

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

**Tiruchengode-637215**

**Department of Microbiology (UG)**

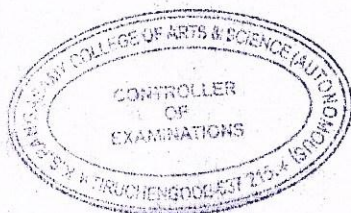
**1.2.2 Percentage of programs in which Choice Based Credit System (CBCS)/elective course system has been implemented**


1. Elective I: Medical Mycology and Parasitology
2. Elective I: Nano Microbiology
3. Elective II: Pharmaceutical Microbiology
4. Elective II: Basic and Applied Botany

**Enclosures:**

1. Copy of scheme of examination.
2. Syllabus copy of the elective courses

  
**Head of the Department**

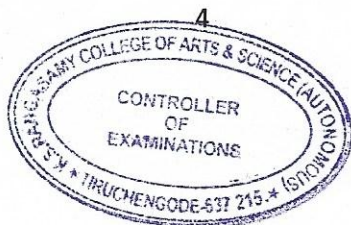


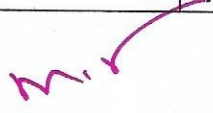
  
**Controller of Examination**

**Mr. M. PRASAD, M.Sc., M.B.A., M.F.**  
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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	
<b>FIRST SEMESTER</b>							
<b>Part I</b>							
18UTALA101/ 18UHILA101/ 18UFRLA101	Tamil I /Hindi I/ French I	5	3	25	75	100	3
<b>Part II</b>							
18UENLA101	English I	5	3	25	75	100	3
<b>Part III</b>							
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
<b>Part IV</b>							
18UVE101	Value Education I: Yoga	2	3	25	75	100	2
		30				700	20
<b>SECOND SEMESTER</b>							
<b>Part I</b>							
18UTALA201/ 18UHILA201/ 18UFRLA201	Tamil II /Hindi II/ French II	5	3	25	75	100	3
<b>Part II</b>							
18UENLA201	English II	5	3	25	75	100	3
<b>Part III</b>							
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
<b>Part IV</b>							
18UVE201	Value Education II: Environmental Studies	2	3	25	75	100	2
		30				700	20



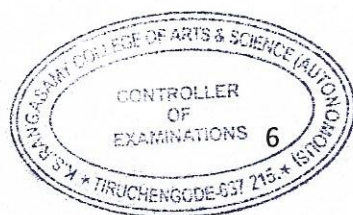
  
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THIRD SEMESTER							
Part I							
18UTALA301/ 18UHILA301/ 18UFRLA301	Tamil III / Hindi III/ French III	5	3	25	75	100	3
Part II							
18UENLA301	English III	5	3	25	75	100	3
Part III							
18UMBM301	Core III: Molecular Biology	5	3	25	75	100	5
18UBCMBA301	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



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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
<b>Grand Total</b>						<b>4400</b>	<b>140</b>



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**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

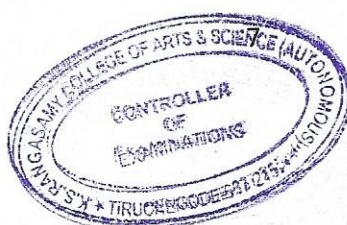
**ELECTIVE**

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

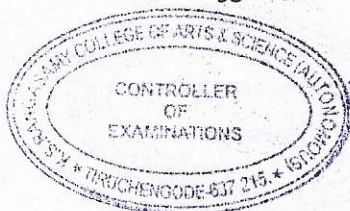
**TOTAL MARKS AND CREDIT DISTRIBUTION**

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
<b>TOTAL</b>		<b>(4400)</b>	<b>(140)</b>



M. ✓

18UMBEL501	ELECTIVE I: MEDICAL MYCOLOGY AND PARASITOLOGY	SEMESTER V	
<p><b>Course Objectives:</b></p> <p>The course aims</p> <ul style="list-style-type: none"> <li>To acquire knowledge of fungal and parasitic diseases, etiology, diagnosis and treatment.</li> <li>To understand the taxonomy, morphology, and pathogenesis of human parasites and fungi</li> </ul>			
Credits: 04			Total Hours: 40
UNIT	CONTENTS	Hrs	CO
I	<p><b>Mycology:</b> 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><b>Fungal Diseases:</b> Superficial mycosis- <i>Tinea</i>, <i>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><b>Medical Parasitology:</b> Morphology, classification, characteristics, pathogenesis, laboratory diagnosis, prevention and control; Intestinal amoebae - <i>Entamoeba histolytica</i>, <i>Giardia lamblia</i>. Free living Amoebae - <i>Naegleria fowleri</i>, <i>Acanthamoeba</i> sp. Blood and tissue flagellates - <i>Trichomonas vaginalis</i>, <i>Trypanosoma brucei</i>, <i>Trypanosoma cruzi</i>. Malarial parasite - <i>Plasmodium falciparum</i>, <i>Plasmodium vivax</i>.</p>	10	CO3



