

K.S.Rangasamy College of Arts and Science (Autonomous)

Tiruchengode-637215

Department of Microbiology (UG)

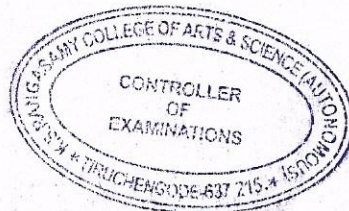
1.2.1 Percentage of new courses introduced of the total number of courses across all programmes offered during the last five years

1. Core II: Microbial Taxonomy and Physiology
2. Core Practical II
3. Core Practical III
4. Add on course: Mushroom Technology
5. SBC II : Practical I
6. Add-on Course: Microbiology for social welfare
7. ALC I: Biofertilizer Technology
8. Core VI: Environmental Microbiology
9. Core VII: Soil and Agricultural Microbiology
10. Core VIII: Medical Bacteriology
11. ALC II: Marine Microbiology
12. Elective I: Medical Mycology and Parasitology
13. Core IX: Fermentation Technology
14. Elective II: Pharmaceutical Microbiology
15. SBC IV: Practical II

Enclosures:

1. Copy of scheme of examination.
2. Syllabus copy of the new course introduced


Head of the Department

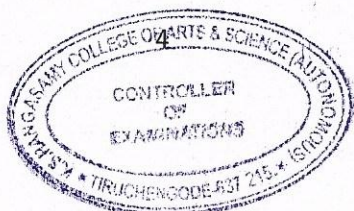



Controller of Examination

Mr. M. PRASAD, M.Sc., M.B.A., M.F.A.
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215, Tamilnadu, India

SCHEME OF EXAMINATION

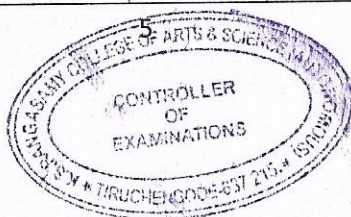
Subject Code	Subject	Hrs of Instruction	Exam Duration (Hrs)	Max Marks			Credit Points
				CA	CE	Total	
FIRST SEMESTER							
Part I							
18UTALA101/ 18UHILA101/ 18UFRLA101	Tamil I /Hindi I/ French I	5	3	25	75	100	3
Part II							
18UENLA101	English I	5	3	25	75	100	3
Part III							
18UMBM101	Core I: Basics in Microbiology	5	3	25	75	100	5
18UCHMBA101	Allied I: Chemistry	4	3	25	75	100	2
18UMBMP101	Core Practical I	6	6	40	60	100	3
18UCHMBAP10	Allied Practical I: Volumetric and organic analysis	3	3	40	60	100	2
Part IV							
18UVE101	Value Education I: Yoga	2	3	25	75	100	2
		30				700	20
SECOND SEMESTER							
Part I							
18UTALA201/ 18UHILA201/ 18UFRLA201	Tamil II /Hindi II/ French II	5	3	25	75	100	3
Part II							
18UENLA201	English II	5	3	25	75	100	3
Part III							
18UMBM201	Core II: Microbial Taxonomy and Physiology	6	3	25	75	100	5
18UBCMBA201	Allied II: Computer for biology	4	3	25	75	100	2
18UMBMP201	Core Practical II	6	6	40	60	100	3
18UBCMBAP201	Allied Practical II: Office package for biology	2	3	40	60	100	2
Part IV							
18UVE201	Value Education II: Environmental Studies	2	3	25	75	100	2
		30				700	20



M.V.
Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
 Controller of Examinations
 K.S. Ramasamy College of Arts & Science (Autonomous)
 Tiruchengode - 617 215, Tamilnadu, India.

B.Sc., Microbiology (Students admitted from 2018-2019 onwards)

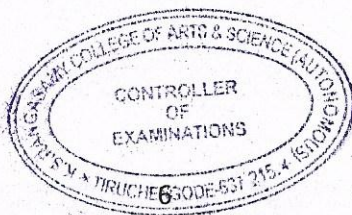
THIRD SEMESTER							
Part I							
18UTALA301/ 18UHILA301/ 18UFRLA301	Tamil III / Hindi III/ French III	5	3	25	75	100	3
Part II							
18UENLA301	English III	5	3	25	75	100	3
Part III							
18UMBM301	Core III: Molecular Biology	5	3	25	75	100	5
18UBCMBA301	Allied III: Biochemistry	3	3	25	75	100	2
18UMBMP301	Core Practical III	3	6	40	60	100	3
18UBCMBAP301	Allied Practical III:	3	3	40	60	100	2
Part IV							
18UMBSB301	SBC I : Bioinstrumentation (100% Internal)	2	3	25	75	100	2
	NMEC I	2	3	25	75	100	2
Part V (Non credit)							
18ULS301	Career Competency Skills I	1					-
	Add on course	1	3		100	100	
		30				800	22
FOURTH SEMESTER							
Part I							
18UTALA401/ 18UHILA401/ 18UFRLA401	Tamil IV/ Hindi IV/ French IV	5	3	25	75	100	3
Part II							
18UENLA401	English IV	5	3	25	75	100	3
Part III							
18UMBM401	Core IV: Immunology	5	3	25	75	100	5
18UMAMBA401	Allied V: Biostatistics	4	3	25	75	100	2
18UMBMP401	Core Practical IV	3	6	40	60	100	3
18UCSMBAP401	Allied Practical IV: Statistical Software	2	3	40	60	100	2
Part IV							
18UMBSBP401	SBC II : Practical I (External Evaluation)	2	3	40	60	100	2
	NMEC II	2	3	25	75	100	2
Part V (Non credit)							
18ULS401	Career Competency Skills II	1					
	Add on course	1	3		100	100	
		30				800	22



Mr. M. PRASAD, M.Sc., M.B.A., M.A.
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215, Tamilnadu, India.

B.Sc., Microbiology (Students admitted from 2018-2019 onwards)

FIFTH SEMESTER							
Part III							
18UMBM501	Core V: Fundamentals of Virology	5	3	25	75	100	5
18UMBM502	Core VI: Environmental Microbiology	4	3	25	75	100	4
18UMBM503	Core VII: Soil and Agricultural Microbiology	4	3	25	75	100	4
18UMBM504	Core VIII: Medical Bacteriology	5	3	25	75	100	5
	Elective I	4	3	25	75	100	4
18UMBMP501	Core Practical V	5	6	40	60	100	3
Part IV							
18UMBSB501	SBC III : Microbial Technology	2	3	100	-	100	2
Part V							
18UMBE501	Extension Activity	-	-	-	-	-	2
18ULS501	Career Competency Skills III	1					
		30				700	29
SIXTH SEMESTER							
Part III							
18UMBM601	Core IX: Fermentation Technology	5	3	25	75	100	5
18UMBM602	Core X: Genetic Engineering	5	3	25	75	100	5
18UMBM603	Core XI : Food and Dairy Microbiology	4	3	25	75	100	4
	Elective II	4	3	25	75	100	4
18UMBMP601	Core Practical VI	5	6	40	60	100	3
18UMBIP601	Internship and Viva-Voce	4	-	40	60	100	4
Part IV							
18UMBSBP601	SBC IV: Practical II: (External Evaluation)	2	3	40	60	100	2
Part V							
18ULS601	Career Competency Skills IV	1					
		30				700	27
Grand Total						4400	140



M. V.
 Mr M PRASAD, M.Sc., M.B.A.,
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India.

Non Major Elective Course (NMEC)

Course Code	Subject	Semester
18UMBNM301	Personal Hygiene	III
18UMBNM401	Microbes and Human health	IV

Add-on Course

Course Code	Subject	Semester
18UMBAC301	Mushroom Technology	III
18UMBAC401	Microbiology for social welfare	IV

Advanced Learners Course

Course Code	Subject	Semester
18UMBAL401	Biofertilizer Technology	IV
18UMBAL501	Marine Microbiology	V

