocc i-*Neisseria* sp, rod - *Pseudomonas* sp) - Anaerobic Gram positive (rod- *Clostridium* sp.) - Gram negative (cocci - *Veilonella* sp, rod - *Bacteriodes* sp). Facultative - *Escherichia coli.*

UNIT III

Viruses – General characteristics-plant virus (TMV), Animal virus (Rhabdo virus and Pox), bacteriophage (T4 series).

UNIT IV

Algae – Type study *(Chlamydomonas sp*) - Protozoa – general characteristics - type study (*Trypanosoma* sp.), Bacterial photosynthesis - pigments and mechanism. Fungi – Type study (Aspergillus sp.) - Modes of multiplication.

UNIT V

Protozoa – General characteristics - Type study (*Trypanosoma* sp.) - Modes of multiplication.

TEXT BOOKS:

1. Alexopoulos.C.J and Mims,C.W(1979) Introductory Mycology, Third edition. Wiley,Newyork
2. MURRY P.R., Baron.E.J., Jorgenson, J.H., and Yolken , R.H 2003, Manual of Clinical Microbiology, 8 th Edn, Vol.1&2 ASM Press,Washington, D.C.

REFERENCE BOOKS:

1. Grneral Microbiology By Bilgrami.
2. Jacquelyn G Black, 2002, Microbiology-Principles and Exploration – 5th Edn John Wiley&Sons.
3. Holt etal, 1998, Bergey's manual of determinative Bacteriology.
4. Ravikumar S., Kathiresan .K and Ramanathan G. - Methods in Marine Microbiology, Eds., CMST Publications M.S University.

WEB SITES:

http://web.indstate,edu/theme/mwking

http://www.nuigalway.ie/microbiology/cpoblab/teaching.html.

I & II SEMESTERS		
CORE PRACTICAL - I (EXAM. END OF II SEM.)		**11UCMB2P**
Hrs/Week: 2	**Hrs / Sem : 2x 15 = 30**	**Credits: 3**

TECHNIQUES IN MICROBIOLOGY & MICROBIAL PHYSIOLOGY

1. Sterilization techniques and preparation of different types of media
2. Staining techniques – Simple, Gram's, Spore, Capsular staining.
3. Bacterial culture/isolation techniques.
    a. Streaking method
    b. Pour plate method
    c. Serial dilution technique.
4. Isolation and cultivation of fungi.
5. Bacterial growth curve.
6. Carbohydrate fermentation tests:
    a. Glucose
    b. Lactose,
7. Microbial assessment of air quality – open plate method
8. Production of extra cellular enzymes:
    a. Starch hydrolysis
    b. Casein hydrolysis
    c. Gelatin and Lipid hydrolysis
9. Biochemical test for identification of bacteria:
    a. Indole test,
    b. Methyl red
    c. Voges Proskauer test
    d. Citrate utilization
    e. TSI agar test
    f. Urease
    g. Catalase
    h. Oxidase

REFERENCE BOOKS:

1. Cappucino J.G, and Sherman .N, 1996 Microbiology –A laboratory Manual
2. Kannan 1996. Laboratory Manual in General Microbiology Palani Paramount Publications, Palani.

SEMESTER-III			
C 3 ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY			**11UCMB31**
Hrs/Week: 4	**Hrs / Sem : 4x 15 = 60**	**Hrs/unit:12**	**Credits: 5**

UNIT I

Microorganisms in nature - methods in microbial ecology - factors influencing microbial activity in nature abiotic factors: nutrients, moisture, pH, oxidation-reduction potential, temperature, pressure.

UNIT II

Microflora in soil – Bacteria, Fungi, Algae and Nematodes. Interactions among microorganisms. Symbiosis – mutalism – commensalisms – competition – amensalism – synergism – parasitism – predation.

UNTI III

Biofertilizers biological nitrogen fixation - symbiotic (Rhizobium) – Asymbiotic (Azotobacter) - mycorrhizae (ecto and endo). Biogeochemical cycles. Carbon, nitrogen, phosphorus and sulphur - microbial leaching, bioluminescence.

UNIT IV

Aquatic microbiology: Ecosystems - Freshwater & Marine - Eutrophication - potability of water - microbial assessment of water quality. Introduction to Bio remediation –Phyto and Myco remediation

UNIT V

Water treatment: types of wastes - industrial and domestic - useful by products from waste - composting, bio gas - liquid waste treatment - aerobic and anaerobic technique -sewage treatment.

TEXT BOOKS :

1 Alexander, M.(1971). Microbial Ecology. John Wiley & Sons, Inc., New York.
2. Alexander, M.(1977). Introduction to Soil Microbiology. John Wiley & Sons , Inc., New York.

REFERENCE BOOKS:

1. Norris, J.R and Pettipher, G.L.(1987). Essays in Agricultural and Food Microbiology, John wiley and Sons, Singapore.
2. Harold J.Benson, 1994. Microbiological applications. Wm.C.Brown Publishers, Melbourne, Australia.
3. James G.Cappuccino. 1996. Microbiology. The Benjamin/Cummings Pub.Co.,

IV SEMESTER			
C 4	**MICROBIAL PHYSIOLOGY AND METABOLISM**		**11UCMB41**
Hrs/Week: 4	**Hrs / Sem : 4x 15 = 60**	**Hrs/unit:12**	**Credits: 5**

UNIT- I

Nutritional importance in microbial growth – nutritional types. Growth curve and growth curve measurement by turbidity.Components of Cellwall (Peptidoglycan, muramic acid, LPS), Basic differences of Gram positive and Gram negative cell wall

UNIT- II

Basic concepts of metabolism: anabolism and catabolism. Anabolism: Glycogenesis and gluconeogenesis. Biosynthesis of amino acids: essential and non essential. Biosynthesis of fatty acids and lipids. Physiological importance of amino acids for microbial growth. Nucleotide biosynthesis.

UNIT III

Catabolism: Carbohydrates - Glycolysis, pentose phosphate pathway, Entner - Doudorff pathway, TCA cycle, Glyoxylate cycle. Catabolism of aminoacids – urea cycle. Catabolism of fatty acids: beta oxidation of fatty acids.

UNIT IV

Membrane transport system-Plasma membrane models - passive and active transport systems-facilitated diffusion-group translocation, Ion transport, Chemiosmotic theory, Fermentation pathways - homo and heterolactate fermentation – propionate fermentation.

UNIT V

Growth of microorganisms: Nutritional types of microorganisms, Factors influencing the growth of microorganisms – temperature, pH, Osmotic pressure, moisture and Radiations, Physiology of growth – Significance of various phases of growth. Synchronous and Asynchronous growth.

Reference Books

1. Caldwell, D. R., "Microbial Physiology and metabolism". Star Publishing Company, New York, 1999.
2. Byung, H., Kim, B.H. and Gadd, G.M., "Bacterial Physiology and Metabolism",Cambridge University Press, Cambridge, 2008.
3. Moat, A.G. and Foster, J.W., "Microbial Physiology", John Wiley & Sons, New York, 2008.