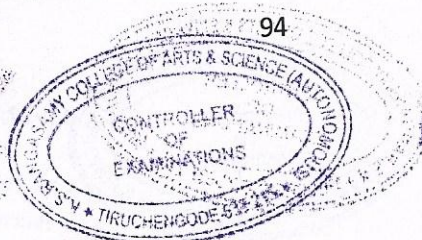
IV	<b>Helminths Infection of Helminthes:</b> <i>Taeniasolium</i> , <i>T. saginata</i> , <i>Echinococcus granulosus</i> , <i>Fasciola hepatica</i> , <i>Paragonimus westermani</i> and <i>Schistosomes</i> , <i>Ascaris lumbricoides</i> , <i>Ancylostoma duodenale</i> , <i>Trichuris</i> , <i>Enterobius</i> and <i>Wuchereria bancrofti</i> .	10	CO4
V	<b>Laboratory techniques in Parasitology:</b> Examination of faeces - Direct and concentration methods. Blood smear examination - Cultivation of protozoan parasites, Serology and PCR techniques.  (Self-Study)	-	CO5

**Text Books:**

1. Jagdishchander. 2017. **Text book of Medical Mycology**. 4<sup>th</sup> edition, Taypee Publisher.
2. Gopinathhait. 2017. **A Text book of Mycology**. New central book agency (NCBA).
3. Chander, J. 2009. **Text Book of Medical Mycology**. 3rd Edn. Mehta Publishers.
4. Jayaram Paniker, C.K. 2013. **Paniker's Textbook of Medical Parasitology**. 7<sup>th</sup> edition, Jaypee Brothers Medical Publishers (P) Ltd, 2013.
5. Parija, S. C. 2013. **Text Book of Medical Parasitology - Protozoology and Helminthology**. 4th Edn. All India Publishers and Distributors, New Delhi.

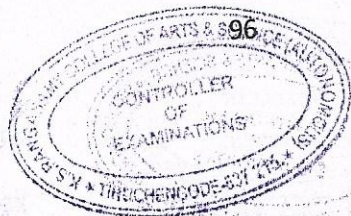
**Reference Books:**

1. Errolraiss, H. Jeanshadorry, G. Mashallyon. 2014. **Fundamental Medical Mycology**. Wiley Blackwell.
2. Russel, F. Cheadle and Ruth Leventhal. 2011. **Medical Parasitology**.
3. Reiss, E. Shadomy, H.J. and Lyon, G.M. 2011. **Fundamental Medical Mycology**. Wiley-Blackwell.
4. Brooks, G, Carrol, K.C, Butel J. and Morse, S. 2012. **Jawetz Melnick and Adelberg Medical Microbiology**. 26th Edn. Lange Medical Publications.
5. Chatterjee, K.D. 2009. **Parasitology: Protozoology and Helminthology**. 13th Edn. CBS Publishers & Distributors Pvt. Limited.



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18UMBEL502		ELECTIVE I: NANO MICROBIOLOGY	SEMESTER V	
<b>Course Objectives:</b>				
The course aims				
<ul style="list-style-type: none"> <li>To enable the learners to construct a good foundation in nanotechnology.</li> <li>To understand the role of microbes in the synthesis of nano particles.</li> <li>To know about the modern applications of nanobiology.</li> </ul>				
<b>Credits: 04</b>			<b>Total Hours: 40</b>	
UNIT	CONTENTS	Hrs	CO	
I	<b>Nanobiology:</b> Concepts, definitions, prospects. Nanoscale systems. Biological Nanoobjects -DNA, protein, lipids. Bionanoparticles- Nanostarch, Nano composites- Dendrimers.	08	CO1	
II	<b>Antimicrobial properties of metal nanoparticles:</b> Ag, Cu, Au nanoparticles- antibiofilm properties of nanoparticles. Biogenesis of bacterial silver nanoparticles, platinum nanoparticles.	08	CO2	
III	<b>Methods of Nanobiology:</b> Analysis of bimolecular Nanostructures by Atomic Force Microscopy, Scanning Probe Electron Microcopy and FTIR. Nanofabrication- Lithography- Photolithography , Electron beam lithography.	08	CO3	
IV	<b>Methods for Susceptibility Testing of Nanoparticles:</b> Growth inhibition assay by spectrophotometer, Broth dilution method, standard agar well diffusion method, Estimation of colony forming units (CFU).	08	CO4	
V	<b>Nano Applications:</b> Use of microbes in relation to Bimedical applications of nanoparticles. Application of Biogenic Silver Nanoparticles in Fabrics. Nanobiosensors and their applications. Nano drug delivery systems.	08	CO5	



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Text Books:	
1.	Balaji Subbaih. 2010. <b>Nanobiotechnology</b> . MJP Publishers, India.

