

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

**Tiruchengode -637215**

**Department of Biochemistry**

**Programmes in Elective Course System**

**UG**

Human Physiology (or) Nutritional Biochemistry

Computational Biology (or) Biomedical Instrumentation

**PG**

Recombinant DNA Technology (or) Food Processing And Quality Control

Molecular Immunology and Immunotechnology (or) Molecular Genetics

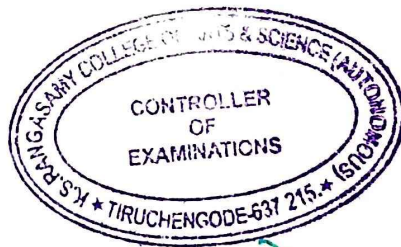
**Enclosures:**

1. Copy of Scheme of Examination.
2. Syllabus Copy of Courses highlighting the Elective Courses

**HOD**

**HEAD**

**Department of Biochemistry,  
K. S. R. College of Arts & Science  
TIRUCHENGODE-637 209**



**COE**


**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.

**PRINCIPAL**

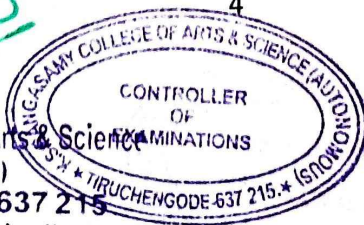
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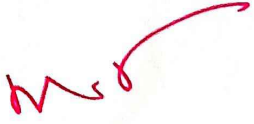
## SCHEME OF EXAMINATION

Subject Code	Subject	Hours of Instruction	Exam Duration (Hours)	Max Marks			Credit Points
				CA	CE	Total	
<b>First Semester</b>							
<b>Part A</b>							
18PBCM101	Core I: Chemistry of Biopolymers	5	3	25	75	100	5
18PBCM102	Core II: Analytical Biochemistry	5	3	25	75	100	5
18PBCM103	Core III: Enzyme Catalysis and Regulation	5	3	25	75	100	5
18PBCM104	Core IV: Molecular Biology	5	3	25	75	100	5
18PBCM105	Core V: Cellular Biochemistry	5	3	25	75	100	5
18PBCMP101	Core Practical I: Analytical Biochemistry and Molecular Biology	4	6	40	60	100	3
<b>Non Credit</b>							
18PLS101	Career Competency Skills I	1	-	-	-	-	-
<b>Total</b>		<b>30</b>				<b>600</b>	<b>28</b>
<b>Second Semester</b>							
<b>Part A</b>							
18PBCM201	Core VI: Intermediary Metabolism and Regulation	6	3	25	75	100	5
18PBCM202	Core VII: Plant Biochemistry	5	3	25	75	100	5
	<b>Elective I</b>	5	3	25	75	100	5
18PBCMP201	Core Practical II: Plant Biochemistry	5	6	40	60	100	3

  
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Optional Papers							
18PMBBCI201	IDC I: Clinical Microbiology	3	3	25	75	100	2
18PMBBCIP201	IDC Practical I: Clinical Microbiology	3	3	40	60	100	2
18PBTBCI201	IDC I: Plant Tissue Culture Technology	3	3	25	75	100	2
18PBTBCIP201	IDC Practical I: Plant Tissue Culture Technology	3	3	40	60	100	2
Part B							
18PVE201	Value Education: Human Rights	2	3	25	75	100	2
Non Credit							
18PLS201	Career Competency Skills II	1	-	-	-	-	-
<b>Total</b>		<b>30</b>				<b>700</b>	<b>24</b>
Third Semester							
Part A							
18PBCM301	Core VIII: Clinical Biochemistry	6	3	25	75	100	5
18PBCM302	Core IX: Biostatistics and Research Methodology	5	3	25	75	100	4
	<b>Elective II</b>	5	3	25	75	100	5
18PBCMP301	Core Practical III: Clinical Biochemistry	6	6	40	60	100	3
18PBCMP302	Core Practical IV: Statistical Software	2	3	40	60	100	2