III & IV SEMESTERS		
CORE PRACTICAL - II	**(EXAM. END OF II SEM.)**	**11UCMB4P**
Hrs/Week: 2	**Hrs / Sem : 2x 15 = 30**	**Credits: 3**

TECHNIQUES IN ENVIRONMENTAL, AGRI & MICROBIAL GENETICS

1. Quantitative assay of microbes in soil-Phosphobacterium and Azotobacter sp
2. Quantification of total coliforms using multiple tube fermentation technique.
3. Quantification of faecal coliforms and total heterotrophic bacterial population
4. Quantification of coliphages from sewage(demonstration)
5. Antibiosis(Actinomyces against E.coli)
6. Isolation of nitrogen fixing bacterium (Rhizobium) from root nodule
7. Estimation of microbial count in phyllosphere.
8. Estimation of BOD and DO.
9. Electrophoretic separation of protein-SDS&PAGE-Demonstration.
10. Isolation of plasmid DNA from E.coli-alkaline lysis method (demonstration)
11. UV Mutagenesis-UV exposure-survival studies
12. Estimation of COD
13. Chemical mutagenesis NTG (demonstration)

REFERENCE BOOKS:

1. J.G. Cappuccino and N. Sherman. 1996 Microbiology – A laboratory manual Benjamin CuMMINS.New York.
2. N. Kannan. 1996. Laboratory manual in general microbiology. Palani Paramount Publ., Palani.

III & IV SEMESTERS			
V SEMESTER			
C 5	**BASIC IMMUNOLOGY**		**11UCMB51**
Hrs/Week: 5	**Hrs / Sem : 5x 15 = 75**	**Hrs/unit:15**	**Credits: 5**

UNIT I

Introduction: History of Immunology – Immunity – types of immunity – innate and acquired. Immune systems - Primary lymphoid organ- Secondary lymphoid organs Cells of the immune system –T and B cells – activation and function.

UNIT II

Antigens: properties, Types, haptens – adjuvants – Immunoglobulins. Structure types and properties - Hybridoma technology

UNIT III

Vaccines – types - Live, killed, recombinant DNA and edible – toxoids antitoxins,

UNIT IV

Antigen – antibody reactions – in vitro methods; Immunoturbidometry Agglutination, Flocculation, Precipitation, Complement fixation,Immunodiffusion - Immuno fluorescence, ELISA, RIA, in vivo methods;

UNIT V

Hypersensitivity reactions – antibody mediated, Type I anaphylaxis, Type II – Antibody dependent cell cytotoxicity, Type III – immune complex reactions – cell mediated immune responses – Type IV – Hypersensitivity reactions. Organ Transplantation(Kidney).

TEXT BOOKS:

1. Ivan M.Roit. 1994. Essential Immunology – Blackwell Scientific Publications, Oxford.
2. Donal M.Weir, John, steward, 1993. Immunology VII edition. ELBS, London.
3. Richard M.Hyde 1995. Immunology III edition. National Medical series,Williamsand Wilkins. Hardward Publishing company.
4. Kuby 1993, Immunology II edition. W.H.Frumen and Company, New York.

REFERENCE BOOKS:

1. Abul. K. Abbas, Andrew H.Lichtman, Jordan S.Pobar 1994.Cellular and Molecular Immunology. II edition. W.B.Saunders, U.S.A.
2. William E.Paul 1993. Fundamental Immunology. II edition, Raven press, New York.
3. Topley & Wilson's 1990. Principles of Bacteriology, Virology and ImmUnity VIII edition Vol.I General Microbiology and ImmUnity. Edward Arnold, London.
4. Lesile Hudson, Frank C.Hay, 1989. III edition. Practical Immunology. Blackwell Scientific Publication.
5. Helen Chapel, Mansel Haeney. 1986. Essentials of clinical Immunology . ELBS.
6. Mackett M. and Wiliamson J.D.1995. Human vaccines and vaccination. BIOS cientific Publishers.

V SEMESTER			
C 6	**CLINICAL MICROBIOLOGY**		**11UCMB52**
Hrs/Week: 5	**Hrs / Sem : 5x 15 = 75**	**Hrs/unit:15**	**Credits: 5**

UNIT I

Introduction Koch postulates- Normal microbial flora of the human body, Host-microbe interactions – Diagnostic Microbiology – collection and transport of specimen for Microbiological examination – General methods for isolation and identification of bacteria. Koch Postulates.

UNIT II

Pathogenesis, laboratory diagnosis, prevention and treatment of the bacterial infections : (a)Streptococcal and Staphylococcal infections, (b)UTI, (c) Meningitis, (d) Tuberculosis,Leprae (e) Nosocomial infection , (f) gastrointestinal disorders – typhoid, cholera, bacillary dysentery, (g) Sexually transmitted diseases – syphilis, gonorrhea. (h) Anaerobic wound infection – tetanus.

UNIT III

Clinical symptoms, pathogenesis, laboratory diagnosis, prevention and treatment of following viral infections – Rabies - Hepatitis – HIV – influenza – herpes, Dengue, Chickungunia, Swineflu.

UNIT IV

Clinical symptoms, pathogenesis, prevention and treatment of the following fungal infections superficial, subcutaneous and systemic mycoses.

UNIT V

Clinical symptoms, pathogenesis, laboratory, prevention and treatment of the following protozoan infections-Amoebiasis, Malaria, Leishmaniasis, Filariasis, Trypanosomiasis(Sleeping sickness).

TEXT BOOKS:

1. Ivan M.Roit.1994. Essential Immunology -Blackwell Scientific Publications,Oxford.
2. Donal M.Weir, John, steward, 1993. Immunology VII edition. ELBS, London.
3. Richard M.Hyde 1995. Immunology III edition. National Medical series, Williams and Wilkins. Hardward Publishing company.
4. Jains Kuby 1993, Immunology II edition. W.H.Frumen and Company, New York.

REFERENCE BOOKS:

1. 1. Abul. K. Abbas, Andrew H.Lichtman, Jordan S.Pobar 1994. Cellular and Molecular Immunology. II edition. W.B.Saunders, U.S.A.
2. William E.Paul 1993. Fundamental Immunology. II edition, Raven press, New York.
3. Topley & Wilson's 1990. Principles of Bacteriology, Virology and ImmUnity VIII edition Vol.I General Microbiology and ImmUnity. Edward Arnold, London.
4. Lesile Hudson, Frank C.Hay, 1989. III edition. Practical Immunology. Blackwell Scientific Publication.
5. Helen Chapel, Mansel Haeney. 1986. Essentials of clinical Immunology . ELBS.
6. Mackett M. and Wiliamson J.D.1995. Human vaccines and vaccination. BIOS Scientific Publishers.
7. Bernard R.Glick and Jack J.Pasternak 1994. Molecular Biotechnology – Principles and Applications of Recombinant DNA. ASM Press, Washington
8. Schaechter, M.Medoff, G. and Eisenstein, B.C.(1993). Mechanism of Microbial Diseases. 2nd edition. Williams & Wilkins, Baltimore.
9. J.C.Collee, J.P., Duguid, A.C.Fraser, B.P. and Marimon (1989). Mackie and Mc Carteny Practical Medical Microbiology – 13th Edition, Churchill Livingstone.