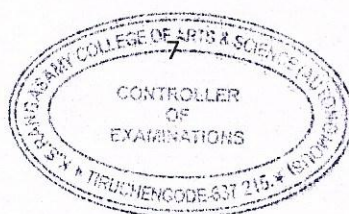
ELECTIVE

The students shall opt one of the following subjects as Elective in fifth & sixth semester

Elective	Subject code	Subject
Elective I	18UMBEL501	Medical Mycology and Parasitology
	18UMBEL502	Nano Microbiology
Elective II	18UMBEL601	Pharmaceutical Microbiology
	18UMBEL602	Basic and Applied Botany

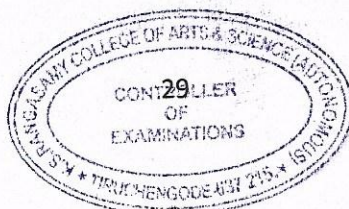
TOTAL MARKS AND CREDIT DISTRIBUTION

S.No.	PART	MARKS	NO. CREDITS
1.	PART I: Language	400	12
2.	PART II: Foundation English	400	12
3.	PART III : Core, Allied and Elective	2800	98
4.	PART IV: Value Education (Yoga) Environmental Studies NMEC and SBC	800	16
5.	PART V: Extension Activity	000	02
TOTAL		(4400)	(140)



M.V.
Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India.

18UMBM201	CORE II: MICROBIAL TAXONOMY AND PHYSIOLOGY	SEMESTER II	
Course Objectives:			
The course aims			
<ul style="list-style-type: none"> To learn the classification and taxonomic groups of microbes. To understand the basic nutritional requirements of microorganism. To learn the general metabolic activities of bacteria. 			
Credits: 06		Total Hours: 50	
UNIT	CONTENTS	Hrs	CO
I	Microbial evolution: Classification-Haeckel's three kingdom concepts- Whittaker's five kingdom concepts. Taxonomy hierarchy. Binomial Nomenclature. Classical systems of classification- Chemotaxonomy, Numerical taxonomy.	10	CO1
II	Molecular based classification: DNA- DNA Hybridization - Protein sequencing - rRNA sequencing. Classification and Salient features of bacteria according to the Bergey's manual of determinative bacteriology.	10	CO2
III	Microbial Growth: Growth and mode of cell division in bacteria- growth curve- measurement of growth- batch, continuous and synchronous culture. Factors affecting microbial growth- Physical and Chemical - temperature, pH, osmotic pressure, moisture, radiations and salinity. Endospore formation.	10	CO3
IV	Microbial Nutrition: Nutritional requirements and types of bacteria. Transport of nutrients by bacteria- active transport, passive diffusion, facilitated diffusion and group translocation.	10	CO4
V	Metabolic Pathways: Glycolysis, Entner Duodroff pathway, Citric acid cycle, Electron transport chain - ATP generation, Photosynthesis -oxygenic and anoxygenic and Fermentation.	10	CO5



Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamil Nadu, INDIA.

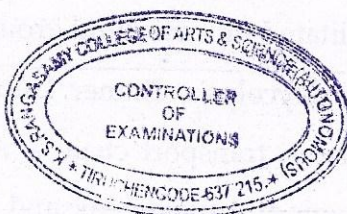
Text Books:	
1.	<i>Atlas</i> , R. M. 1997. Principles of Microbiology . [Second Edition]. WCK. Mc
2.	Graw-Hill. <i>Lansing M Prescott, John P Harley and Donald A Klein</i> . 2010. Microbiology . [Eighth Edition]. Mc GrawHill, NewYork.

Reference Books:	
1.	<i>Madigan, M.T., Martinko, J.M. and Parker, J.</i> 2000. Brock Biology of Microorganisms . [Ninth Edition]. Prentice Hall International, Inc.
2.	<i>Balows, A. Truper, H.G. Devorkin, M. Harder and Schleife, K.H.</i> 1992. The Prokaryotes . Springerlink. NewYork.
3.	<i>Black, J.G.</i> 1999. Microbiology-Principles and Exploration . [Fourth Edition]. Prentice Hall International Inc.

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Identify the group of microorganisms based on taxonomical character.
CO2	Analyze microorganisms based on their molecular features.
CO3	Assess the growth factors for cultivation of microorganisms in the laboratory.
CO4	Formulate suitable media for microbial growth.
CO5	Outline metabolic pathways and standardize culture conditions for industrially important microorganisms.



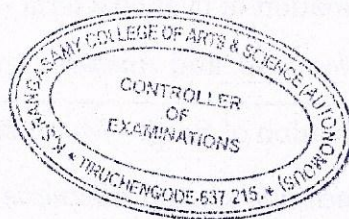
M.P.
Mr. M. PRASAD, M.Sc., M.B.A., M.T.
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India

MAPPING

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	H	H
CO2	H	H	H	H	H
CO3	H	M	H	M	M
CO4	H	H	H	H	H
CO5	M	H	M	H	H

H-High; M-Medium; L-Low

M.V.



Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
Controller of Examinations
K.S. Ramesh Babu College of Arts & Science (Autonomous)
Tiruchengode - 637 215, Tamil Nadu, India.

18UMBMP201	CORE PRACTICAL II : MICROBIAL TAXONOMY AND PHYSIOLOGY	SEMESTER II	
Course Objectives:			
The course aims			
<ul style="list-style-type: none"> To learn about the morphological diversity of microorganisms. To understand the biochemical characterization of microorganisms. 			
Credits: 03		Total Hours: 60	
Experiment	CONTENTS	Hrs	CO
1.	Measurement of cell size and motility of bacteria - Micrometry and Hanging drop method.	5	CO1
2.	Microscopic examination of cyanobacteria - <i>Oscillatoria</i> <i>sp.</i> , <i>Spirulina sp.</i> , <i>Nostoc sp.</i> and <i>Anabaena sp.</i>	2	CO2
3.	Microscopic examination of fungi - <i>Mucor sp.</i> , <i>Aspergillus sp.</i> , <i>Penicillium sp.</i> and <i>Alternaria sp.</i>	2	CO2
4.	Growth curve -Turbidity method	5	CO3
5.	IMViC tests	5	CO4
6.	Sugar fermentation tests	5	CO4
7.	Triple sugar iron agar (TSI) test	5	CO4
8.	Nitrate reduction test	3	CO4
9.	Starch hydrolysis	3	CO4
10.	Catalase and Oxidase tests	5	CO4
11.	Urease test	5	CO4
12.	Gelatin hydrolysis test	5	CO4
13.	Effect of various factors on growth of bacteria i. Temperature ii. pH iii. Nutrients - carbon source	5	CO5
14.	Thermal Death Point and Thermal Death Time	5	CO5



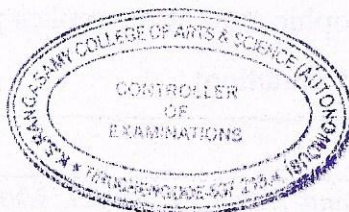
Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Trichengode - 637 215, Tamilnadu, India.

Reference Books	
1.	<i>Harley Prescott. Laboratory Exercises in Microbiology.</i> [Fifth Edition]. The McGraw-Hill companies.
2.	<i>Kannan, N. Laboratory Manual in General Microbiology.</i> [Second Edition]. Panima publishing corporation, New Delhi.
3.	<i>Benson. 2001. Microbiological Applications Laboratory Manual in General Microbiology.</i> [Eighth Edition]. The McGraw-Hill Companies.

EXPERIMENT OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Identify the motility of bacteria and determine the size of bacteria.
CO2	Discriminate the structures of Algae and Fungi.
CO3	Analyze the different phases of bacterial growth.
CO4	Outline the characterization of bacteria based on biochemical activities.
CO5	Assess the bacterial growth based on environmental factors.