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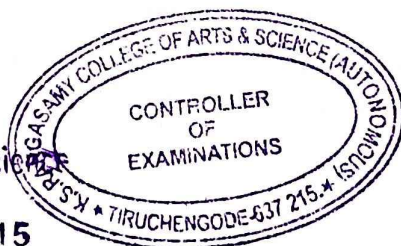
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Optional Papers							
18PMBBCI301	IDC II: Industrial Microbiology	3	3	25	75	100	2
18PMBBCIP301	IDC Practical II: Industrial Microbiology	3	3	40	60	100	2
18PBTBCI301	IDC II: Animal Tissue Culture Technology	3	3	25	75	100	2
18PBTBCIP301	IDC Practical II: Animal Tissue Culture Technology	3	3	40	60	100	2
<b>Total</b>		<b>30</b>				<b>700</b>	<b>23</b>
Fourth Semester							
Part A							
18PBCM401	Core X: Human Physiology and Neuroscience	5	3	25	75	100	4
18PBCM402	Core XI: Hormonal Biochemistry and Biochemical Pharmacology	5	3	25	75	100	5
18PBCPR401	Project & Viva-Voce	6	-	50	150	200	6
<b>Total</b>		<b>16</b>				<b>400</b>	<b>15</b>
<b>Grand Total</b>						<b>2400</b>	<b>90</b>

  
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### ELECTIVE SUBJECT

The students shall choose any one of the following subjects as Elective I and II in the Second and Third semesters respectively.

#### ELECTIVE I

S.No	Semester	Subject code	Subject
1.	Second	18PBCEL201	Recombinant DNA Technology
2.		18PBCEL202	Food Processing And Quality Control

#### ELECTIVE II

S.No	Semester	Subject code	Subject
1.	Third	18PBCEL301	Molecular Immunology and Immunotechnology
2.		18PBCEL302	Molecular Genetics

#### FOR COURSE COMPLETION

Student shall complete:

- Value Education: Human Rights in II semester.
- IDC in II and III semester.
- Elective subjects in II and III semesters.
- Project & Viva-Voce in IV semester.
- Career Competency Skills in I and II semester.

#### TOTAL MARKS AND CREDIT DISTRIBUTION

S.NO	COMPONENET	MARKS	CREDITS
1.	PART A: Core subjects, Elective, IDC and Project	2300	88
2.	PART B: Value Education	100	2
<b>TOTAL</b>		<b>2400</b>	<b>90</b>



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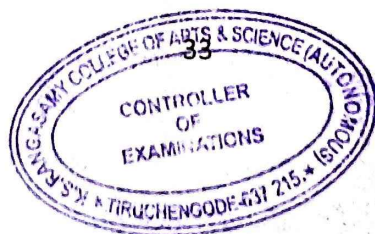
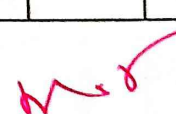


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18PBCEL201	ELECTIVE I: RECOMBINANT DNA TECHNOLOGY	SEMESTER-II	
<p><b>Course Objectives:</b></p> <p><b>The Course aims</b></p> <ul style="list-style-type: none"> <li>To understand the concept of rDNA technology and to acquire a comprehensive knowledge about the cloning and expression strategies.</li> <li>To apply the recent advances in gene manipulation to enhance existing ones or produce a new product.</li> </ul>			
Credits: 5		Total Hours: 50	
UNIT	CONTENTS	Hrs	CO
I	<p><b>Techniques of Gene manipulation:</b> Isolation and purification of Nucleic Acids. Agarose Gel Electrophoresis, Southern, Northern and Western hybridization. Preparation of nucleic acid probes - radioactive and non-radioactive labelling. PCR - principle, types (Inverse, RT, anchored and real time quantitative PCR) and applications. DNA sequencing- Sanger's and Maxam&amp; Gilbert methods.</p> <p><b>Enzymes involved in genetic manipulation:</b> Restriction endonuclease (nomenclature, types, recognition sites, applications), DNA Ligase, Alkaline phosphatase, Reverse transcriptase, Nuclease, Terminal transferase, Polynucleotide kinase.</p>	10	CO1
II	<p><b>Vectors used in gene cloning:</b> Plasmid vectors - General features, properties of natural (Ti plasmid), artificial (pBR - pBR322 &amp; pBR327 and pUC -7, 8 vectors). Bacteriophage vectors - life cycle, Lamda phage (charon 4A and <math>\lambda</math>gt WES <math>\lambda</math>B) and M13 vectors (mp 1), Cosmids (PHC 79), phagemids. BAC. Yeast Vectors. - vectors based on 2<math>\mu</math>m circle and YAC. Shuttle vectors.</p>	10	CO2