V SEMESTER			
C 7	**MICROBIAL GENETICS**		**11UCMB53**
Hrs/Week: 5	**Hrs / Sem : 5x 15 = 75**	**Hrs/unit:15**	**Credits: 5**

UNIT I

Historical perspective of microbial genetics – structure,types and function of DNA and RNA.DNA replication - modes and enzymes.

UNIT II

Basic concepts of Genetic code - transcription and translation - Constitutive and Regulated genes - Operon concept - lac and trp Operon.

UNIT III

Bacterial plasmids - structure types and properties of plasmids - plasmid replication -transposans andIS elements – structure - types and properties - viral replication DNA(ØX174), ds DNA (pox), ssRNA (retrovirus) and ss DNA (reo virus).

UNIT IV

Mutation –Definition,types-Frameshift,Point, spontaneous and induced - basepair changes , deletion , insertion –transversions - Ames test.

UNIT V

Concepts of Gene transfer mechanisms – Steps involved in conjugation – transformation – transduction (Generalized and Specialized).

TEXT BOOKS:

1. Watson, JD, Hopkins NH, Roberts JW, Steitz JA, Weiner AAM. 1987. Molecular Biology of the Gene. The Benjamin/Cummings publishing company.
2. Lewin B.1994. Genes V.Oxford University press.
3. Lodish, H, Baltimore D, Berk A, Zipursky SL, Matsudaira P, Darnell J. 1995. Molecurlar Cell Biology. Scientific American Books.
4. Freifelder D. 1991 Molecular Biology. Narosa Publishing Home.

REFERENCE BOOKS:

1. Maloy SR, Cronan Jr.JE, Freifelder D.1994. Microbial Genetics. Jones and Bartlett Publishers.
2. Eckstein F, Lilley DM. 1992 Nucleic acids and Molecular Biology - Springer – Verlag.

V SEMESTER			
C E-1(A)	**MICROBIAL BIOTECHNOLOGY**		**11UEMB5A**
Hrs/Week: 4	**Hrs / Sem : 4x 15 = 60**	**Hrs/unit:12**	**Credits: 4**

UNIT I

Introduction to bio-technology - genetically modified microorganisms - role of microbes in genetic engineering - socio-ethical aspects of biotechnology

UNIT II

Techniques in gene transfer vector construction plasmid (Ti), cosmid,phage, phagemid, Artificial plasmid, PBR 322.

UNIT III

Techniques in molecular biology - blotting techniques - southern, western, northern, RAPD, RFLP and PCR.

UNIT IV

Applications of microbes - Agricultural Biopesticides - Baculovirus and Bacillus thuringiensis – Environment (Pseudomonas putida) - food(scp-Bacteria and yeast and mushroom production).

UNIT V

Applications of microbes in medicine – insulin - vaccine and Antibiotics.

TEXT BOOKS:

1. Watson, JD, Hopkins NH, Roberts JW, Steitz JA, Weiner AAM. 1987. Molecular Biology of the Gene. The Benjamin/Cummings publishing company.
2. Lewin B.1994. Genes V.Oxford University press.
3. Lodish, H, Baltimore D, Berk A, Zipursky SL, Matsudaira P, Darnell J. 1995. Molecurlar Cell Biology. Scientific American Books.
4. Freifelder D. 1991 Molecular Biology. Narosa Publishing Home.

REFERENCE BOOKS:

1. Maloy SR, Cronan Jr.JE, Freifelder D.1994. Microbial Genetics. Jones and Bartlett Publishers.
2. Eckstein F, Lilley DM. 1992 Nucleic acids and Molecular Biology - Springer – Verlag.
3. Blackburn CM, Gait MJ. 1996. Nucleic acids in Chemistry and Biology – Oxford University.

V SEMESTER			
C E-1(B)	**VETERINARY MICROBIOLOGY**		**11UEMB5B**
Hrs/Week: 4	**Hrs / Sem : 4x 15 = 60**	**Hrs/unit:12**	**Credits: 4**

UNIT I

General properties, source, vectors, transmission, pathogenesis, prevention and control of important bacterial, parasitic, fungal and viral diseases of animals

UNIT II

Zoonotic diseases, types, characteristics, vectors, transmission dynamics of bacterial, fungal, parasitic and viral diseases.

UNIT III

Fungal diseases of animals - characteristics, transmission and control

UNIT IV

Parasitic diseases Characteristics, transmission and control trematodes, nematodes - viral diseases.

UNIT V

Simple techniques for disease diagnosis - prophylaxis and vaccine disease monitoring

TEXT BOOKS:

1. Pelzar Jr.M.J.Chau. E.C.S. and Kreig N.R.91993). Microbiology –McGraw Hill Inc., NewYork.
2. Stainer . R.Y. Ingraham J.L.Wheelis M.L. and Painter P.R.(1986). General Microbiology, MacMillan Education Ltd., London.
3. Starr, M.P.Stolp, H.Truper, H.C.Balows, A and Schegel, H.C.(1991). The Prokaryotes. A hand book of Habitats, Isolation and Identification of Bacteria. Springerrr Verlag.

REFERENCE BOOKS:

1. Holt J.S.Krieg. N.R.Sneath P.H.A. and Williams S.T.(1994). Bergey's Manual of Determinative Bacteriology. (9th edition) – Williams & Wilkins, Baltimore.
2. Topley and Wilson's (1990). Principles of Bacteriology, Virology and Immunity,

VI SEMESTER			
C 8	**FOOD MICROBIOLOGY**		**11UCMB61**
Hrs/Week: 5	**Hrs / Sem : 5x 15 = 75**	**Hrs/unit:15**	**Credits: 5**

UNIT I

Introduction - Importance of food Microbiology – Types of microorganisms in food – Source of contamination (primary sources) – Factors influencing microbial growth in foods (extrinsic and intrinsic).

UNIT II

Food fermentations: Cheese, bread, wine, Beer fermented vegetables – Sauerkraut,pickles and Olives methods and organisms used. Enzymes from microorganisms – amylase, protease.

UNIT III

Contamination, spoilage and preservation of different kinds of foods, cereals and cereal products – sugar and sugar products – vegetable and fruits – meat and meat products – fish and other sea foods and poultry

UNIT IV

Food Poisoning: food borne infections (a) Bacterial: Staphylococcal, Brucella, Bacillus, Clostridium, Escherichia, Salmonella (b) Fungal: Mycotoxins, (c) Viral: Hepatitis, (d) Algal toxins

UNIT V

Food preservation: Principles of food preservation – methods of preservation. a. Physical (irradiation, drying, heat processing, canning, chilling and freezing, high pressure and modification of atmosphere) b. Chemical. Food Sanitation: Good manufacturing practices – Hazard analysis, Critical control points, Personal hygiene.