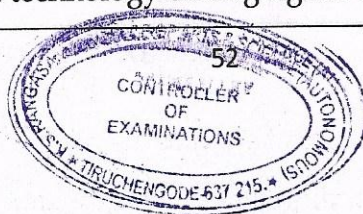
M.P.
Mr. M. PRASAD, M.Sc., M.Phil.,
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215, Tamil Nadu

18UMBMP301	CORE PRACTICAL III : MOLECULAR BIOLOGY	SEMESTER III	
Course Objectives:			
The course aims			
<ul style="list-style-type: none"> To understand and apply the basic principles and techniques of molecular biology for further research. To know about isolation, estimation and purification of nucleic acids. 			
Credits: 03		Total Hours: 50	
Experiment	CONTENTS	Hrs	CO
1.	Isolation of genomic DNA from bacteria.	06	CO1
2.	Isolation of plasmid DNA.	06	CO1
3.	Estimation of DNA by Diphenylamine method.	05	CO2
4.	Estimation of RNA by Orcinol method.	05	CO2
5.	Protein estimation by Lowry's method.	06	CO2
6.	Determination of UV killing effect for bacteria.	06	CO3
7.	Isolation of auxotrophic mutants by gradient plate technique (Spontaneous mutation).	08	CO4
8.	Isolation of auxotrophic mutants by replica plating technique (induced mutation).	08	CO4
Reference Books:			
1.	<i>Maniatis Sambrook and David W. Russel. Molecular Cloning: A Laboratory Manual. [Third Edition]. Cold Spring Harbor laboratory press.</i>		
2.	<i>Janarthanan, S. and Vincent, S. 2009. Practical Biotechnology: Methods and Protocols. [Second Edition]. Universities press, (India) Pvt Ltd, Hyderabad.</i>		

COURSE OUTCOMES (CO)

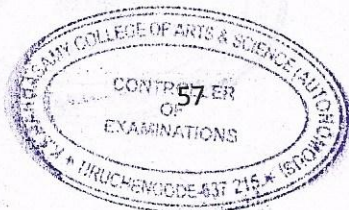
After completion of the course, the students will be able to

CO1	Analyze the bacterial genomic DNA and RNA.
CO2	Assess the quantification of nucleic acids and proteins.
CO3	Determine the killing effect of UVC on microorganisms.
CO4	Demonstrate rDNA technology through gene transfer in prokaryotes.



Mr. M. PRASAD, M.Sc., M.B.A., M.P.A.
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India

18UMBAC301		ADD ON COURSE I: MUSHROOM TECHNOLOGY	SEMESTER III	
Course Objectives:				
The course aims				
<ul style="list-style-type: none"> To learn the scope and importance of mushrooms. To study cultivation methods of various edible mushrooms. 				
				Total Hours: 25
UNIT	CONTENTS		Hrs	CO
I	Introduction: Scope and economic importance of mushroom cultivation-Nutritive values of mushroom- key to differentiate edible from Poisonous mushrooms.		05	CO1
II	Equipments and substrates in mushroom cultivation: Polythene bags, vessels, inoculation hook, inoculation loop, low cost stove, sieves, culture racks, mushroom unit or mushroom house, water sprayer, tray, boilers, driers.		05	CO2
III	Cultivation techniques: Spawn- tissue culture- types of spawn, substrate, mycelia isolation, spawn running- Cultivation of common edible mushrooms: <i>Agaricus bisporus</i> , <i>Pleurotus ostreatus</i> and <i>Volvariella volvaceae</i> and Harvesting. Medicinal properties of Magic mushroom.		05	CO3
IV	Storage of mushroom: Long term and short term storage of mushrooms- Diseases and pest control of mushrooms.		05	CO4
V	Value added products from mushrooms: Mushroom research centers: National level and regional level, Marketing of mushrooms in India and world.		05	CO5
Text Book:				
1.	Tripathi, D.P. 2005. Mushroom Cultivation . Oxford & IBH Publishing Co. Pvt.Ltd, New Delhi.			



Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
 Controller of Examinations
 Anna University College of Arts & Science (Autonomous)
 Anna Nagar - 607 215, Chennai-600 025.

Reference Books:

1.	<i>Pathak Y.G. 2010. Mushroom production and Processing Technology. Agrobios (India).</i>
2.	<i>Kannaiyan. S, Ramasamy. K. 1980. A hand book of edible mushroom. Today & Tomorrows printers & publishers, New Delhi.</i>
3.	<i>Nita. B. Handbook on Mushrooms .Oxford & IBH Publishing Co.</i>

COURSE OUTCOMES (CO)

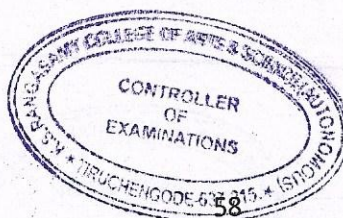
After completion of the course, the students will be able to

CO1	Discuss the economic importance of mushrooms.
CO2	Understand instrumental part of mushroom cultivation.
CO3	Apply various cultivation techniques for mushrooms.
CO4	Demonstrate disease and pest management for mushroom cultivation.
CO5	Outline marketing and value added product preparation of mushrooms.

MAPPING

PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	H
CO2	H	H	M	H	H
CO3	H	H	H	H	H
CO4	H	M	H	H	H
CO5	M	M	M	M	H

H-High; M-Medium; L-Low



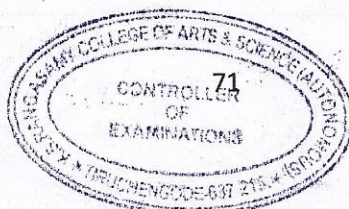
M.V.
Mr. M. PRASAD, M.Sc., M.Ed., U.P.H.D.
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 216, Tamilnadu, India.

18UMBSBP401	SBC II: PRACTICAL I	SEMESTER IV	
Course Objectives:			
The course aims			
<ul style="list-style-type: none"> To train the students to handle the basic instruments. To understand the basic techniques in characterization of biomolecules. 			
Credits: 02		Total Hours: 25	
Experiment	CONTENTS	Hrs	CO
1.	Calibration and Maintenance of pH meter.	2	CO1
2.	Preparation of buffers- Phosphate, Acetate, Citrate	3	CO2
3.	Estimation of chlorophyll pigment by solvent extraction method	5	CO2
4.	Separation of amino acids by Paper chromatography	5	CO3
5.	Separation of bacterial pigment by Column chromatography	5	CO4
6.	Separation of amino acids by Thin Layer Chromatography	5	CO4
Reference Books:			
1.	Thimmaiah, S.K. Standard Methods of Biochemical Analysis. Kalyani Publishers		

COURSE OUTCOMES (CO)

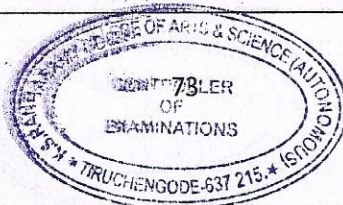
After completion of the course, the students will be able to

CO1	Discuss the calibration of basic microbiological instrument.
CO2	Apply the technique for the separation of biomolecules.
CO3	Evaluate the characteristic features of biopigments.