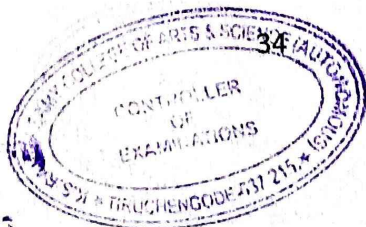
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III	<p><b>Gene transferring methods and Cloning strategies:</b> Introduction of DNA into cells - chemical (Ca-phosphate precipitation, PEG &amp; DEAE dextran mediated transformation) and physical methods (Microinjection, biolistic transformation, liposome mediated, electroporation). Construction and screening of genomic DNA and cDNA libraries. Selectable markers &amp; reporter genes. Identification &amp; selection of recombinants- insertional inactivation, south-western screening for DNA binding protein, colony hybridization, plus-minus screening, HRT and HART.</p>	10	CO3
IV	<p><b>Expression vectors:</b> expression cassettes, Promoters-strong and regulatable promoters. Maximizing the expression of cloned genes. Maximizing gene expression systems in <i>E.coli</i>, yeast, insect cell and mammalian cells. Problems caused in expression of eukaryotic genes in prokaryotic host. DNA finger printing.</p> <p><b>Gene therapy-</b> Somatic cell gene therapy, Germ cell gene therapy. <i>Ex vivo</i> gene therapy-ADA deficiency, Cystic fibrosis and Lesch- Nyhan syndrome.</p>	10	CO4
V	<p><b>Production of transgenic plants:</b> Plant transformation using Viral vectors and <i>Agrobacterium</i>. Applications of transgenic plants- insect resistance, virus resistance, herbicide resistance, stress tolerant, Plants as bioreactors- antibodies. Genetic engineering of fruit ripening. Transgenic plants with improved nutrition-Golden rice.</p> <p><b>Transgenic animals-</b>methods of production- retroviral, microinjection &amp; ES cell methods. Applications of transgenic animals - transgenic animals as disease models, animal bioreactors, pharming animals.</p> <p><b>Bioethics:</b> Definition, need of Bioethics. Applications of</p>	10	CO5

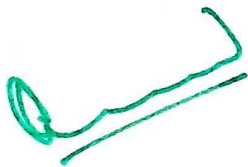
  
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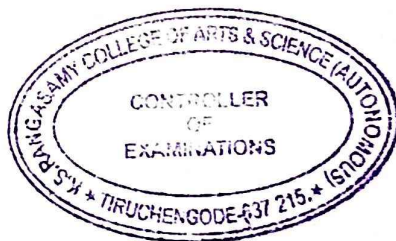
  
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	Bioethics. Introduction To Intellectual Property: IPR - Definition, Other forms of IPR - Copyright - Trademark - Designs.		
<b>Text Books</b>			
<ol style="list-style-type: none"><li>1. <i>Bernard R.Glick and Jack J.Pasternak.</i> 2007. <b>Molecular Biotechnology.</b> Principles and Applications of Recombinant DNA.[Third edition]. ASM press. Washington.</li><li>2. <i>Ernst-L.Winnacker.</i> 1987. <b>From Genes to clones, Introduction to gene technology.</b></li><li>3. <i>Sandy B. Primrose, Richard M. Twyman and Robert W. Old.</i> 2001. <b>Principles of Gene Manipulation.</b> [Sixth Edition]. Blackwell Science, USA.</li><li>4. <i>Satheesh, M. K.</i> 2011. <b>Bioethics and Biosafety.</b> I.K. International, New Delhi.</li></ol>			
<b>Reference Books</b>			
<ol style="list-style-type: none"><li>1. <i>Joseph Sambrook and David William Russel.</i> 2001. <b>Molecular Cloning: A Laboratory Manual, Vol. 1, 2 and 3.</b>[Third Edition]. Cold Spring Harbor Laboratory Press, New York.</li><li>2. <i>Smita Rastogi and Neelam Pathak.</i> 2010. <b>Genetic Engineering.</b> Oxford University press, New york.</li></ol>			