TEXT BOOKS:

1. Adams, M.R. and Moss, M.O.1995. Food Microbiology, The Royal Society of Chemistry, Cambridge.
2. Frazier, W.C. and Westhoff, D.C.1988. Food Microbiology, TATA McGraw Hill Publishing company ltd., New Delhi.

REFERENCE BOOKS :

1. Banwart, G.J.1989. Basic Food Microbiology, Chapman & Hall New York.
2. Board, R.C.1983. A Modern Introduction to Food Microbiology, Blackwell Scientific Publications, Oxford.
3. Robinson, R.K.1990. Dairy Microbiology, Elsevier Applied Science, London.

VI SEMESTER			
C 9	**INDUSTRIAL MICROBIOLOGY**		**11UCMB62**
Hrs/Week: 5	**Hrs / Sem : 5x 15 = 75**	**Hrs/unit:15**	**Credits: 5**

UNIT I

Historical development of Industrial Microbiology, Screening and selection of Industrially important microorganisms, Improvement of Industrially important microbial strains

UNIT II

Fermentation: Definition, Types-Batch, continuous, Fedbatch. Fermentation media formulation, types of fermentor: Design, Basic functions, Types (CSTR, Airlift)

UNIT III

Up stream (media formulation,sterilization, inoculation,growth monitoring) and Down stream processing(Distillation,centrifugation and filtration) and product recovery (cell disruption, intracellular and extra cellular), immobilizations of cells Introduction and its applications.

UNIT IV

Microbial products of pharmaceutical value –Penicillin, Vitamin B12 and polio vaccine.

UNIT V

Microbial products of Industrial value –ethanol, vinegar, protease, , acetone – butanol.

TEXT BOOKS :

1. Stanbury, P.F.Whitaker, A.Hall, S.J. 1995. Principles of Fermentation Technology,
Pergamon Press.
kyta, B.1983. Methods in Industrial Microbiology, Ellis horwood limited. 3. Click, B.R.Pasternak, J.J.1994. Molecular Biotechnology – ASM Press.

REFERENCE BOOKS:

1.. Demain A.L.Solomon, N.A.1986. Mannuall of Industrial Microbiology and Biotechnology. ASM Press
2. Reed. G. 1982. Prescott and Dunn's Industrial Microbiology. Macmillian Publishers.
3. Prave, P.Faust, V, Sitting, W., Sukatsch, DA. 1987. Fundamentals of Biotechnology.
ASM Press.
4. Malik V.S.Sridhar, P.1992. Industrial Biotechnology. Oxford & IBH.
5. Venkataraman, L.V.1983. A Monograph on Spirulina platensis. CFTRI, Mysore.

VI SEMESTER			
C E-2(A)	**BIODEGRADATION OF WASTE MATERIAL**		**11UEMB6A**
Hrs/Week: 4	**Hrs / Sem : 4x 15 = 60**	**Hrs/unit:12**	**Credits: 4**

UNIT I

Solid waste disposal - sources of waste - nature of waste-sanitary land fills – composting - role of microorganisms in composting - vermi composting, biomethanation.

UNIT II

Paper mill effluent - physico-chemical properties - treatment-standards for discharged effluent - breweries and leather industries - physico-chemical properties – treatment - standards.

UNIT III

Textile dyeing industry – effluent – characteristics - treatment – standards. Pharmaceu ticals effluent - treatment-standards - food industry – dairy - nature of waste water –treatment - standards.

UNIT IV

Hydrocarbon pollution - in soil, fresh water and marine environment - petroleum and its products - degradation paint pollution and control.

UNIT V

Xenobiotics used in agriculture – pesticides – fungicides – insecticides - pesticide pollution of soil and waterways.

TEXT BOOKS:

1. R.M.Atlas and R.Bartha 1987 Microbial ecology-fundamentals and applications Benjamin cummings,Menlo park,California.
2. M.J.Pelczar,E.C.S.Chan, and applications-Mc Graw Hill, Inc., New York.

REFERENCE BOOKS:

1. Michael T Madigan Brock biology of microorganisms – 10th Edn 2003, (Edn.) Prenticehall.
2. K.P.Talaro and A.Talaro. 1999- Fundamentals in microbiology

VI SEMESTER			
C E-2(B)	**DIARY MICROBIOLOGY**		**11UEMB6B**
Hrs/Week: 4	**Hrs / Sem : 4x 15 = 60**	**Hrs/unit:12**	**Credits: 4**

UNIT I

Introduction - sources and microorganisms in milk - classification of microbes - bio chemical types, temperature, characteristics, pathogenicity.

UNIT II

Bacteriological examination of milk(TVC,MBRT,RT) preservation of milk, Cooling, pasteurization,UHT, Post Pasteurization Contamination(PPC) dehydration, microbial standards and milk grading.

UNIT III

Dairy products-fermented milk - flavoured milk - curd-butter milk, cheese, milk cream, yoghurt - lactic starter culture - contamination, spoilage, preservation.

UNIT IV

Milkborne diseases-bacterial – Brucellosis, Q fever, Mastitis and viral diseases - Foot and Mouth disease - control measures.

UNIT V

Preservatives in dairy products - mode of preservation - analytical procedures in dairy microbiology.Health of employees – Sanitation and Control, Human health (HACCP).

TEXT BOOKS :

1. Adams, M.R. and Moss, M.O.1995. Food Microbiology, The Royal Society of Chemistry, Cambridge.
2. Frazier, W.C. and Westhoff, D.C.1988. Food Microbiology, TATA McGraw Hill Publishing company ltd., New Delhi.
3. Jay, J.M.1987. Modern Food Microbiology. CBS Publishers and distributors, New Delhi
4. Atlas, R.M. 1989. Microbiology, A Fundamentals and Applications, Macmillan Publishing company.

REFERENCE BOOKS:

1. Banwart, G.J.1989. Basic Food Microbiology, Chapman & Hall New York.
2. Board, R.C.1983. A Modern Introduction to Food Microbiology, Blackwell Scientific Publications, Oxford.
3. Robinson, R.K.1990. Dairy Microbiology, Elsevier Applied Science, London.
4. Hobbs, B.C. and Roberts, D.1993. Food Poisoning and Food Hygiene, Edward

VI SEMESTER		
P	**PROJECT**	**11UPMB61**
Hrs/Week: 4	**Hrs / Sem : 5x 15 = 75**	**Credits: 4**

OBJECTIVES:

At the end of the semester the students should be able to:

1. Identify the potential areas of research in his/her field;
2. Collect data from various sources including the internet, analyze them, make new Connections and link them to life;
2. Read and write originally and usefully.

GUIDELINES:

1. The project may be done groups not exceeding five per group.
2. The minimum length of the project should be 50 pages in A4 size.
3. A viva voce examination will be conducted by the external examiners. Marks for the project report will be 100 divided as **80% for the presentation of project and 20%** for viva-voce.