M. Prasad
Mr. M. PRASAD, M.Sc, MBA, Ph.D.
 Controller of Examinations
 Bangalore University, College of Arts & Science
 Bangalore - 560075

18UMBAC401	ADD ON COURSE II: MICROBIOLOGY FOR SOCIAL WELFARE	SEMESTER IV	
Course Objectives:			
The course aims			
<ul style="list-style-type: none"> To learn the importance and applications of microbial products. To understand the entrepreneur opportunities in relevance to Microbiology. 			
Total Hours: 25			
UNIT	CONTENTS	Hrs	CO
I	Microbial Technology: Bioactive compounds from microorganisms -Antibiotics - Production of Streptomycin. Novel Microbial products- Production of human insulin. Biopolymers - Engineering of <i>Xanthomonas campestris</i> . Biosequestration of heavy metal pollutants.	05	CO1
II	Institutions and schemes of Government of India: Schemes and programmes, Department of science and technology schemes, Nationalized banks - other financial institutions etc - SIDBI - NSIC - NABARD - IDBI - IFCI - ICICI etc. Opportunities in & as NGO sectors.	05	CO2
III	Biofertilizers: Algal fertilizers- <i>Azolla</i> as fertilizer. Composting - domestic waste, agricultural and industrial waste, vermi composting and organic farming.	05	CO3
IV	Patenting in Microbial Biotechnology: Patents - patenting strategies. Copy rights. Trade secrets, Trademarks, WIPO, GATT & TRIPs. Patenting of Biological materials.	05	CO4
V	SCP production: Mushroom and Spirulina cultivation and its marketing. Probiotics and its use as animal feed.	05	CO5
Text Book:			
1	Dubey, R.C (2009). A text book of Biotechnology, S. Chand & Company Ltd,		



Mr. M. PRASAD, B.A., M.B.A., M.P.
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India

	New Delhi.
Reference Books:	
1	Subba Rao, N.S., 1995. Biofertilizer in agriculture and forestry. Oxford and IBH, New York.
2	Bernard, R., Glick and Jack J Pasternik. 1996. Molecular Biotechnology Principles and Application of Recombinant DNA. Panima Publishing Corporation, New Delhi.

COURSE OUTCOMES (CO)

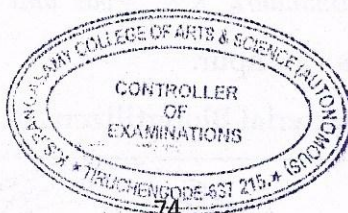
After completion of the course, the students will be able to

CO1	Discuss the valuable products of microbes
CO2	Understand the various government schemes and banking systems
CO2	Apply the microbes and its products as biofertilizers
CO3	Demonstrate the patenting methods for novel products
CO4	Outline the production of SCP and its marketing strategies

MAPPING

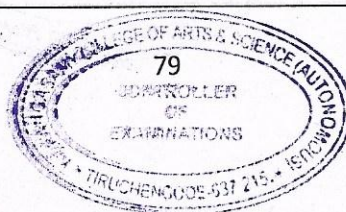
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	L	M	M	M	H
CO3	H	H	H	H	H
CO4	H	H	H	H	M
CO5	H	M	H	M	H

H-High; M-Medium; L-Low



Mr. M. PRASAD, M.Sc., MBA
 Controller of Examinations
 K.S. Ramasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamil Nadu

18UMBAL401	ADVANCED LEARNERS COURSE I: BIOFERTILIZER TECHNOLOGY	SEMESTER IV
Course Objectives: The course aims <ul style="list-style-type: none"> To learn the scope and importance of biofertilizers. To study mass cultivation methods of various biofertilizers. 		
UNIT	CONTENTS	CO
I	Introduction to biofertilizers: Structure and characteristic features of the following biofertilizer organisms - <i>Azospirillum</i> , <i>Azotobacter</i> , <i>Rhizobium</i> and <i>Frankia</i> .	CO1
II	Biofertilization processes: Decomposition of organic matter and soil fertility and vermicomposting. Mechanism of phosphate solubilization and phosphate mobilization. Free living and symbiotic nitrogen fixation.	CO2
III	Cultivation techniques: Isolation, purification, mass multiplication, formulation and crop response of inoculants - <i>Rhizobium</i> , <i>Azotobacter</i> and <i>Azospirillum</i> and phosphate solubilizer (<i>Pseudomonas striata</i>).	CO3
IV	Cyanobacteria: Isolation, purification, mass multiplication and application of cyanobacterial bioinoculants. <i>Azolla</i> - mass cultivation and its application.	CO4
V	Mycorrhizae: Ecto and endomycorrhizae. Isolation of AM fungi - Wet sieving method and sucrose gradient method. Mass production of AM inoculants and field applications.	CO5
Text Books:		
1.	<i>Somani, L.L., S.C. Bhandari, K.K. Vyas and S.N. Saxena.</i> 1990. Biofertilizers. Scientific Publishers - Jodhpur.	
2.	<i>Tilak, K.V.B.</i> 1991. Bacterial Biofertilizers. ICAR Pub., New Delhi.	



Mr. M. PRASAD, M.Sc., M.B.A., M.T.M.
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India.

Reference Books:

1.	Purohit, S.S., P.R. Kothari and S.K. Mathur. 1993. Basic and Agricultural Biotechnology . Agro Botanical Pub. India.
2.	Subba Rao, N. S. 1988. Biological Nitrogen Fixation: Recent Developments . Oxford and IBH Pub. Co. Pvt. Ltd., India.
3.	Subba Rao, N.S., G.S. Venkataraman and Kannaiyan. S. 1993. Biological Nitrogen Fixation . ICAR Pub., New Delhi.

COURSE OUTCOMES (CO)

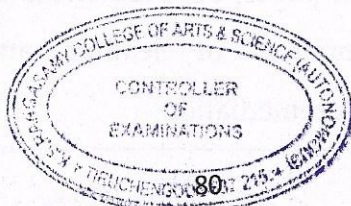
After completion of the course, the students will be able to

CO1	Discuss the economic importance of biofertilizers.
CO2	Understand the nitrogen fixation process.
CO3	Apply the various formulation and cultivation methods for biofertilizer production.
CO4	Demonstrate the cyanobacterial biofertilizer production.
CO5	Outline the field application of mycorrhizal bioinoculants.

MAPPING

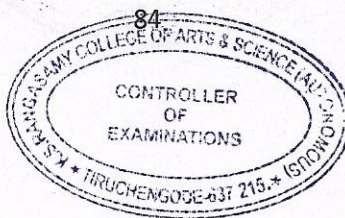
PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	H
CO2	H	H	H	H	H
CO3	H	M	H	H	H
CO4	H	M	H	H	H
CO5	H	H	H	H	H

H-High; M-Medium; L-Low



M. V.
 Mr. M. PRASAD, M.Sc., MBA, M.Phil.
 Controller of Examinations
 R.S. Rajangam College of Arts & Science (Autonomous)
 Tiruchengode - 637 215. Tirunelveli, INDIA

18UMBM502	CORE VI: ENVIRONMENTAL MICROBIOLOGY	SEMESTER V	
Course Objectives: The course aims <ul style="list-style-type: none"> To impart the significant processes involving in environmental microbiology. To understand bioremediation process and biofuel production. 			
Credits: 04		Total Hours: 40	
UNIT	CONTENTS	Hrs	CO
I	Ecological Principles: ecosystem-types of ecosystems-dynamics of ecosystem- culturable and non-culturable bacteria- conventional and molecular methods of studying microbial diversity.	08	CO1
II	Air and Aquatic -Microbiology: Aerosol- droplet nuclei. Enumeration of bacteria from air - Air sampling devices, Air sanitation- Air borne diseases and their control measures. Potability of water quality - Indicator organisms - MPN index. Eutrophication. Waterborne diseases and their control measures.	08	CO2
III	Sewage Microbiology: Chemical and Biochemical characteristics of sewage - Biological oxygen demand; Chemical oxygen demand. Sewage treatment - Physical, chemical and biological (trickling filter, activated sludge and oxidation pond) - Solid waste treatment-Saccarification and Pyrolysis.	08	CO3
IV	Role of microbes in environment: Bioremediation- types and its applications; bioremediation of hazardous waste and metals; biodegradation of paper, oil, pesticide and xenobiotic compound. Bio-deterioration of leather and textiles. Bioleaching of ores. Phytoremediation.	08	CO4

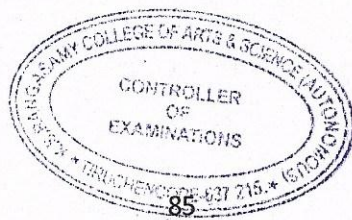


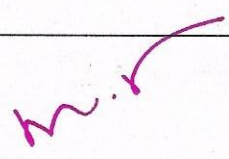
Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India

V	Microbial conversion of solid waste to food: Mushroom, SCP. Biofuel production- bioethanol, biogas, hydrogen and algal fuel. Applications of GIS and RS in environmental monitoring. Microbial composting and Vermicomposting.	08	CO5
Text Books:			
1.	<i>Atlas, R.M and Bartha R.</i> 1980. Microbial Ecology: Fundamentals and applications. Fourth Edition, An imprint of Addison Wesley Longman Inc.		
2.	<i>Vijaya Ramesh, K.</i> 2004. Environmental Microbiology. 1 st Edition, MJ1P Publishers (A unit of Tamil Nadu Book house), Chennai.		

