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

K.S.RANGASAMY COLLEGE OF ARTS & SCIENCE (AUTONOMOUS) CONTROLLER OF EXAMINATIONS * TIRUCHENGODE-637 215 *

COE

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.

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

SCHEME OF EXAMINATION

Subject Code	Subject	Hours of Instruction	Exam Duration (Hours)	Max Marks			Credit Points
				CA	CE	Total	
First Semester							
Part A							
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
Non Credit							
18PLS101	Career Competency Skills I	1	-	-	-	-	-
	Total	**30**				**600**	**28**
Second Semester							
Part A							
18PBCM201	Core VI: Intermediary Metabolism and Regulation	6	3	25	75	100	5
18PBCM202	Core VII: Plant Biochemistry	5	3	25	75	100	5
	Elective I	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	-	-	-	-	-
Total		**30**				**700**	**24**
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
	Elective II	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

CONTROLLER OF EXAMINATIONS

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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
Total		**30**				**700**	**23**
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
Total		**16**				**400**	**15**
					Grand Total	**2400**	**90**

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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
TOTAL		2400	90

18PBCEL201	ELECTIVE I: RECOMBINANT DNA TECHNOLOGY	SEMESTER–II

Course Objectives:

The Course aims

- To understand the concept of rDNA technology and to acquire a comprehensive knowledge about the cloning and expression strategies.
- To apply the recent advances in gene manipulation to enhance existing ones or produce a new product.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Techniques of Gene manipulation**: 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& Gilbert methods. **Enzymes involved in genetic manipulation:** Restriction endonuclease (nomenclature, types, recognition sites, applications), DNA Ligase, Alkaline phosphatase, Reverse transcriptase, Nuclease, Terminal transferase, Polynucleotide kinase.	10	CO1
II	**Vectors used in gene cloning:** Plasmid vectors – General features, properties of natural (Ti plasmid), artificial (pBR - pBR322 & pBR327 and pUC -7, 8 vectors). Bacteriophage vectors – life cycle, Lamda phage (charon 4A and λgt WES λB) and M13 vectors (mp 1), Cosmids (PHC 79), phagemids. BAC. Yeast Vectors. - vectors based on 2μm circle and YAC. Shuttle vectors.	10	CO2

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

	Bioethics. Introduction To Intellectual Property: IPR – Definition, Other forms of IPR - Copyright - Trademark – Designs.		

Text Books

1. *Bernard R.Glick and Jack J.Pasternak.* 2007. **Molecular Biotechnology**. Principles and Applications of Recombinant DNA.[Third edition]. ASM press. Washington.
2. *Ernst-L.Winnacker.* 1987. **From Genes to clones, Introduction to gene technology.**
3. *Sandy B. Primrose, Richard M. Twyman* and *Robert W. Old.* 2001. **Principles of Gene Manipulation.** [Sixth Edition]. Blackwell Science, USA.
4. *Satheesh, M. K.* 2011. **Bioethics and Biosafety**. I.K. International, New Delhi.

Reference Books

1. *Joseph Sambrook* and *David William Russel.* 2001. **Molecular Cloning: A Laboratory Manual, Vol. 1, 2 and 3.**[Third Edition]. Cold Spring Harbor Laboratory Press, New York.
2. *Smita Rastogi and Neelam Pathak.* 2010. **Genetic Engineering**. Oxford University press, New york.

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Tiruchengode - 637 215. Tamilnadu. India.

18PBCEL202	ELECTIVE I : FOOD PROCESSING AND QUALITY CONTROL	SEMESTER–II

Course Objectives:

The Course aims

- To make the students to understand the biochemical processes of food and the role of Food additives and colors in food.
- To get an insight to become an entrepreneur.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Food Processing:** 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.	10	CO1
II	**Food Preservation:** Importance, principles, methods – temporary, permanent. Preservation by salting, sugar (jam), chemicals, drying, antibiotics and irradiation, cold, use of heat. **Food additives**: Definition, antioxidants, emulsifiers, sweeteners, colours, flavours.	10	CO2
III	**Food Storage**: 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.	10	CO3
IV	**Evaluation of Food Quality**: 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.	10	CO4

	Objective evaluation-Definition, advantage and disadvantages. Test for objective evaluation.		
V	**Food Laws and Standards:** 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

Course Objectives:

The Course aims

- To understand the concept of rDNA technology and to acquire a comprehensive knowledge about the cloning and expression strategies.
- To apply the recent advances in gene manipulation to enhance existing ones or produce a new product.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Techniques of Gene manipulation**: 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& Gilbert methods. **Enzymes involved in genetic manipulation:** Restriction endonuclease (nomenclature, types, recognition sites, applications), DNA Ligase, Alkaline phosphatase, Reverse transcriptase, Nuclease, Terminal transferase, Polynucleotide kinase.	10	CO1
II	**Vectors used in gene cloning:** Plasmid vectors – General features, properties of natural (Ti plasmid), artificial (pBR - pBR322 & pBR327 and pUC -7, 8 vectors). Bacteriophage vectors – life cycle, Lamda phage (charon 4A and λgt WES λB) and M13 vectors (mp 1), Cosmids (PHC 79), phagemids. BAC. Yeast Vectors. - vectors based on 2µm circle and YAC. Shuttle vectors.	10	CO2

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

	Bioethics. Introduction To Intellectual Property: IPR – Definition, Other forms of IPR - Copyright - Trademark – Designs.		

Text Books

1. *Bernard R.Glick and Jack J.Pasternak.* 2007. **Molecular Biotechnology**. Principles and Applications of Recombinant DNA.[Third edition]. ASM press. Washington.
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Tiruchengode - 637 215. Tamilnadu. India.

18PBCEL202	ELECTIVE II: FOOD PROCESSING AND QUALITY CONTROL	SEMESTER–II

Course Objectives:

The Course aims

- To make the students to understand the biochemical processes of food and the role of Food additives and colors in food.
- To get an insight to become an entrepreneur.

Credits: 5 **Total Hours: 50**

UNIT	CONTENTS	Hrs	CO
I	**Food Processing:** 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.	10	CO1
II	**Food Preservation:** Importance, principles, methods – temporary, permanent. Preservation by salting, sugar (jam), chemicals, drying, antibiotics and irradiation, cold, use of heat. **Food additives**: Definition, antioxidants, emulsifiers, sweeteners, colours, flavours.	10	CO2
III	**Food Storage**: 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.	10	CO3
IV	**Evaluation of Food Quality**: 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.	10	CO4

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	Objective evaluation-Definition, advantage and disadvantages. Test for objective evaluation.		
V	**Food Laws and Standards:** 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

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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.

M.S.

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K.S. Rangasamy College of Arts & Science (Autonomous)
Tiruchengode - 637 215. Tamilnadu. India.

B.Sc., Biochemistry (Students admitted from 2018– 2019 onwards)

Subject Code	Subject	Hours of Instruction	Exam Duration (Hours)	Maximum 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	Foundation English I	5	3	25	75	100	3
		Part III					
18UBCM101	Core I: Biomolecules	6	3	25	75	100	5
18UCHBCA101	Allied I: Chemistry I	4	3	25	75	100	2
18UBCMP101	Core Practical I: Biomolecules	5	6	40	60	100	3
18UCHBCAP101	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
	Total	**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	Foundation English II	5	3	25	75	100	3
		Part III					
18UBCM201	Core II: Biochemical Techniques	6	3	25	75	100	5
18UMBBCA201	Allied II: Microbiology	4	3	25	75	100	2
18UBCMP201	Core Practical II: Biochemical Techniques	5	6	40	60	100	3
18UMBBCAP201	Allied Practical II: Microbiology	3	3	40	60	100	2
		Part IV					
18UVE201	Value Education II: Environmental Studies	2	3	25	75	100	2

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Total		**30**				**700**	**20**
Third Semester							
		Part I					
18UTALA301/ 18UHILA301/ 18UFRLA301	Tamil III/ Hindi III/ French III	5	3	25	75	100	3
		Part II					
18UENLA301	Foundation English III	5	3	25	75	100	3
		Part III					
18UBCM301	Core III: Enzymology	4	3	25	75	100	4
18UCSBCA301	Allied III: Computer for Biology	4	3	25	75	100	2
18UBCMP301	Core Practical III: Enzymology	3	6	40	60	100	3
18UCSBCAP301	Allied Practical III: Computer for Biology	2	3	40	60	100	2
		Part IV					
18UBCSB301	SBC I: Cell Biology	2	3	25	75	100	2
	NMEC I	2	3	25	75	100	2
		Non Credit					
18ULS301	Career Competency Skills I	1	-	-	-	-	-
	Add on Course	2	3	-	-	100	-
	Total	**30**				**900**	**21**
Fourth Semester							
		Part I					
18UTALA401/ 18UHILA401/ 18UFRLA401	Tamil IV/ Hindi IV/ French IV	5	3	25	75	100	3
		Part II					
18UENLA401	Foundation English IV	5	3	25	75	100	3
		Part III					
18UBCM401	Core IV: Bioenergetics and Intermediary Metabolism	5	3	25	75	100	5
18UMABCA401	Allied IV: Biostatistics	4	3	25	75	100	2
18UBCMP401	Core Practical IV: Intermediary Metabolism	3	6	40	60	100	3
18UMABCAP401	Allied Practical IV:	2	3	40	60	100	2