V & VI SEMESTERS		
CORE PRACTICAL - III (EXAM. END OF VI SEM.)		**11UCMB6P1**
Hrs/Week : 3	**Hrs / Sem : 3 x 15 = 45**	**Credits: 4**

TECHNIQUES IN IMMUNOLOGY, CLINICAL MICROBIOLOGY & MICROBIAL GENETICS.

1. Blood grouping – Rh types
2. Routine blood examination (RBC, WBC, TC, DC, Hemoglobin Estimation and ESR)

3) Differential Count

4) Bacterial Agglutination test- Widal test.

5) Latex agglutination test - CRP test, RPR.

6) Gel diffusion antigen – antibody reaction by Oucterlony double immune diffusion

7) Rheumatoid arthritis (R.A), Antistreptolysin 'O'.

5. Skin test – Mauntoux
6. Examination of parasitic ova and cysts from faecal samples.
7. Isolation and Identificaiton of pathogens from urine

8). Isolation and Identificaiton of pathogens from sputum,

9). Isolation and Identificaiton of pathogens from blood

10). Isolation and Identificaiton of pathogens from pus

11). Transformation

12). Conjugation

REFERENCE BOOKS:

1. J.G. Cappuccino and N. Sherman. 1996 Microbiology – A laboratory manual Benjamin CUMMINS.New York.
2. N. Kannan. 1996. Laboratory manual in general microbiology. Palani Paramount Publ., Palani

V & VI SEMESTERS		
CORE PRACTICAL - IV (EXAM. END OF VI SEM.)		**11UCMB6P2**
Hrs/Week : 3	**Hrs / Sem : 3 x 15 = 45**	**Credits: 4**

TECHNIQUES IN FOOD AND INDUSTRIAL MICROBIOLOGY

1. Isolation of yeast from Idly batter
2. Isolation of yeast from grape juice.
3. Ethanol Fermentation.
4. Production of alcohol from sugar cane.
5. Isolation and identification of industrially important micro organisms-crowded plate technique-giant colony technique.
6. Determination of quality of milk-Methylene blue and resazurin
7. Microbial examination of milk products.
8. Wet mount preparation of spoiled bread, tomato, grapes, potato.
9. Quantitative and qualitative examination of microbes in fruits.
10. Quantitative and qualitative examination of microbes in vegetables.
11. Quantitative and qualitative examination of microbes in meat.
12. Quantitative and qualitative examination of microbes in fish.
13. Quantitative and qualitative examination of microbes in canned foods.
14. Cell immobilization.

REFERENCE BOOKS:

1. J.G. Cappuccino and N. Sherman. 1996 Microbiology – A laboratory manual Benjamin CuMMINS.New York.
2. N. Kannan. 1996. Laboratory manual in general microbiology. Palani Paramount Publ., Palani

V & VI SEMESTERS		
CORE ELECTIVE PRACTICAL - IV (EXAM. END OF VI SEM.) 11UEMB6P		
Hrs/Week : 2	**Hrs / Sem : 2x 15 = 30**	**Credits: 2**

ONE ELECTIVE FROM EACH SEMESTER

CE 1 (A) TECHNIQUES IN MICROBIAL BIOTECHNOLOGY

1. Estimation of genomic DNA
2. Estimation of genomic RNA
3. Agarose gel electrophoresis-SDS-PAGE.
4. Western blot technique
5. Mass production of career based inoculam-rhizobium
6. Isolation of oil degrading bacteria-Pseudomonas putida.
7. Visit to bio-technology lab

REFERENCE BOOKS:

1. J.G. Cappuccino and N. Sherman. 1996 Microbiology – A laboratory manual Benjamin CuMMINS.New York.
2. N. Kannan. 1996. Laboratory manual in general microbiology. Palani Paramount Publ., Palani

CE 1 (B) TECHNIQUES IN VETERINARY MICROBIOLOGY

1. Observation of intestinal parasites from animal faeces.
2. Microbial examination of skin lesion,urine and pus. (animals)
3. Routine examination of animal blood-Haemoglobin, total count, differential count, ESR, (Cow /rabbit/Dog)
4.Urine-routine analysis

REFERENCE BOOKS:

1. Text Book of Pathology Vol. I & II – N.C. Dey
2. Clinical Laboratory Diagnosis – Levinson S A, Mac Fate R.D.
3. Clinical Lab. Methods & Diagnosis Vol. I & II – Alex C,S L Garelt.
4. Clinical Lab. Methods – John D Benger, Plilip G. Achermann, Gelsaon Toro

CE 2 (A) TECHNIQUES IN BIODEGRADATION

1. Composting(demonstration)
2. Vermicomposting(demonstration)
3. Isolation of cellulose degrading microorganisms(cellulomonas)
4. Determination of total alkalinity(industrial effluent)
5. Determination of sulphate and chloride
6. Isolation of protease producing microorganisms from dairy effluent
7. Isolation of lipase producing microorganisms from dairy effluent
8. Preparation of effluent and analyse the physical characteristics.
9. Visit to water treatment/effluent treatment plant

REFERENCE BOOKS:

1. James G.Cappuccino. 1996. Microbiology. The Benjamin/Cummings Pub.Co., California.
2. Martin Alexander Wiley. 1961. Introduction to Soil Microbiology. International Edn., New York

CE 2 (B) TECHNIQUES IN DAIRY MICROBIOLOGY

1. Determination of quality of milk-methylene blue reduction test
2. Resazurin test of milk
3. Microbial examination of milk products (TVC)
4. Microscopic observation of yeast in curd
5. Phosphatase test
6. Isolation of *Alcaligens viscolactis* from ropy milk
7. Butter making –using lactic starter culture
8. Ice cream making-demonstration
9. Isoloation of pathogens from spoiled milk products
    a. Cheese
    b. Curd
10. Visit to dairy industry

REFERENCE BOOKS:

1. James G.Cappuccino. 1996. Microbiology. The Benjamin/Cummings Pub.Co., California
2. Jay, J.M.1987. Modern Food Microbiology. CBS Publishers and distributors, New Delhi.
3. Atlas, R.M. 1989. Microbiology, A Fundamentals and Applications, Macmillan Publishing company.

PART III- ALLIED 1 & 2 - BIOTECHNOLOGY (2010 – 2014)			
I SEMESTER			
AII P1	**INTRODUCTION TO BIOTECHNOLOGY**		**11UABT11**
Hrs / Week : 4	**Hrs / Sem : 4 x 15 =60**	**Hrs / Unit : 12**	**Credits :4**

UNIT I

Biotechnology – definition - History, scope and importance of Biotechnology - Aims of genetic engineering - Basic concept of Genetic Engineering -, outline of cloning.

UNIT II

Nucleic acid - Structure, Components and forms of DNA, Nucleosides & Nucleotides (introduction, structure & bonding), Watson and Crick model.

UNIT III

RNA and its components and Types. DNA is the genetic material, Types of DNA Replication.

UNIT IV

Mutation –Definition, Types. Genetic code- Codons, Anticodons, Triplet codes

UNIT V

Purification and Separation of nucleic acids – Gel Electrophoresis – AGE, SDS PAGE.