Reference Books:			
1.	<i>Mithell R.</i> 1974. Introduction to Environmental Microbiology. Prantice Hall. Inc., Englewood Cliffs, New Jersey.		
2.	<i>Daniel J. C.</i> 1999. Environment Aspects of Microbiology. 1 st Edition, Bright sun Publications, Chennai.		
3.	<i>Raina, M. M, Ian, L. P and Charles, P G.</i> 2000. Environmental Microbiology. Academic Press, USA.		

COURSE OUTCOMES (CO)	
CO1	Recall the existence of living organisms and communities.
CO2	Evaluate air quality, air sanitation and control air borne diseases.
CO3	Create awareness about proper disposal and recycling of waste water.
CO4	Develop remediation for control environmental pollution using microorganisms.
CO5	Assess commercial application of microbial products.



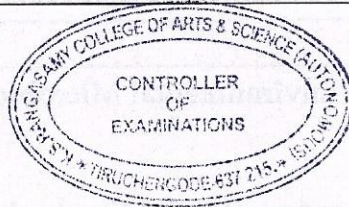

Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India.

K.S. RANGASAMY COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)
 TIRUCHENGODE - 637 215, TAMILNADU, INDIA.
 CONTACT: 0421-2333333, 0421-2333334
 WWW.KSRANGASAMYCOLLEGE.COM

MAPPING

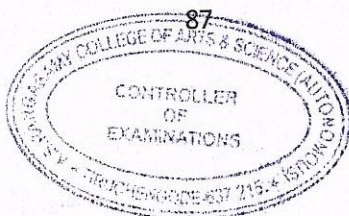
CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	M	M	M
CO2	H	H	H	M	L
CO3	H	H	M	M	M
CO4	M	M	M	L	L
CO5	H	H	H	M	M

H-High; M-Medium; L-Low



M.P.
Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
 Controller of Examinations
 K.S. Ranganathan College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India

18UMBM503	CORE VII: SOIL AND AGRICULTURAL MICROBIOLOGY	SEMESTER V	
Course Objectives: The course aims <ul style="list-style-type: none"> To gain knowledge about basics of soil profile. To understand role of soil microorganisms and its interactions. To ascertain the importance and application of bio-fertilizers and biocontrol agents. 			
Credits: 04		Total Hours: 40	
UNIT	CONTENTS	Hrs	CO
I	Soil Profile: Properties of soil, structure, texture and formation of soil. Soil profile types. Classification of soil. Microbial grouping- Autochthonous, Allochthonous and zymogenous microbes. Significance of soil microbes- Bacteria, Archaea, eukaryotic algae, cyanobacteria, fungi, Actinomycetes, protozoa, Nematode and viruses.	08	CO1
II	Biogeochemical cycle: Carbon cycle, Phosphorous cycle and Nitrogen cycle. Nitrogen fixation- Symbiotic Nitrogen fixers, Root nodule formation. Non symbiotic bacteria - cyanobacteria. Biochemistry of nitrogen fixation- Nitrogenase, hydrogenase, nif gene and nod gene. Associative nitrogen fixation- <i>Azospirillum</i> sp.	08	CO2
III	Interactions among soil microbes and plants: Neutralism, Commensalism, Symbiosis, Synergism, Amensalism, Parasitism, Predation and Competetion. Rhizosphere concept, R:S ratio, rhizoplane; spermosphere; phyllosphere, Mycorrhizae.	08	CO3
IV	Phytopathology: Introduction, Symptoms, disease cycle and	08	CO4

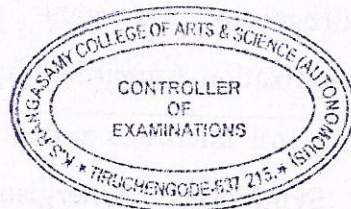


Mr. M. PRASAD, M.Sc., M.B.A., M.L.T.M.
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Trichengode - 637 215, Tamilnadu, India.

	control measures. Bacterial diseases- Blight of rice, Citrus canker. Mycoplasma disease- little leaf of brinjal. Fungal disease- Light blight of potato, Red rot of sugarcane, Wilt of cotton Tikka leaf spot of groundnut.		
V	Biofertilizers, biopesticides and biocontrol agents: Mass multiplication, field application and crop response to <i>Rhizobium</i> , and <i>Azospirillum</i> . Mode of action, formulation and application methods of biopesticides <i>Bacillus thuringiensis</i> and <i>Brevvaria bassiana</i> .	08	CO5

Text Books:

1. Atlas, R.M. and Bartha, R. 1992. **Microbial Ecology - Fundamentals and Applications.** [Fourth Edition]. Red Wood City C.A Benjamin/Cummings. Menlo Park, California, USA.
2. Martin Alexander. 1997. **Introduction to Soil Microbiology.** John Wiley & Sons, New York, USA.
3. Rangaswam, G. and A. Mahadvan. 1999. **Diseases of crop plants in India.** Fourth edition. Prentice Hall of India Pvt Ltd., New Delhi.
Subba Rao, N.S. 1982. **Advances in Agricultural Microbiology.** Oxford and LBH publishing co.
4. Alexander N. Glazer and Hiroshi Nikaido. **Microbiol biotechnology- Fundamentals of Applied Microbiology.** W.H. Freeman and Co, New york.



Mr. M. PRASAD, M.Sc., M.B.A., U. 2017
 Controller of Examinations
 K.R. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu. In

Reference Books:

1. *Subbha Rao, M.S.* 1995. **Soil Microorganisms and Plant Growth.** Oxford and IBH. New Delhi.
2. *Paul, E.A.* 2007. **Soil Microbiology and Biochemistry.** [Third Edition]. Academic Press - An imprint of Elsevier, Burlington, USA.
3. *Bawden. F.C.* 1999. **Plant Diseases.** Greenworld. First Edition in India. Efficient offset printers. New Delhi.
4. *Atlas, A.M. and R. Bartha.* 1998. **Microbial Ecology. Fundamentals and Applications.** An imprint of Addison Wesley longmann Inc.
5. *Mark S. Coney.,* 1999. **Soil Microbiology: An exploratory approach.** Delmar publishers, Singapore.

COURSE OUTCOMES (CO)

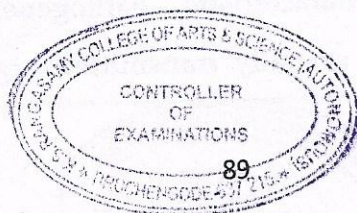
After completion of the course, the students will be able to

CO1	Analyze the soil profile and its properties.
CO2	Understand biogeochemical cycles and biological nitrogen fixation mechanism.
CO3	Compute interactions with soil microbes and plants.
CO4	Assess the disease established by phytopathogens.
CO5	Prepare effective biofertilizers for improving soil health.