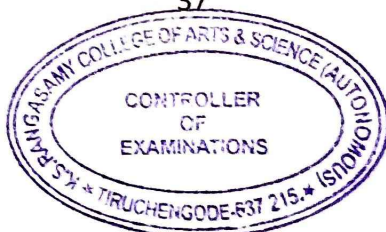
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*M. V.*  
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18PBCEL202	ELECTIVE I : FOOD PROCESSING AND QUALITY CONTROL	SEMESTER-II	
<p><b>Course Objectives:</b></p> <p><b>The Course aims</b></p> <ul style="list-style-type: none"> <li>To make the students to understand the biochemical processes of food and the role of Food additives and colors in food.</li> <li>To get an insight to become an entrepreneur.</li> </ul>			
<b>Credits: 5</b>		<b>Total Hours: 50</b>	
UNIT	CONTENTS	Hrs	CO
I	<p><b>Food Processing:</b> Scope and importance; historical developments; High temperature processing - thermal (cooking, blanching, pasteurization, sterilization, evaporation and dehydration). Low temperature processing - refrigeration (changes of foods during refrigeration storage), freezing.</p>	10	CO1
II	<p><b>Food Preservation:</b> Importance, principles, methods - temporary, permanent. Preservation by salting, sugar (jam), chemicals, drying, antibiotics and irradiation, cold, use of heat.</p> <p><b>Food additives:</b> Definition, antioxidants, emulsifiers, sweeteners, colours, flavours.</p>	10	CO2
III	<p><b>Food Storage:</b> Refrigeration storage: requirements of refrigeration storage, refrigeration load, chilling and refrigeration, cold storage. Freezing and frozen storage: freezing curves, slow and quick freezing, factors determining freezing rate, freezing methods, changes in food during freezing, frozen food storage and freeze drying in food processing.</p>	10	CO3
IV	<p><b>Evaluation of Food Quality:</b> Sensory Evaluation of Foods- Appearance, colour, flavour, odour, taste, mouth feel. Types of tests-difference tests-paired comparison test, rating test-ranking test, sensitivity threshold test, descriptive test.</p>	10	CO4



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	Objective evaluation-Definition, advantage and disadvantages. Test for objective evaluation.		
V	<b>Food Laws and Standards:</b> Prevention of food adulteration act, standard- ISI, Agmark. HACCP- microbiological, chemical and physical hazards, steps in HACCP, critical limits for control measures.	10	CO5

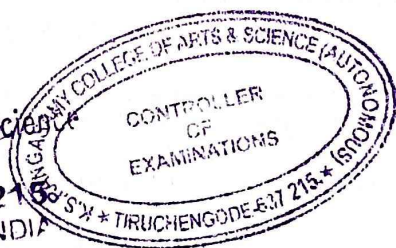
**Text Book**

1. *Hosahalli Ramaswamy and Michele Marcotte. 2009. Food processing – Principles and Applications. Taylor & Francis group, New York.*

**Reference Books**


1. *Manoranjan Kalia and Sangeetha Sood. 1999. Food Preservation and Processing. Kalyani Publishers, New Delhi.*
2. *Sreelakshmi. B. 1997. Food Science. New Age International Pvt. Ltd., New Delhi.*
3. *Sunetra Roday. 2011. Food hygiene and sanitation. Tata McGraw Hill Education, Pvt. Ltd., New Delhi.*