Reference Books

1. Dubey, R. C. A - Text Book of Biotechnology (4 th Edition) S.Chand & Company Limited, 7361 Ram Nagar, New Delhi - 110 055
2. Gupta, P.K.Elements of Biotechnology. Rastogi Publications, Gangotri, Shivaji Road, Meerut - 250 002.
3. Jogdand, S. N .- Gene Biotechnology (5 th Edition) Himalaya Publishing House, Ramdoot, Dr. BhaleroMarg, Giraon, Mumbai. – 400 004 .

II SEMESTER			
AII P1	**BASIC BIOTECHNOLOGY**		**11UABT21**
Hrs / Week : 4	**Hrs / Sem : 4 x 15 =60**	**Hrs / Unit : 12**	**Credits :4**

UNIT I

Cloning vectors: Plasmids - properties and isolation, cosmids and bacteriophages. - microbial growth, batch culture, continuous culture.

UNIT II

Recombinant DNA technology – Restriction of DNA, Ligation of DNA, Identification of Recombination and cDNA Synthesis.

UNIT III

Gene expression - expression of cloned genes in bacteria, yeast, Analysis of gene Expression.

UNIT IV

DNA microarray - Introduction and Analysis, Analysis of SNP using DNA chip.

UNIT V

Plant cell and tissue culture - totipotency, nutrient medium - MS & B5 media, sterilization, inoculation and maintenance of culture. Micro propagation and Organogenesis.

REFERENCE BOOKS:

1. Arora M.Biotechnology (2nd Edition) Himalaya Publishing House,Ramdoot,Dr Bhalero Marg, Giraon, Mumbai. – 400 004.
2 .Dubey, R. C. A - Text Book of Biotechnology (4 th Edition) S.Chand & Company Limited, 7361 Ram Nagar, New Delhi - 110 055
3. Gupta ,P.K.Elements of Biotechnology. Rastogi Publications, Gangotri, Shivaji Road, Meerut - 250 002.
4. Jogdand, S. N .- Gene Biotechnology (5 th Edition) Himalaya Publishing House, Ramdoot, Dr. BhaleroMarg, Giraon, Mumbai. – 400 004 .
5. Joshi, P.- Genetic Engineering Student Edition., Agrobios (India), Behind Nasrani Cinema, Chopasani Road, Jodpur – 342 002 .
6. Kumar, H. D. Modern Concept of Biotechnology Vikas Publishing House Private Ltd. 576, Maszid Road , Jangpura, New Delhi – 100 014 .

I & II SEMESTERS		
A II	**PRACTICAL (Exam. end of II sem.)**	**11ABT41P**
Hrs / Week : 2	**Hrs / Sem : 2 x 15 = 30**	**Credits : 2**

TECHNIQUES IN BIOTECHNOLOGY I

1. Estimation of genomic DNA
2. Estimation of RNA
3. Isolation of oil degrading bacteria-*Pseudomonas putida*.
4. Determination of lethal death time of bacteria.
5. Agarose Gel Electrophoresis.
6. UV Mutagenesis.
7. Analysis of antibiotic resistant mutant.
8. Chemical Mutagenesis (Demonstration)
9. Conjugation (Demonstration).
10. Isolation of antibiotic producers by Giant colony Method.
11. Mass Production of carrier based inoculam *Rhizobium*

III SEMESTER			
A II P 2	**ANIMAL BIOTECHNOLGY**		**11ABT31**
Hrs / Week : 4	**Hrs / Sem : 4 x 15 = 60**	**Hrs / Unit : 12**	**Credits : 4**

UNIT I

Transgenesis; Methods of transferring genes - physical, chemical and biological methods. Transgenic animals (Mice, Sheep, Goat and Fish). Artificial insemination and embryo transfer.

UNIT II

Methods for the construction of recombinant animal viral vectors - SV40, adeno virus,gene transfer into cell lines.

UNIT III

Animal biotechnology for production of regulatory proteins, blood products, vaccines and hormones.

UNIT IV

Gene therapy - *in Vivo* and *in Vitro*, Viral and non- viral. Synthetic viral vectors in gene transfer.

UNIT V

History of stem cells. Preparation and applications of embryonic, adult and umbilical cord blood stem cells. Stem cell differentiation and transplantation. Bioethics – Introduction.

REFERENCES

1. Gene Expression Systems (2006). Edited by Joseph M. Fernandes and James P. Hoeffler. Academic Press.
2. Principles of Gene Manipulation and Genomics (2006). S.B. Primrose and R.M. Twyman. Blackwell Publishing
3. Biotechnology: Fundamentals and Applications (2004). S.S.Purohit. Students Edition
4. Principles of Gene Manipulation (2001). Sandy Primrose, Richard Twyman and Bob Old. Blackwell Science
5. Gene Cloning and Analysis (2001). T.A.Brown. Blackwell Science Ltd
6. RNA Viruses (2000). Alan J.Cann. Oxford University Press
7. Recombinant DNA (1992) by J.D. Watson, M. Gilman, J. Witowski and Mark Zoller, Scientific American Books
8. Molecular Biotechnology (1998), Second Edition, Glick, B.R., and Pasternack, J.J., ASM Press, Washington, DC,

IV SEMESTER			
A II P 2	**APPLIED BIOTECHNOLOGY**		**11ABT44**
Hrs / Week : 4	**Hrs / Sem : 4 x 15 = 60**	**Hrs / Unit : 12**	**Credits : 4**

UNIT I: Environmental Biotechnology

Bioremediation: Definition – types – Microbial and Phyto. Xenobiotics, Bio-degradation of Xenobiotic Compounds, Super bug

UNIT II: Agricultural Biotechnology

Genetic manipulation of nif gene and 'nod' gene for nitrogen fixation. Genetically modified crops – Advantages & disadvantages.

UNIT III: Bioenergy Technology

Biogas – Production and its Applications. Ethanol Production, Bio fuels

UNIT IV: Enzyme Technology.

Commercial production of microbial enzymes – Amylase and lipase – Immobilization of enzymes and its industrial application.

UNIT V: Health care Biotechnology

Recombinant Vaccines, DNA Vaccines. DNA sequencing. Molecular markers and applications - DNA finger printing technique and applications

REFERENCE BOOKS

1. Arora M.P.- Biotechnology (II nd Edition) Himalaya Publishing House, Ramdoot. Dr. Bhalerao Mar g, Girgaon Mumbai – 400004.
2. Dubey R.C. - A Text book of Biotechnology (4th Edition). S.Chand & Co Ltd . 7361, Ramnagr, New Delhi – 110055.
3. Gupta P.K - Elements of Biotechnology. Rastogi Publications, Gangotri, Shivaji Road, Mererut – 2500002
4. Herren, R.V. - Introduction to Biotechnology, Thomson Learning, Alps Buildings, Ist Floor, 56 Janpath , New Delhi – 110001.
5. Joshi.P - Genetic Engineering. Student Edition, Agrobios (India) Behind Nasrani Cinema, Chopasani Road, Jodhpur – 342002.
4. Prakash S. Lohar - Biotechnology , M.J.P. Publishers , Tamilnadu Book house 47, Nallathambi Street Triplicane – 600005.
6. Singh B .D - Biotechnology Kalyani Publishers. Mahalakshmi street T. Nagar, Chennai – 600017.
7. Trivedi P.C - Advances in Bio-technology, Agrobios (India) Behind Nasrani Cinema, Choprasani Road Jodhpur – 342002.