MAPPING

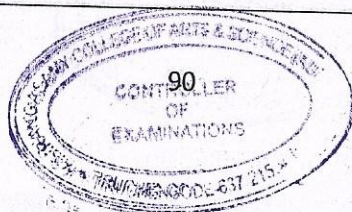
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	H
CO2	M	H	H	H	H
CO3	M	H	H	H	H
CO4	H	H	H	H	H
CO5	M	H	H	H	H

H-High; M-Medium; L-Low



M. Prasad
 Mr. M. PRASAD, M.Sc., M.Phil., M.A.,
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamil Nadu, India.

18UMBM504	CORE VIII: MEDICAL BACTERIOLOGY	SEMESTER V	
Course Objectives:			
The course aims			
<ul style="list-style-type: none"> To gain knowledge about the pathogenesis. To understand the importance of collection, transport, storage and processing of clinical samples To ascertain the antigenic properties of pathogens. To enhance employability skills in agriculture. 			
Credits: 05		Total Hours: 50	
UNIT	CONTENTS	Hrs	CO
I	Microbial disease: Infection- Host parasite interactions- adhesion, invasion, host damage, spread, multiplication and release of pathogen. Normal flora of human- skin, eye, respiratory tract and gastrointestinal tract.	10	CO1
II	Collection, transport, storage and processing of clinical samples: Blood, Urine, Sputum and Body fluids. Hospital acquired infection and their control.	10	CO2
III	Morphology, Cultural characteristic, pathogenesis, lab diagnosis and control of Gram positive organisms: <i>Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Mycobacterium tuberculosis, Corynebacterium diphtheriae, Clostridium botulinum, Clostridium tetani.</i>	10	CO3
IV	Morphology, Cultural characteristic, pathogenesis, lab diagnosis and control of Gram negative Organisms: <i>Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas aeruginosa, Vibrio cholerae.</i>	10	CO4
V	Morphology, Cultural characteristic, pathogenesis, lab diagnosis and control of sexually transmitted organisms:	10	



Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India

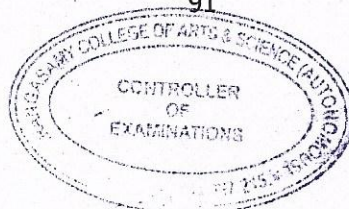
	<i>Treponema pallidum, Neisseria gonorrhoeae, Chlamydia trachomatis, Mycoplasma genitalium, Haemophilus ducreyi.</i>		CO5
Text Books:			
1.	<i>Chakrabort, P.</i> 2003. A Text book of Microbiology. Second edition, Published by New Central Agency (P) Ltd., Kolkata.		
2.	<i>Ananthanarayan, R and Jayaram Paniker, C. K.</i> 2005. Text Book of Microbiology. Seventh edition, Orient Longman Limited, Hyderabad.		
3.	<i>Satish, G.</i> 2005. The Short Textbook of Medical Microbiology. Eighth edition, Jaypee Brothers, Medical publishers (P) Ltd., New Delhi.		

Reference Books:	
1.	<i>Baron, E.J, Peterson, L.R., and Finegold, S. M .</i> 1994. Bailey and Scotts diagnostic microbiology. 9th edition, Mosby publications
2.	<i>Rajan, S.</i> 2009. Medical Microbiology. First edition, MJP Publishers, Chennai.6.
3.	<i>Rajesh Bhatia and Ratan Lalchhpujani.</i> 2004. Essentials of Medical Microbiology. Third edition, Jaypee Brothers, Medical Publishers (P) Ltd., New Delhi.
4.	<i>Sundararaj, T.</i> 2005. Microbiology Laboratory Manual, Perungudi, Chennai-96.8.
5.	<i>Jawetz, Melnick, and Adelberg's.</i> 2013. Medical Microbiology. 26th Edition. McGraw-Hill.

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Analyze microbial diseases and normal flora.
CO2	Understand the proper processing of clinical samples.
CO3	Analyze and diagnose the infections caused by Gram positive pathogens
CO4	Analyze and diagnose the infections caused by Gram negative pathogens
CO5	Create awareness for parasitical infestation



MAPPING

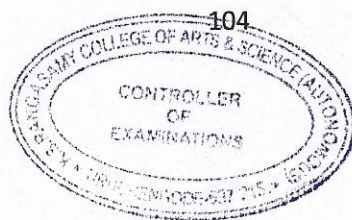
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	H	M	H	H
CO3	M	H	H	H	M
CO4	M	H	H	H	H
CO5	M	H	H	H	H

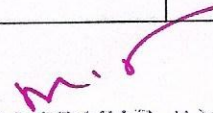
H-High; M-Medium; L-Low



M.P.
Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.,
 Controller of Examinations
 K.G. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India

18UMBAL501	ADVANCED LEARNERS COURSE II: MARINE MICROBIOLOGY	SEMESTER V
<p>Course Objectives:</p> <p>The course aims</p> <ul style="list-style-type: none"> This subject aims to introduce the students to understand microbial diversity, significance, and dynamics of marine environment, Marine food borne pathogens, and marine products. 		
UNIT	CONTENTS	CO
I	<p>Marine Environment: Properties of sea water, chemical and physical factors of marine environment-Ecology of coastal, shallow and deep sea microorganism - significance of marine microflora. Diversity of microorganism - Archaea, bacteria, actinobacteria, cyanobacteria, algae, fungi, viruses and protozoa in the mangroves and coral environments.</p>	CO1
II	<p>Cultivation of Marine Microbes: Methods of studying marine microorganisms- sample collection- isolation and identification: Cultural, Morphological, physiological, biochemical and Molecular characteristics- Preservation methods of marine microbes.</p>	CO2
III	<p>Marine Extremophiles: Survival at extreme environments - starvation - adaptive mechanisms in thermophilic, alkalophilic, osmophilic and barophilic, psychrophilic microorganisms - hyperthermophiles, halophiles and their importance.</p>	CO3
IV	<p>Microbial Biodegradation: Natural and synthetic material in the marine environment pesticide, cellulose degradation, hydrocarbon production. Bioremediation of pollutants in marine environment.</p>	CO4




 M. PRASAD, M.Sc., M.B.A.,
 Controller of Examinations
 V.S. Ranganatha Samy College of Arts & Science (Autonomous)
 Trichy, Tamilnadu - 627 215.

V	Marine Microbial Products: Carrageenan, agar-agar, sea weed fertilizers, Astaxanthin, β carotene - enzyme - antibiotics - antitumor agents - bio surfactants - pigments. Preservation of seafoods.	CO5
---	---	-----

Text Book

1. *Belkin, S and Colwell, R, R.* 2005. **Ocean and health: Pathogens in the Marine Environment.** Springer.
2. *Bhakuni, D.S and Rawat, D.S.* **Bioactive marine natural products.** Anamaya Publishers, New Delhi. 2005.
3. *Elay, A.R.* 1992. **Microbial food poisoning.** Chapman and Hall, London.
4. *Ford TE.* 1993. **Aquatic microbiology. An ecological approach.** Blackwell scientific publications, London.
5. *Austin. B and Austin, D.A.* 1999. **Bacterial Fish pathogens- Diseases of Farmed and Wild Fish.** Springer Publisher.
6. *Munn and Munn.* 1996. **Marine Microbiology: Ecology and Applications.** BIOS Scientific publisher.
7. *Atlas, R.M.* 1988. **Microbiology, Fundamentals and applications.** Maxwell McMillan International Editions.



M.V.
Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215, Tamilnadu, India.

Reference Books:

1. Hunter-Cevera, J., Karl, D and Buckley, M. 2005. **Marine Microbial Diversity: the key to Earth's habitability.** American Academy of Microbiology.
2. James W. Nybakker . 2001. **Marine Biology.** Benjamin Cummings.
3. Krichman D.L. **Microbial ecology of the oceans.** Wiley liss, New York.
4. Rheinheimer, G. 1980. **Aquatic Microbiology-an Ecological Approach.** Blackwell Scientific Publications.
5. Kirchman, L. 1991. **Microbial Ecology of the Oceans.** 2000 John Wiley and Sons.
6. *The Prokaryotes:* 1992. **A Handbook on the biology of Bacteria.** Vol. 1-4. Springer &Verlag New York 2000.