	Statistics (Using MS-Excel)						
Part IV							
18UBCSB401	SBC II: Fundamentals of Biochemical Calculations (100 % Internal Evaluation)	2	3	100	-	100	2
	NMEC II	2	3	25	75	100	2
Non - Credit							
18ULS401	Career Competency Skills II	1	-	-	-	-	-
	Add on Course	1	3	-	-	100	-
	Total	**30**				**900**	**22**
ALC*							
Fifth Semester							
Part III							
18UBCM501	Core V: Fundamentals of Immunology	5	3	25	75	100	4
18UBCM502	Core VI: Molecular Biology	5	3	25	75	100	5
18UBCM503	Core VII: Clinical Biochemistry	5	3	25	75	100	5
18UBCM504	Core VIII: Endocrinology	4	3	25	75	100	4
	Elective I	4	3	25	75	100	4
18UBCMP501	Core Practical V: Immunology and Clinical Biochemistry	4	6	40	60	100	3
Part IV							
18UBCSB501	SBC III : Pharmacognosy (100 % Internal Evaluation)	2	3	25	75	100	2
Part V							
18UBCE501	Extension Activity	-	-	-	-		2
Non - Credit							
18ULS501	Career Competency Skills III	1	-	-	-	-	-
	Total	**30**				**700**	**29**
ALC *							

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Sixth Semester							
Part III							
18UBCM601	Core IX: Plant Biochemistry	5	3	25	75	100	5
18UBCM602	Core X: Pharmaceutical Biochemistry	5	3	25	75	100	5
18UBCM603	Core XI: Genetic Engineering	5	3	25	75	100	5
	Elective II	4	3	25	75	100	4
18UBCMP601	Core Practical VI: Plant Biochemistry and Genetic Engineering	4	6	40	60	100	3
18UBCPR601	Internship	4	-	40	60	100	4
Part IV							
18UBCSB601	SBC IV : Phytochemistry	2	3	25	75	100	2
Non - Credit							
18ULS601	Career Competency Skills IV	1	-	-	-	-	-
Total		**30**				**700**	**28**
Grand Total						**4400**	**140**

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ELECTIVE SUBJECT

The students shall choose any one of the following elective subjects in fifth and sixth semester.

S.No.	Semester	Subject code	Subject
1.	V	18UBCEL501	Human Physiology
2.		18UBCEL502	Nutritional Biochemistry
3.	VI	18UBCEL601	Computational Biology
4.		18UBCEL602	Biomedical Instrumentation

NON MAJOR ELECTIVE COURSE (NMEC)

Non Major Elective Course is conducted for the Students of other Departments.

S.No.	Semester	Course Code	Subject
1.	III	18UBCNM301	Biochemistry in Health and Diseases
2.	IV	18UBCNM401	Functional Biology

ADD-ON COURSE

The students shall study the following Add-on Course during their Third and fourth semesters.

S.No.	Semester	Subject Code	Subject
1.	III	18UBCAC301	Clinical Laboratory Techniques
2.	IV	18UBCAC401	Medical Terminology (For Medical Coding/Medical Transcription)

ADVANCED LEARNER COURSE:

The students shall choose any one of the following Advanced Learner Course during their Fourth and Fifth semester.

S.No.	Semester	Subject Code	Subject
1.	IV	18UBCAL401	Food Biochemistry
2.		18UBCAL402	Bioprocess technology
3.	V	18UBCAL501	Soil Biochemistry
4.		18UBCAL502	Microbial Biochemistry

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

FOR COURSE COMPLETION

Student shall complete:

- Language subjects (Tamil/Hindi/French, English) in I, II, III and IV semester.
- Value Education: Yoga and Environmental Studies in I and II semester respectively.
- Allied subjects in I, II, III and IV semester.
- Two Add-on Course in III and IV semesters of their course of study.
- Two Non Major Elective Courses in III and IV semesters.
- Four Skill Based Courses in III, IV, V and VI semesters.
- Extension activity in V semester.
- Elective subjects in the V and VI semesters.
- Internship during the VI semester.
- Career Competency Skill in semester III, IV, V and VI.