Reference Books:	
1.	Pradeep, T. 2008. <b>Nano: The Essentials: Understanding Nanoscience and Nanotechnology</b> . Tata McGraw-Hill Publishing Company Limited, New Delhi.
2.	Mahendra Roi and Nelson Dura. 2011. <b>Metal nanoparticles in Microbiology</b> . Springer.
3.	Christof M. Niemayer, Chad A. Mirkin. 2004. <b>Nanobiotechnology: Concepts, applications and perspectives</b> . Wiley VCH publishers.

### COURSE OUTCOMES (CO)

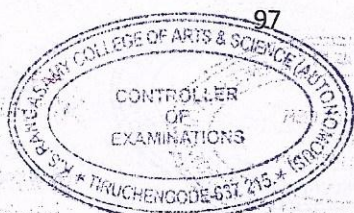
After completion of the course, the students will be able to

CO1	Understand the basic concepts of bionanoparticles.
CO2	Analyze antimicrobial properties of metal nanoparticles.
CO3	Compute the bimolecular nanostructures by AFM, Scanning Probe Electron Microscopy and FTIR.
CO4	Assess the various methods for susceptibility testing of nanoparticles.
CO5	Prepare effective nano based drug delivery systems for infectious disease.

### MAPPING

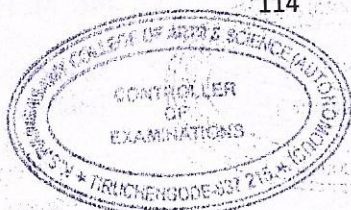
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	M
CO2	M	M	H	H	H
CO3	H	H	M	M	M
CO4	M	M	H	H	N
CO5	M	H	H	H	H

H-High; M-Medium; L-Low



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18UMB MEL601	ELECTIVE II: PHARMACEUTICAL MICROBIOLOGY	SEMESTER- VI	
<b>Course Objectives:</b> <ul style="list-style-type: none"> <li>To learn about the synthetic antimicrobial agents and its mechanism of action.</li> <li>To understand microbial contamination and spoilage of various pharmaceutical products.</li> <li>To study the quality assurance and validation of pharmaceutical Industry</li> </ul>			
<b>Credits: 04</b>			<b>Total Hours: 40</b>
UNIT	CONTENTS	Hrs	CO
I	<b>Antibiotics:</b> 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	<b>Microbial contamination and spoilage of pharmaceutical products:</b> 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	<b>Pharmaceutical Drug Analysis:</b> Biosensors and applications in Pharmaceuticals; Macromolecular, cellular and synthetic drug carriers. Assay of steroids.	10	CO3



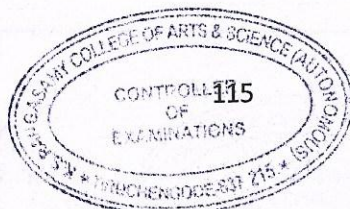
IV	<p><b>Preclinical Development:</b> Safety profile of drugs (Pyrogenicity, Toxicity- hepato, - nephro, - cardio and neurotoxicity), Toxicological evaluation of drug (LD50, Acute, subacute and chronic toxicity), Mutagenicity (Ames test, micronucleus test) and Carcinogenicity. <b>Clinical studies:</b> Phase I, phase II, phase III and phase IV of clinical trials - Objectives, Conduct of trials, Outcome of trials.</p>	10	CO4
V	<p><b>Quality Assurance and Validation:</b> 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. *Hugo and Russell*. 2004. **Pharmaceutical Microbiology**. [Seventh Edition]. Wiley-Blackwell Publishers, UK.

**Reference Books:**

1. *Purohit, S. S., Saluja, A. K. and Kakrani, H. N.* 2003. **Pharmaceutical Microbiology**. Agrobios, New Delhi.
2. *Lansing M Prescott, John P Harley and Donald A Klein.* 2010. **Microbiology**. [Eighth Edition]. Mc Graw Hill, New York
3. *Burn J. H.* **Principles of Therapeutics**, Blackwell Scientific Pub. O. Ltd. Oxford.
4. *Goldstein A., Aronow L., and Kalman S. M.* **Principles of Drug Action, The Basis of Pharmacology**, Harper international edition New York
5. *Mannfred A. Holliger.* 2008. **Introduction to pharmacology**, 3rd Ed., CRC Press