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Discuss Marine Environment and its diversity
CO2	Be aware of marine microbes isolation, preservation and biogeochemical cycle
CO3	Demonstrate marine extremophiles and their importance
CO4	Apply the marine microbes for biodegradations of various pollutant
CO5	Create and develop the employable and entrepreneur opportunity in marine microbiology.

MAPPING

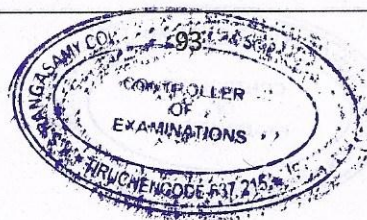
PSO \ CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	M
CO2	H	H	M	H	M
CO3	M	M	H	M	H
CO4	M	M	M	H	M
CO5	M	H	M	H	H

H-High; M-Medium; L-Low



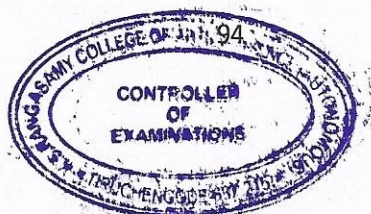
M. PRASAD, M.Sc., M.Phil.,
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India.

18UMBEL501	ELECTIVE I: MEDICAL MYCOLOGY AND PARASITOLOGY	SEMESTER V	
<p>Course Objectives:</p> <p>The course aims</p> <ul style="list-style-type: none"> To acquire knowledge of fungal and parasitic diseases, etiology, diagnosis and treatment. To understand the taxonomy, morphology, and pathogenesis of human parasites and fungi 			
Credits: 04		Total Hours: 40	
UNIT	CONTENTS	Hrs	CO
I	<p>Mycology: Historical introduction to Mycology - Morphology - Taxonomy - Nomenclature and Classification of fungi - Isolation and identification of fungi from clinical specimens. Mycotoxins and Mycetism. Antifungal agents - Testing methods and quality control. Virulence factors of fungi.</p>	10	CO1
II	<p>Fungal Diseases: Superficial mycosis- <i>Tinea, Piedra</i>- Dimorphic fungi causing systemic mycosis- Blastomycosis and Histoplasmosis- Cutaneous mycosis- Dermatophytosis. Subcutaneous mycosis- Sporotrichosis, Mycetoma, Rhinosporidiosis. Opportunistic mycosis- Candidiasis, Cryptococcosis and Aspergillosis.</p>	10	CO2
III	<p>Medical Parasitology: Morphology, classification, characteristics, pathogenesis, laboratory diagnosis, prevention and control; Intestinal amoebae - <i>Entamoeba histolytica, Giardia lamblia</i>. Free living Amoebae - <i>Naegleria fowleri, Acanthamoeba</i> sp. Blood and tissue flagellates - <i>Trichomonas vaginalis, Trypanosoma brucei, Trypanosoma cruzi</i>. Malarial parasite - <i>Plasmodium falciparum, Plasmodium vivax</i>.</p>	10	CO3



Mr. M. FRASAD, M.Sc., M.B.A., M.Phil.
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu.

IV	Helminths Infection of Helminthes: <i>Taeniasolium</i> , <i>T. saginata</i> , <i>Echinococcus granulosus</i> , <i>Fasciola hepatica</i> , <i>Paragonimus westermani</i> and <i>Schistosomes</i> , <i>Ascaris lumbricoides</i> , <i>Ancylostoma duodenale</i> , <i>Trichuris</i> , <i>Enterobius</i> and <i>Wuchereria bancrofti</i> .	10	CO4
V	Laboratory techniques in Parasitology: Examination of faeces - Direct and concentration methods. Blood smear examination - Cultivation of protozoan parasites, Serology and PCR techniques. (Self-Study)	-	CO5
Text Books:			
1. 2. 3. 4. 5.	<p><i>Jagdishchander</i>. 2017. Text book of Medical Mycology. 4th edition, Taypee Publisher.</p> <p><i>Gopinathhait</i>. 2017. A Text book of Mycology. New central book agency (NCBA).</p> <p><i>Chander, J.</i> 2009. Text Book of Medical Mycology. 3rd Edn. Mehta Publishers.</p> <p><i>Jayaram Paniker, C.K.</i> 2013. Paniker's Textbook of Medical Parasitology. 7th edition, Jaypee Brothers Medical Publishers (P) Ltd, 2013.</p> <p><i>Parija, S. C.</i> 2013. Text Book of Medical Parasitology - Protozoology and Helminthology. 4th Edn. All India Publishers and Distributors, New Delhi.</p>		
Reference Books:			
1. 2. 3. 4. 5.	<p><i>Errolraiss, H. Jeanshadorry, G. Mashallyon.</i> 2014. Fundamental Medical Mycology. Wiley Blackwell.</p> <p><i>Russel, F. Cheadle and Ruth Leventhal.</i> 2011. Medical Parasitology.</p> <p><i>Reiss, E. Shadomy, H.J. and Lyon, G.M.</i> 2011. Fundamental Medical Mycology. Wiley-Blackwell.</p> <p><i>Brooks, G, Carrol, K.C, Butel J. and Morse, S.</i> 2012. Jawetz Melnick and Adelberg Medical Microbiology. 26th Edn. Lange Medical Publications.</p> <p><i>Chatterjee, K.D.</i> 2009. Parasitology: Protozoology and Helminthology. 13th Edn. CBS Publishers & Distributors Pvt. Limited.</p>		



Mr. M. PRASAD, M.Sc., M.A.,
 Controller of Examinations
 K.R. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India

COURSE OUTCOMES (CO)

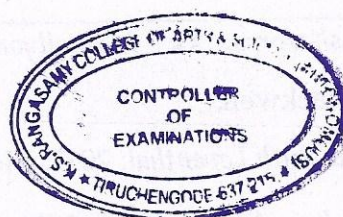
After completion of the course, the students will be able to

CO1	Analyze proper processing of fungal infected clinical samples.
CO2	Understand the superficial, cutaneous, subcutaneous and opportunistic fungal pathogens.
CO3	Analyze and diagnose the infections caused by intestinal and free living <i>Amoeba</i> .
CO4	Analyze and diagnose Helminths Infection of Helminthes.
CO5	Develop laboratory techniques in Parasitology.

MAPPING

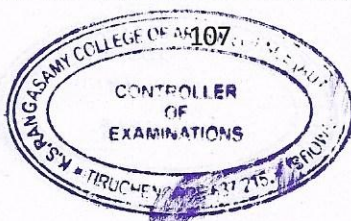
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	M	M	H	H
CO3	M	H	H	M	M
CO4	M	H	M	M	H
CO5	M	H	H	H	H

H-High; M-Medium; L-Low



Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Trichengode - 637 215, Tamilnadu, India

18UMBM601	CORE IX: FERMENTATION TECHNOLOGY	SEMESTER VI	
Course Objectives:			
The course aims			
<ul style="list-style-type: none"> To learn about the isolation of industrially important organism, industrial medium formulation and sterilization. To know the various component parts of the fermentor and its function. To get an idea about the sterility testing of pharma products. 			
Credits: 05		Total Hours: 50	
UNIT	CONTENTS	Hrs	CO
I	Screening techniques: Primary and secondary screening techniques. Preservation of culture. Strain improvement by rDNA techniques and mutation. Development of inoculum for various fermentation processes- Bacteria, fungi and yeast.	10	CO1
II	Fermentor: Components and types of fermentor. Control systems in fermentation - pH, Temperature, Oxygen and foam. Computer applications in fermentation technology.	10	CO2
III	Upstream and downstream processing: Medium formulation - Water, carbon, nitrogen, minerals and antifoams. Medium sterilization - Batch & continuous sterilization. Recovery and purification of intra cellular and extracellular products.	10	CO3
IV	Industrial production of alcoholic beverages: Preparation of substrate, fermentation and recovery of Wine and Beer. Production of organic acids - citric acid and acetic acid. Microbial production of Lysine and recovery. Microbial production of α -amylase and vitamin B ₁₂ .	10	CO4
V	Industrial production of antibiotics: Inoculum preparation, fermentation and recovery of Penicillin and Streptomycin.	10	CO5



M.S.
M. PRASAD, B.Sc., Microbiology,
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India

	Citric acid - Surface culture and submerged process using <i>Aspergillus niger</i> .		
Text Books:			
1.	<i>Stanbury, P.F., Whittaker, A. and Hall, S.J.</i> 1997. Principles of Fermentation Technology . [Second Edition]. Aditya Books Pvt. Ltd., New Delhi.		
2.	<i>Patel, A.H.,</i> 2005. An Introduction to Industrial Microbiology . Macmillan India Ltd., Chennai.		