TOTAL CREDIT DISTRIBUTION

S.No.	PART	Total Marks	Total Credits
1.	PART I: Language	400	12
2.	PART II: Foundation English	400	12
3.	PART III : Major, Allied, Elective, Internship	2800	98
4.	PART IV: Value Education, SBC, NMEC	800	16
5.	PART V: Extension Activity	-	2
TOTAL		**4400**	**140**

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18UBCEL501	ELECTIVE I: HUMAN PHYSIOLOGY	SEMESTER – V

Course Objectives:

The Course aims

- To study about the organization and function of human immune system in health and disease.
- To understand the principle of molecular interactions of immune cells with an antigen.

Credits: 4 **Total Hours: 40**

UNIT	CONTENTS	Hrs	CO
I	**Blood:** Composition and functions of blood, blood coagulation-intrinsic and extrinsic pathways. **Cardio Vascular system:** Anatomy of heart. Cardiac conduction system and cardiac cycle. Blood pressure and control of blood pressure.	8	CO 1
II	**Respiratory system:** Anatomy of lungs. Diffusion of gases in lungs, transport of oxygen from lungs to tissues through blood, Transport of CO_2 from tissues to lungs through blood. **Muscles**: Classification of muscles. Contractile elements of muscle – myosin, actin, tropomyosin and troponin. Physiology of muscle contraction.	8	CO 2
III	**Digestive system:** Structure and functions of different components of digestive system-stomach, pancreas, liver, gall bladder and intestine. Absorption of carbohydrates, lipids and proteins. Mechanism of HCl formation in stomach. **Excretory system:** Anatomy and histology of the kidneys, renal physiology – Mechanism of urine formation. Micturition.	8	CO 3
IV	**Nervous system:** Classification of nervous system. Classification	8	CO 4

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18UBCEL502	ELECTIVE I: NUTRITIONAL BIOCHEMISTRY	SEMESTER – V

Course Objectives

The Course aims

- To enable the learners to understand the major role in the Nutrition and Diet for the maintenance of normal health.

Credits: 4 **Total Hours: 40**

UNIT	CONTENTS	Hrs	CO
I	**Nutrition**- Concepts, Role of nutrition in maintaining health. Nutritional problems in India. Food Safety and Standards. **Energy** -Unit of Energy -kcal, Measurements of energy- Direct and Indirect calorimetry. Definition and factors affecting- Specific Dynamic action (SDA), Respiratory quotient (RQ), Basal metabolic rate (BMR), Body mass index (BMI).	8	CO 1
II	**Carbohydrates, Fats, Proteins** - Classification, calorific value, recommended daily allowances, Dietary sources. Functions, digestion, absorption, storage and metabolism. Malnutrition: Deficiencies and Over consumption. **Obesity**- Definition, etiology, complications, prevention and treatment.	8	CO 2
III	**Vitamins**: Classification. Recommended daily allowances, dietary sources, functions and deficiencies of water and fat soluble vitamins. **Minerals**: Macro elements - recommended daily allowances, dietary sources, functions and deficiencies of Ca, Mg, Na, P, K, S and Cl. Microelements - recommended daily allowances, dietary sources, functions and deficiencies of Cu, Zn, I, Fe, Mn, Co, Mo, Se, Cr and F. Over consumption and toxicity.	8	CO 3
IV	**Diet and Physiological Status**: Protein energy malnutrition (PEM) (Kwashiorkor and Marasmus). Human milk and its	8	CO 4

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	viruses, Breast vs formulated milk feeding. Nutritional requirements in pregnancy and lactation. Sports Nutrition (Elementary details).		
V	**Food allergy** – Definition of Food allergy. Effect of drugs on food. Drug nutrient interactions. Nutritional therapy. Role of diet and nutrition in the prevention and treatment of diseases and various ailments – Diabetes mellitus, cardiovascular diseases, kidney disorders.	8	CO 5

Text Book

1. *Swaminathan,* M. 2004. **Essentials of Food and Nutrition**. The Bangalore Printing and Publishing Co. Ltd., Bangalore.

Reference Books

1. *Garrow, J. S.* and *James, W. P. T.* 2000. **Human Nutrition and Dietetics**. [Tenth Edition]. Churchill Livingstone Publishers, UK.
2. *Wong, D. W. S.* 1996. **Mechanism and Theory in Food Chemistry.** CBS, New Delhi.