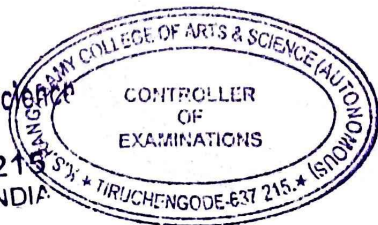
  
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18PBCEL201	ELECTIVE I: RECOMBINANT DNA TECHNOLOGY	SEMESTER-II	
<p><b>Course Objectives:</b></p> <p>The Course aims</p> <ul style="list-style-type: none"> <li>To understand the concept of rDNA technology and to acquire a comprehensive knowledge about the cloning and expression strategies.</li> <li>To apply the recent advances in gene manipulation to enhance existing ones or produce a new product.</li> </ul>			
Credits: 5		Total Hours: 50	
UNIT	CONTENTS	Hrs	CO
I	<p><b>Techniques of Gene manipulation:</b> Isolation and purification of Nucleic Acids. Agarose Gel Electrophoresis, Southern, Northern and Western hybridization. Preparation of nucleic acid probes - radioactive and non-radioactive labelling. PCR - principle, types (Inverse, RT, anchored and real time quantitative PCR) and applications. DNA sequencing- Sanger's and Maxam &amp; Gilbert methods.</p> <p><b>Enzymes involved in genetic manipulation:</b> Restriction endonuclease (nomenclature, types, recognition sites, applications), DNA Ligase, Alkaline phosphatase, Reverse transcriptase, Nuclease, Terminal transferase, Polynucleotide kinase.</p>	10	CO1
II	<p><b>Vectors used in gene cloning:</b> Plasmid vectors - General features, properties of natural (Ti plasmid), artificial (pBR - pBR322 &amp; pBR327 and pUC -7, 8 vectors). Bacteriophage vectors - life cycle, Lamda phage (charon 4A and <math>\lambda</math>gt WES <math>\lambda</math>B) and M13 vectors (mp 1), Cosmids (PHC 79), phagemids. BAC. Yeast Vectors. - vectors based on 2<math>\mu</math>m circle and YAC. Shuttle vectors.</p>	10	CO2

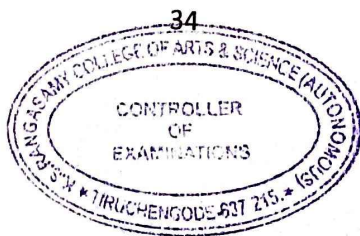
  
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III	<p><b>Gene transferring methods and Cloning strategies:</b> Introduction of DNA into cells - chemical (Ca-phosphate precipitation, PEG &amp; DEAE dextran mediated transformation) and physical methods (Microinjection, biolistic transformation, liposome mediated, electroporation). Construction and screening of genomic DNA and cDNA libraries. Selectable markers &amp; reporter genes. Identification &amp; selection of recombinants- insertional inactivation, south-western screening for DNA binding protein, colony hybridization, plus-minus screening, HRT and HART.</p>	10	CO3
IV	<p><b>Expression vectors:</b> expression cassettes, Promoters-strong and regulatable promoters. Maximizing the expression of cloned genes. Maximizing gene expression systems in <i>E.coli</i>, yeast, insect cell and mammalian cells. Problems caused in expression of eukaryotic genes in prokaryotic host. DNA finger printing.</p> <p><b>Gene therapy-</b> Somatic cell gene therapy, Germ cell gene therapy. <i>Ex vivo</i> gene therapy-ADA deficiency, Cystic fibrosis and Lesch- Nyhan syndrome.</p>	10	CO4
V	<p><b>Production of transgenic plants:</b> Plant transformation using Viral vectors and Agrobacterium. Applications of transgenic plants- insect resistance, virus resistance, herbicide resistance, stress tolerant, Plants as bioreactors- antibodies. Genetic engineering of fruit ripening. Transgenic plants with improved nutrition-Golden rice.</p> <p><b>Transgenic animals-</b>methods of production- retroviral, microinjection &amp; ES cell methods. Applications of transgenic animals - transgenic animals as disease models, animal bioreactors, pharming animals.</p> <p><b>Bioethics:</b> Definition, need of Bioethics. Applications of</p>	10	CO5