III & IV SEMESTERS		
A II	**PRACTICAL (Exam. end of IV sem.)**	**11ABT41P1**
Hrs / Week : 2	**Hrs / Sem : 2 x 15 = 30**	**Credits : 2**

TECNIQUES IN BIOTECHNOLOGY II

1. Isolation of genomic DNA from E.coli.
2. Isolation of Plasmid DNA.
3. Protein separation by SDS – PAGE.
4. Restriction Digestion of DNA.
5. Ligation of restricted DNA fragments.
6. Transformation (Demonstration).
7. Immobilization of an enzyme or Cell.
8. Analysis of Recombination (Demonstration).
9. Immunoelectrophoresis - Counter current and Rocket.
10. Plant Tissue culture – Micropropagation (Demonstration).
11. Animal cell Culture – Monolayer Culture (Demonstration).

PART – IV – SKILL BASED ELECTIVES (2011 – 2014)			
I SEMESTER			
SBE-1	**MEDICAL BIOCHEMISTRY**		**11SEMB11**
Hrs/Week : 3	**Hrs / Sem : 3x 15 = 45**	**Hrs/Unit:9**	**Credits: 2**

UNIT I

Preparation of standard solution, reagent and buffers and indicators – Normal solution, concentrated solution ,Molar concentration.Preparation of common reagent and buffer ,indicator, pH and adjustment of pH.

UNIT II

Carbohydrates: Definition, Classification, Function and properties. Blood Glucose Regulation, Glycosuria, Glucose tolerance test. Estimation of glucose by Glucoseoxidase peroxidase method and its clinical significance.

UNIT III

Lipids: Definition, Classification, Function of Lipids, Lipid Profile: VLDL, LDL, HDL and total cholesterol. Clinical importance of Triglycerides,

UNIT IV

Proteins and Amino acids: Definition, Classification and Function Estimation of protein and its clinical significance.

UNIT V

Haemostasis Mechanism – Blood Clotting factors and its role. Acid base balance: Definition and importance of blood pH and its maintenance by buffer. Respiratory mechanism – Acidosis and Alkalosis.

TEXT BOOKS:

1. Stryer. L2001.Bio-chemistry.W H Freeman &co., New York.
2. Ottschalk. G .1986.Bacterial Metabolism.Springer Verlag,New York.
3. Prescott. L.N Hartley.J.P& Klein D.A, 1993 Microbiology. W.M.C. Brown, IC., New York.
4. JainJ.L,Sanjay Jain Funtamentals of Bio-chemistry,6th Edn 2005,S.chand.New Delhi

REFERENCE BOOKS:

1 Stainer R.Y..Ingharam J.L..Wheelis M.L,and Painter. P.R, 1999. General Microbiology Mac Millan Educational Ltd, London.
2 Zubey G.L.Pousan W.W, and. Vance D.E.1994. Principles of Biochemistry W.M.C Brown Publication, England.

II SEMESTER			
SBE 2	**HAEMATOLOGY**		**11SEMB21**
Hrs/Week : 3	**Hrs / Sem : 3x 15 = 45**	**Hrs/Unit:9**	**Credits: 2**

UNIT I

Blood: Composition, Function and separation of plasma proteins. Methods of collection of blood – Anticoagulants and its role. Preparatio blood smear and Staining.

UNIT II

Estimation of – heamoglobin (cymeth heamoglobin method),RBC Count, WBC Count by using Heamocytometer. Differential count using staining procedure. Estimation of ESR, PCV by Wintrobe method.

UNIT III

Study of Peripheral blood Smear for Reticoilcyte count. Haemopoiesis – Erthropoiesis, Leucopoiesis and Thrombopoiesis.

UNIT IV

Determination of Bleeding time, Clotting Time, Prothrombin and partial thromboplastin time.

UNIT V

Detction of blood Parasites – leishmaniasis, Microfilament and Malarial parasite.

REFERENCE BOOKS:

1. Clinical Diagnosis by Laboratory Examination John A Kokmer.
2. Text Book of Pathology Vol. I & II – N.C. Dey
3. Clinical Laboratory Diagnosis – Levinson S A, Mac Fate R.D.
4. Clinical Lab. Methods & Diagnosis Vol. I & II – Alex C, S. L. Garelt.
5. Clinical Lab. Methods – John D Benger, Plilip G. Achermann, Gelsaon Toro.

III SEMESTER			
SBE 3	**CLINICAL PATHOLOGY**		**11SEMB31**
Hrs/Week : 3	**Hrs / Sem : 3x 15 = 45**	**Hrs/Unit:9**	**Credits: 2**

UNIT I

Normal Composition of urine – Routine Examination of Urine – Physical – colour, odour, pH, Specific gravity, Chemical – Sugar, protein, Ketone bodies, Bile Salt,Bile Pigments, Microscopy – Casts and Crystals, Pus Cells, RBCs, Epithelial cell, Bacteria, yeast Cells.

UNIT II

Stool – Physical examination of Stool – Consistancy, Colour, Mucus, blood. Chemical – Reducing Substance, Occult blood. Microscopy – Ova and Cysts of Entamoeba coli, Entamoeba histolytica, giardia.

UNIT III

CSF – Normal composition, Examination CSF proteins sugar, Microscopical examination for pus cells, Bacteria. Findings in CSF in common diseases.

UNIT IV

Semen – Physical Examination of Semen – Volume, Colour, Odour, Viscosity. Chemical examination – pH, Fructose. Microscopy – Sperm count, Motility and Morphology. Clinical Contions – Azoopermia, oligozoopermia. Aspermia, Hypospermia. Teratozoospermia.

UNIT V

Renalfunction Test – Defnition, purpose of RFT. UREA, Creatinine estimation, normal values and its clinical significance.

REFERENCE BOOKS:

1. Text Book of Pathology Vol. I & II – N.C. Dey
2. Clinical Laboratory Diagnosis – Levinson S A, Mac Fate R.D.
3. Clinical Lab. Methods & Diagnosis Vol. I & II – Alex C,S L Garelt.
4. Clinical Lab. Methods – John D Benger, Plilip G. Achermann, Gelsaon Toro

IV SEMESTER			
SBE 4	**TRANSFUSIONOLOGY& SEROLOGY**		**11SEMB41**
Hrs/Week : 3	**Hrs / Sem : 3x 15 = 45**	**Hrs/Unit:9**	**Credits: 2**

UNIT I

In troduction to Immunohneamotology – Immunologic reaction in blood banking – Blood Components – Introduction Basic principle involved in immunohaemotology.