18UBCEL601	ELECTIVE II: COMPUTATIONAL BIOLOGY	SEMESTER – VI

Course Objectives

The Course aims

- To enable the learners to understand the basic concept in Bioinformatics

Credits: 4 **Total Hours: 40**

UNIT	CONTENTS	Hrs	CO
I	**Genomics** – Definition. Hierarchical view of genome analysis. Subfields – Definition (structural, functional and comparative genomics). Genome mapping- Definition. Physical mapping. Expressed sequence tags (EST). Gene expression analysis - DNA microarray. DNA polymorphism – Definition. Single nucleotide polymorphism. RFLP and its applications.	8	CO 1
II	**Proteomics** - Definition. Protein sequencing – Steps - End group analysis (Edman degradation), cleavage of disulfide bonds, separation, purification and characterization polypeptide chains, amino acid composition, specific peptide cleavage reactions, separation and purification of peptide fragments, sequence determination, ordering the peptide fragments, assignment of disulfide bond positions, peptide sequencing by MS, peptide mapping. Protein expression analysis - 2D PAGE and isoelectric focusing.	8	CO 2
III	**Nucleic acid database:** Bioinformatics - Introduction, History and Applications. Internet concepts. Biological Database – types, classification and properties. Sequence Formats – FASTA. Nucleic acid Sequence Database – NCBI – Features and tools. GENBANK – format, divisions and retrieval system. Retrieving Human BRCA1 gene sequence. EMBL and DDBJ.	8	CO 3

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IV	**Protein Database:** Protein sequence database – SWISSPROT-format, features and sequence retrieval system. Molecular visualization tools: RasMol, MolMol. Retrieving Human myosin protein sequence. Features of PIR. Protein Structure database – SCOP, CATH and PDB. PDB - Database submission & retrieving tools. Retrieving Human insulin protein structure. Secondary structure prediction - Neural network and Chou-fasman method. Analysis of casein secondary structural features by Chou- fasman method.	8	CO 4
V	**Comparative genomics and proteomics:** Sequence alignment – Types. Local and Global alignment. Pair wise alignment - BLAST: principle & types. BRCA1 sequence analysis - Principle, methods, applications and similarity search with BLAST. Multiple sequence alignment- CLUSTAL W. Study of similarities - BLOSUM, PAM and Gap (Elementary details).	8	CO 5

Text Books

1. *Attwood, T. K.* and *Parry Smith, D. J.* 2005. **Introduction to Bioinformatics**. [First Edition]. Pearson Education. New Delhi. **(UNIT - I, III, IV & V).**
2. *Donald Voet and Judith G.Voet*. 1995. **Biochemistry.** [Second Edition]. John Wiley &Sons, Inc. New York. **(UNIT - II).**

Reference Book

1. *David W. Mount*. 2004. **Bioinformatics: Sequence and Genome Analysis**. CSHL.

18UBCEL602	ELECTIVE II: BIOMEDICAL INSTRUMENTATION	SEMESTER – VI

Course Objectives

The Course aims

- To enable the learners to understand the basic concept in Biomedical Instrumentation.

Credits: 4 **Total Hours: 40**

UNIT	CONTENTS	Hrs	CO
I	**Biomedical Instrumentation**: Definition, Classification of Biomedical instrumentation, sources of biomedical signals, components, design factors and characteristics. Difficulties in measuring living system.	8	CO 1
II	**Electrodes**- theory, types-biopotential, microelectrodes, metal plate and needle electrodes. Transducers – types - magnetic induction, piezoelectric, photovoltaic, thermoelectric, strain guage. Sensors.	8	CO 2
III	**Biopotential Recorders**: Resting and action potential, propagation of action potential, wave forms- ECG, EMG, EEG, EOG, EGG & ERG. **Specialized Medical Equipments:** X- ray machine, Angiography.	8	CO 3
IV	**Physiological assist devices**- pace makers, artificial heart valves, defibrillators, nerve and muscle stimulator (Galvanic and interrupted Galvanic current), heart-lung machine-mechanical functions, oxygenators- bubble, film. Kidney machine-hemo and peritoneal dialysis.	8	CO 4
V	**Advances in biomedical instrumentation**- Lasers, endoscopes-types. Cryogenic surgery. Gamma ray camera,	8	CO 5

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	computerized tomography, infrared thermography, ultrasonic imaging, magnetic resonance imaging.		

Text Books

1. *Anandanatarajan*, R. 2013. **Biomedical Instrumentation and measurements**. PHI Learning Pvt., Ltd. New Delhi.
2. *Arumugam*, M. 2011. **Biomedical Instrumentation**. Anuradha publications, Chennai.

Reference Book

1. *Khandpur, R. S.* 1995. **Hand book of Biomedical instrumentation.** Tata Mc.Graw-Hill publishing company Ltd., New Delhi.

COURSE OUTCOMES (CO)

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

CO1	Explain the classification of biomedical instruments
CO2	Analyze the working of electrodes and transducers
CO3	Relate the principle & working of biopotential recorders
CO4	Tailor on the principles and working physiological assist devices
CO5	Narrate the recent advancements in biomedical instruments

MAPPING

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

H-High; M-Medium; L-Low