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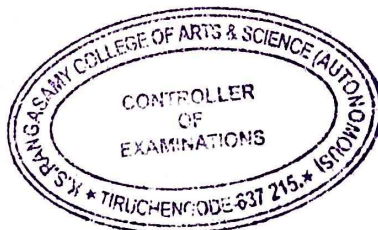



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<b>Text Books</b>		
<ol style="list-style-type: none"><li>1. <i>Bernard R.Glick and Jack J.Pasternak.</i> 2007. <b>Molecular Biotechnology.</b> Principles and Applications of Recombinant DNA.[Third edition]. ASM press. Washington.</li><li>2. <i>Ernst-L.Winnacker.</i> 1987. <b>From Genes to clones, Introduction to gene technology.</b></li><li>3. <i>Sandy B. Primrose, Richard M. Twyman and Robert W. Old.</i> 2001. <b>Principles of Gene Manipulation.</b> [Sixth Edition]. Blackwell Science, USA.</li><li>4. <i>Satheesh, M. K.</i> 2011. <b>Bioethics and Biosafety.</b> I.K. International, New Delhi.</li></ol>		
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18PBCEL202	ELECTIVE II: FOOD PROCESSING AND QUALITY CONTROL	SEMESTER-II	
<p><b>Course Objectives:</b></p> <p><b>The Course aims</b></p> <ul style="list-style-type: none"> <li>To make the students to understand the biochemical processes of food and the role of Food additives and colors in food.</li> <li>To get an insight to become an entrepreneur.</li> </ul>			
<b>Credits: 5</b>		<b>Total Hours: 50</b>	
UNIT	CONTENTS	Hrs	CO
I	<p><b>Food Processing:</b> Scope and importance; historical developments; High temperature processing - thermal (cooking, blanching, pasteurization, sterilization, evaporation and dehydration). Low temperature processing - refrigeration (changes of foods during refrigeration storage), freezing.</p>	10	CO1
II	<p><b>Food Preservation:</b> Importance, principles, methods – temporary, permanent. Preservation by salting, sugar (jam), chemicals, drying, antibiotics and irradiation, cold, use of heat.</p> <p><b>Food additives:</b> Definition, antioxidants, emulsifiers, sweeteners, colours, flavours.</p>	10	CO2
III	<p><b>Food Storage:</b> Refrigeration storage: requirements of refrigeration storage, refrigeration load, chilling and refrigeration, cold storage. Freezing and frozen storage: freezing curves, slow and quick freezing, factors determining freezing rate, freezing methods, changes in food during freezing, frozen food storage and freeze drying in food processing.</p>	10	CO3
IV	<p><b>Evaluation of Food Quality:</b> Sensory Evaluation of Foods- Appearance, colour, flavour, odour, taste, mouth feel. Types of tests-difference tests-paired comparison test, rating test-ranking test, sensitivity threshold test, descriptive test.</p>	10	CO4

M.Sc., Biochemistry (Students Admitted from 2018 – 2019 onwards)


	Objective evaluation-Definition, advantage and disadvantages. Test for objective evaluation.		
V	<b>Food Laws and Standards:</b> Prevention of food adulteration act, standard- ISI, Agmark. HACCP- microbiological, chemical and physical hazards, steps in HACCP, critical limits for control measures.	10	CO5

**Text Book**


1. *Hosahalli Ramaswamy and Michele Marcotte.* 2009. **Food processing - Principles and Applications.** Taylor & Francis group, New York.

**Reference Books**

1. *Manoranjan Kalia and Sangeetha Sood.* 1999. **Food Preservation and Processing.** Kalyani Publishers, New Delhi.
2. *Sreelakshmi. B.* 1997. **Food Science.** New Age International Pvt. Ltd., New Delhi.
3. *Sunetra Roday.* 2011. **Food hygiene and sanitation.** Tata McGraw Hill Education, Pvt. Ltd., New Delhi.

  
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