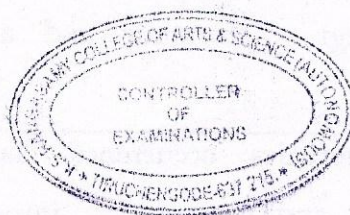
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COURSE OUTCOMES (CO)	
After completion of the course, the students will be able to	
CO1	Recall the basics and working mechanism of antibiotics against infectious diseases
CO2	Optimize the production of pharmaceutical products
CO3	Develop the pharmaceutical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

**MAPPING**

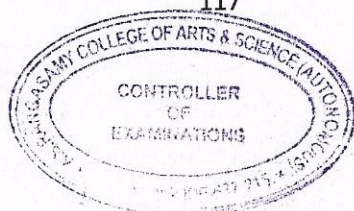
PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	M	H
CO2	M	M	H	M	M
CO3	H	M	H	H	M
CO4	H	M	H	M	H
CO5	M	H	H	H	H

H-High; M-Medium; L-Low



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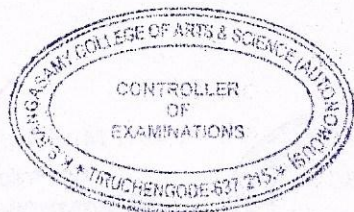
18UMBEL602	ELECTIVE II: BASIC AND APPLIED BOTANY	SEMESTER VI	
<b>Course Objectives:</b>			
The course aims			
<ul style="list-style-type: none"> <li>To gain knowledge about morphology, occurrence and properties of major groups of plants.</li> <li>To understand the economic importance of algae, fungi, lichens and other groups of plants</li> <li>To learn about advanced techniques plant cultivation.</li> </ul>			
<b>Credits: 04</b>		<b>Total Hours: 40</b>	
UNIT	CONTENTS	Hrs	CO
I	<b>Algae:</b> Distribution, Morphology - Thallus structure - Classification. Sexual reproduction. Asexual Reproduction - algal nutrition. Algal importance - Algae as food. Commercial products derived from algae- Agar Agar, Carrageenin, SCP, Chlorellin	08	CO1
II	<b>Fungi:</b> Distribution - Fungal divisions: Characteristics of Ascomycetes, Basidiomycetes, Deuteromycetes, Zygomycetes - Cell structure - reproduction- sexual and asexual modes. Fungi - economic and agricultural importance.	08	CO2
III	<b>Plant:</b> General characteristics, occurrence, classification, structure, reproduction and economic importance of Lichens. General characteristics, occurrence, classification, structure, reproduction and economic importance Bryophyta, Pteridophyta, Gymnosperms and Angiosperms	08	CO3
IV	<b>Advanced Botany:</b> Plant Tissue Culture and its applications- Organic farming. Vertical farming- Hydroponics for potato cultivation- Aeroponics- Bonzai technique. Medicinal plants and their applications -Herbarium preparation and its	08	CO4



	importance.		
V	<b>Entrepreneurial Botany:</b> Production of biodiesel from Jatropha, Biocontrol agent production from Neem. Oyester Mushroom cultivation. Bee Keeping - Sericulture- Oriliculture. Plant breeding: Conventional plant breeding methods and its applications.	08	CO5

**Text Books:**

1. *Vashishta B.R.* 2012. **Botany for Degree Students - Algae.** S. Chand & Co.,
2. *Sharma, O.P.* 2006. **Text Book of Fungi.** Tata McGraw Hill Publishing Co., New Delhi.
3. *Misra, A. and Agarwal, R.P.* 1970. **Lichens, A Preliminary Text,** Oxford & IBH Publishing Co.
4. *Pandey. B.P.* 1977. **A Text Book of Bryophyta, Pteridophyta and Gymnosperms.** K.Nath and Co., Meerut.
5. *Pandey, B.P.* 1980. **Economic Botany.** S. Chand & Co.



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Reference Books:	
1.	Vashista, B.R. 1969. <b>Botany for Degree students.</b> S. Chand and Co.

### COURSE OUTCOMES (CO)

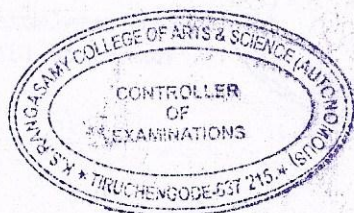
After completion of the course, the students will be able to

CO1	Discuss the valuable products of algae.
CO2	Understand the various classes of fungi and its applications.
CO3	Assess the lichens and various plant groups for plant identification and better classification.
CO4	Apply the advanced botany techniques in agriculture system.
CO5	Create and develop the employable and entrepreneur opportunity in botany.

### MAPPING

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

H-High; M-Medium; L-Low



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