Reference Books:			
1.	<i>Hugo, W.B. and Russell, A.D.</i> 1998. Pharmaceutical Microbiology . [Sixth Edition]. Blackwell scientific company Ltd., USA.		
2.	<i>Agarwal, A.K., and Pradeep, P.</i> 2005. Industrial Microbiology: Fundamentals and Applications . [First Edition]. Published by Agrobios (India).		
3.	<i>Hugo, W.B and Russel, A.D.</i> 1998. Pharmaceutical Microbiology . Sixth edition, Black Well Scientific Company Ltd.		

COURSE OUTCOMES (CO)

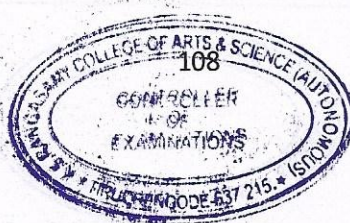
After completion of the course, the students will be able to

CO1	Analyze the strain improvement techniques for potent strain preparation.
CO2	Prepare basic techniques for fermentor design.
CO3	Demonstrate the upstream and downstream techniques.
CO4	Assess the techniques used in Industrial production of Alcoholic beverages and enzymes.
CO5	Create improved technology for antibiotics production.

MAPPING

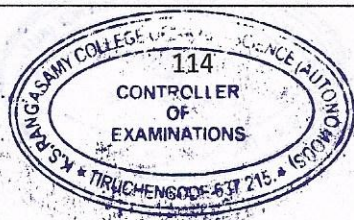
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	H
CO2	H	M	M	H	M
CO3	M	H	H	H	H
CO4	M	M	H	M	M
CO5	H	H	M	H	H

H-High; M-Medium; L-Low



Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India.

18UMB MEL601	ELECTIVE II: PHARMACEUTICAL MICROBIOLOGY	SEMESTER- VI	
Course Objectives: <ul style="list-style-type: none"> To learn about the synthetic antimicrobial agents and its mechanism of action. To understand microbial contamination and spoilage of various pharmaceutical products. To study the quality assurance and validation of pharmaceutical Industry 			
Credits: 04		Total Hours: 40	
UNIT	CONTENTS	Hrs	CO
I	Antibiotics: Definition, scope and recent developments of pharmaceutical microbiology. Classification of antibiotics - Mechanism of action of antibiotics (Inhibitors of cell wall synthesis, nucleic acid and protein synthesis)- Antimicrobial resistance- MDR and XDR.	10	CO1
II	Microbial contamination and spoilage of pharmaceutical products: Microbial sources, contamination and spoilage of pharmaceuticals; Factors affecting microbial spoilage of pharmaceutical products; sterile injectables - Intravenous infusions and total parenteral nutrition (TPN), non injectables-non injectable water and haemodialysis solutions, ophthalmic preparations and implants and their sterilization. Methods of preservation of pharmaceutical products.	10	CO2
III	Pharmaceutical Drug Analysis: Biosensors and applications in Pharmaceuticals; Macromolecular, cellular and synthetic drug carriers. Assay of steroids.	10	CO3



M. PRASAD
 Controller of Examinations
 K.S. Rangasamy College of Science (Autonomous)
 Tiruchengode - 637 215, Tamil Nadu, India.

IV	<p>Preclinical Development: Safety profile of drugs (Pyrogenicity, Toxicity- hepato, - nephro, - cardio and neurotoxicity), Toxicological evaluation of drug (LD50, Acute, subacute and chronic toxicity), Mutagenicity (Ames test, micronucleus test) and Carcinogenicity. Clinical studies: Phase I, phase II, phase III and phase IV of clinical trials - Objectives, Conduct of trials, Outcome of trials.</p>	10	CO4
V	<p>Quality Assurance and Validation: Good Manufacturing Practices (GMP) and Good Laboratory Practices (GLP) in Pharmaceutical Industry. Government regulatory practices and policies for pharmaceutical industry: Food and Drug Administration (FDA), The Central Drugs Standard Control Organisation (CDSCO), the Drug Controller General of India (DCGI); patenting of pharmaceutical products.</p> <p style="text-align: right;">(Self-Study)</p>	-	CO5
Text Books:			
1.	<p>Hugoand Russell. 2004. Pharmaceutical Microbiology. [Seventh Edition]. Wiley-Blackwell Publishers, UK.</p>		
Reference Books:			
1.	<p>Purohit, S. S., Saluja, A. K., and Kakrani, H. N. 2003. Pharmaceutical Microbiology. Agrobios, New Delhi.</p>		
2.	<p>Lansing M Prescott, John P Harley, and Donald A Klein. 2010. Microbiology. [Eighth Edition]. Mc Graw Hill, New York</p>		
3.	<p>Burn J. H. Principles of Therapeutics, Blackwell Scientific Pub. O. Ltd. Oxford.</p>		
4.	<p>Goldstein A., Aronow L., and Kalman S. M. Principles of Drug Action, The Basis of Pharmacology, Harper international edition New York</p>		
5.	<p>Mannfred A. Holliger. 2008. Introduction to pharmacology, 3rd Ed., CRC Press</p>		



Mr. M. PRASAD, M.Sc., M.A., M.Phil.
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India.

COURSE OUTCOMES (CO)	
After completion of the course, the students will be able to	
CO1	Recall the basics and working mechanism of antibiotics against infectious diseases
CO2	Optimize the production of pharmaceutical products
CO3	Develop the pharmaceutical products without contamination and spoilage
CO4	Apply the technology in drug delivery systems
CO5	Follow the protocols and regulations to validate pharmaceutical products.

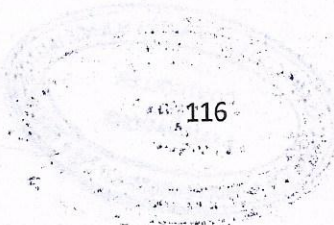
MAPPING

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	H
CO2	M	M	H	M	M
CO3	H	M	H	H	M
CO4	H	M	H	M	H
CO5	M	H	H	H	H

H-High; M-Medium; L-Low



M. S.
 M. S. RANGASAMY,
 Controller of Examinations
 K.S. Rangasamy College of Arts & Science (Autonomous)
 Tiruchengode - 637 215, Tamilnadu, India



18UMBSBP601	SBC IV: PRACTICAL II: MICROBIAL TECHNOLOGY	SEMESTER VI	
Course Objectives:			
The course aims			
<ul style="list-style-type: none"> To train the students to handle the. To understand the basic techniques in. 			
Credits: 02		Total Hours: 25	
Experiment	CONTENTS	Hrs	CO
1.	Alcohol estimation by colorimetric method	2	CO1
2.	Enzyme Immobilization	3	CO2
3.	Production lactic acid	5	CO3
4.	Protease production	5	CO3
5.	PHB production	5	CO3
6.	Cellulase production	5	CO3
Reference Books:			
1.	Thimmaiah, S.K. Standard Methods of Biochemical Analysis. Kalyani Publishers		

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Discuss the estimation and quantification of ethanol.
CO2	Apply the immobilization method for biomedical benefits.
CO3	Evaluate the production of industrial important enzymes for industrial application.



Mr. M. PRASAD, M.Sc., M.B.A., M.Phil.
Controller of Examinations
K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215, Tamilnadu, India.