UNIT II

Major and Minor cross matching – Rhesus typing, Cooms test. Forward and reverse grooping

UNIT III

Introduction to serology. WIDAL, RPR, General inflammatory markers – CRP, RA, ASO.

UNIT IV

Screening Tests – HBs Ag, HIV(ELISA and Western Blot Test) TPHA, Malarial Parasite.

UNIT V

Collection, Separation and Storage of blood and its components.

REFERENCE BOOKS :

1. Lynch Medical Laboratory Technology – Rephale D.B,W.B Saunders.
2. Practical Biochemistry – Plummer
3. Clinical Laboratory Methods – john D. Bener
4. Clinical Laboratory Diagnosis – Levinson S A, Mac Fate R.D.
5. Clinical Lab. Methods & Diagnosis Vol. I & II – Alex C,S L Garelt.
6. Clinical Lab. Methods – John D Benger, Plilip G. Achermann, Gelsaon Toro

V SEMESTER		
SBE 5	**APPLIED MICROBIOLOGY-I**	**11SEMB51**
Hrs/Week : 3	**Hrs / Sem : 3x 15 = 45**	**Credits: 2**

UNIT I

Fermentation types - Products from microorganisms - aminoacids (glutamic acid), organic acid (fumaric acid and kojic acid) – enzymes - proteolytic enzymes.

UNIT II

Vitamins (A&B12) - Growthhormone - gibberellin, Antibiotics (chloramphenicol & Streptomycin) - Vaccine production (rabies vaccine).

UNIT III

Microbial fermentation products-bakers yeast, food and feed yeast, mushroom, single cell protein (bacteria, algae).

UNIT IV

Production of wine (red and white)-alcohol – beer-production on large and small scale.

UNIT V

Production of dairy products by microorganisms, cheese, yogurt, dehydrated milk and milk cream.

TEXT BOOKS :

1. Stanbury, P.F.Whitaker, A.Hall, S.J. 1995. Principles of Fermentation Technology,Pergamon Press.
2. Sikyta, B.1983. Methods in Industrial Microbiology, Ellis horwood limited.

REFERENCE BOOKS:

1. Demain A.L.Solomon, N.A.1986. Manual of Industrial Microbiology and Biotechnology. ASM Press
2. Reed. G. 1982. Prescott and Dunn's Industrial Microbiology. Macmillian Publishers.

VI SEMESTER		
SBE-6	**APPLIED MICROBIOLOGY-II**	**11SEMB61**
Hrs/Week : 3	**Hrs / Sem : 3x 15 = 45**	**Credits: 2**

UNIT I

Biodegradation of xenobiotics pesticides, herbicides, insecticides - production and application of bacterial pesticides and insecticides - bio fertilizers.

UNIT II

Waste treatment - solid and liquid wastes-primary treatment, secondary, tertiary treatment (chlorination) - Aerobic (oxidation ponds, trickling filter, biodiscs), Anaerobic (anaerobic lagoons, anaerobic sludge digestion).

UNIT III

Physicochemical properties and treatment of effluents from breweries, dairy, pharmaceuticals, paper mill.

UNIT IV

Composting - vermi composting, Mushroom production - biomethanation, gasification.

UNIT V

Mechanism of bio- leaching, bio accumulation, bio conversion, bio augmentation.

TEXT BOOKS:

1. Alexander, M.(1971). Microbial Ecology. John Wiley & Sons, Inc., New York
2. Alexander, M.(1977). Introduction to Soil Microbiology. John Wiley & Sons, Inc., New York.

REFERENCE BOOKS:

1. T.D.Brook and M.T.Madigon. Biology of Microorganisms.Prentice Hall,Inc, Newyork.

PART-IV NON-MAJOR ELECTIVE OFFERED BY DEPARTMENT OF MICROBIOLOGY TO OTHER MAJOR STUDENTS (2011 – 2014 ONWARDS)

III SEMESTER			
NME 1	**GENERAL MICROBIOLOGY**		**11NEMB31**
Hrs/Week: 3	**Hrs / Sem: 3 x 15 = 45**	**Hrs / Unit = 9**	**Credits: 2**

UNIT I

Introduction to microorganisms-bacteria-fungi-algae-protozoa-viruses
History of microbiology-important contributions

UNIT II

Staining-simple-gram-acid fast-spore-capsule

UNIT III

Morphology-arrangement of bacteria with examples-normal flora

UNIT IV

Tools, equipments and apparatus used in microbiology laboratory.

UNIT V

Culture media-types-uses.-control measures

TEXT BOOKS:

1. Pelczar Jr. M.J.Chan E.C.S., and Kreig N.R. (1993). Microbiology – McGraw Hill, Inc., New York.
2. Stainer R.Y., Ingraham J.L., Wheelis M.L., and Painter P.R.(1986). General Microbiology, MacMillan Education Ltd., London.

REFERENCE BOOKS:

1. Starr, M.P.Stolp, H., Truper, H.C.Balows, A and Schegel, H.C.(1991). The Prokaryotes. A hand book of Habitats, Isolation and Identification of Bacteria. Springer Verleg.
2. Brige E.A.(1992). Modern Microbiology – Win C.Brown Publishers, Dubuque, U.S.A.

IV SEMESTER			
NME 2	**MEDICAL MICROBIOLOGY**		**11NEMB41**
Hrs/Week: 3	**Hrs / Sem: 3 x 15 = 45**	**Hrs / Unit = 9**	**Credits: 2**

UNIT I

Introduction to Medical microbiology-pathogenic bacteria-fungi- protozoa and viruses -History of medical microbiology-important contributions

UNIT II

Isolation and identification of common pathogenic bacteria-culture study

UNIT III

Diseases-cholera-Tuberculosis-AIDS-Amoebiasis-Typhoid-mycoses

UNIT IV

Pathogenic Bacteria - Examples-*Staphylococcus aureus & Streptococcus pyogenes* (detailed study).

UNIT V

Vaccines-MMR-TT-DTP-Cholera vaccine-polio vaccine.

TEXT BOOKS:

1. Pelczar Jr. M.J.Chan E.C.S., and Kreig N.R. (1993). Microbiology – McGraw Hill, Inc., New York.
2. Stainer R.Y., Ingraham J.L., Wheelis M.L., and Painter P.R.(1986). General Microbiology, MacMillan Education Ltd., London.
3. Starr, M.P.Stolp, H., Truper, H.C.Balows, A and Schegel, H.C.(1991). The Prokaryotes. A hand book of Habitats, Isolation and Identification of Bacteria. Springer Verleg.

REFERENCE BOOKS:

1. Holt J.S.Krieg N.R.Sneath P.H.A. and Williams S.T (1994). Bergey's Mannual of Determinative Bacteriology. (9th edition) – William & Wilkins, Baltimore.
2. Brige E.A.(1992). Modern Microbiology – Win C.Brown Publishers, Dubuque, U.S.A.