



ALAGAPPA UNIVERSITY

(A State University Established in 1985)

Karaikudi - 630003, Tamil Nadu, India



2017 Accredited with A+ Grade by NAAC (CGPA : 3.64)	2018 MHRD Govt. of India UGC University Grants Commission Graded as Category - 1 & Granted Autonomy	2018 MHRD UNIVERSITY OF DISEASE Swachh Campus Rank : 4	2019 NIRF NATIONAL INSTITUTIONAL RANKING FRAMEWORK Rank : 28	2019 QS India Rank : 20 BRICS Rank : 104 Asia Rank : 216
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DEPARTMENT OF BIOMEDICAL SCIENCES



M.Sc., BIOMEDICAL SCIENCES

[Choice Based Credit System (CBCS)]

[For the candidates admitted from the academic year 2019-2020]

PROGRAMME GENERAL OBJECTIVES

Increased life expectancy leads to increased incidence of age-related conditions such as heart disease, dementia, stroke, pulmonary disorders, and cancer. This M.Sc in Biomedical Science programme will allow to explore key topics in these fields and engage in advanced research into the underlying causes of these diseases as well as to understand current and novel diagnostics and treatments of the disorders. A key focus of the degree programme is on personalised medicine for the treatment and care of patients through new approaches for better management of patients' health and targets therapies to achieve the best outcomes in the management of a patient's disease or predisposition to disease.

PROGRAMME SPECIFIC OBJECTIVES

1. Enable students to acquire basic laboratory skills in Biomedical Science.
2. Industrial training: Two month (summer training) and six month (live research projects)
3. Development analytical and cognitive skills with overall personal development.
4. Social Involvement Program for inculcating leadership, community awareness, and social-sensitivity.
5. Allow flexibility at the end of the first year to other departmentally-based courses
6. Provide exposure to the most recent advances in selected areas of biomedical science
7. Opportunity to carry out a research project under supervision

PROGRAMME OUTCOME

On successful completion of the programme

1. The students will have through knowledge in the human system and function for personnel health care
2. The students will be thorough in assessment of patients through handling the human disease diagnosis kits
3. The students will have complete exposure on the organization and effective function of hospitals
4. The students will have through knowledge in the forensic science and artificial organs
5. The students will have expertise to assess the drug discovery and drug delivery
6. The students will have skills to write dissertation, interpretation and presentation of biological data

M.Sc BIOMEDICAL SCIENCE
(For those who join the Course in July 2019 and after)
REGULATIONS AND SYLLABUS

1. Eligibility for admission

A candidate who has passed Bachelor's Degree in Biological Sciences (Anatomy, Physiology, Genetics, Medical Biochemistry, Pathology, Physiology, Pharmacology and Environmental toxicology, Endocrinology, Microbiology, Biochemistry, Biotechnology, Genetics, Biomedical Science, Botany, Zoology, Bioinformatics, Marine Biology, Computational Biology, B. Pharm, B.Sc., Nursing (3or4years), Pharmacology)or B.E/B.Tech Biotechnology, B.E/B.Tech Biomedical Engineering, B.E/B.Tech Medical Instrumentation or any other Biological sciences degree with at least 55% of marks and 50% marks for SC/ST candidates as main course of study of any university accepted by the syndicate as equivalent thereto, subject to such condition as may be prescribed therefore shall be permitted to appear and qualify for the M.Sc. Degree in Biomedical Science of this University after a course of study of two academic years.

2. Duration of Course

The course shall consist of two academic years divided into four semesters. Each semester consist of 90 working days.

3. Teaching Methods

The class room teaching would be through conventional lecture, use of OHP, power point presentation and novel innovative teaching ideas like television and computer aided instruction. Periodic field visit enable the student for gathering the practical experience and up to date industrial scenario. Student seminars would be arranged to improve their awareness and communicative skill. In the laboratory, instruction would be given for the safe handling of chemicals and instruments. The practical experiments shall be conducted with special efforts to inculcate scientific knowledge among students. The students shall be trained to handle advanced instrumental facilities and shall be allowed to do experiments individually. Periodic test would be conducted to students to assess their knowledge. Slow learners would be identified and will be given special attention.

4. Examinations

The examinations shall be conducted separately for theory and practical's to assess the knowledge acquired during the study. There shall be two systems of examinations viz., internal and external examinations. The internal examinations shall be conducted as Continuous Internal Assessment test I and II (CIA Test I & II). The internal assessment shall comprise of maximum 25 marks for each subject. The following procedure shall be followed for awarding internal marks.

Theory paper (Internal Assessment)

Average marks of two CIA test	- 15 marks
Seminar	- 5 marks
Assignment	- 5 marks
Total	- 25 marks

Practical's (Internal Assessment)

CIA tests	- 15 marks
Observation note book	- 10 marks
Total	- 25 marks

External Examinations

The external theory and practical examinations shall be conducted for three and five hour's duration respectively to each paper at the end of each semester. The external examinations shall comprise of maximum of 75 marks for each subject. The candidate failing in any subject will be permitted to appear for each failed subject in the subsequent examination. Practical examinations and demonstration of experiments shall be conducted at first, second and third semester. At the end of fourth semester, the project work viva-voce examination will be conducted on the basis of the dissertation report submitted by the student. Internal and External examiners will jointly conduct the viva-voce examination for evaluation.

5. Scheme of External examination

The duration of examinations for theory and practical's shall be three hours.

Question paper pattern (Theory)

1. The question paper carries a maximum of 75 marks.
2. The question paper consists of three sections namely Part-A, Part-B and Part-C.
3. Part-A consists of 10 multiple choice questions of 2 marks each ($10 \times 2 = 20$ marks). The candidate should answer all questions.
4. Part-B consists of 5 either or choice questions. Each question carries 5 marks ($5 \times 5 = 25$ marks).
5. Part-C consists of 5 questions. Each question carries 10 marks. The candidate should answer any three questions ($10 \times 3 = 30$ marks).

Question paper pattern (Practical) (Maximum 75 marks)

1. Major practical	20 marks
2. Minor practical	10 marks
3. Spotters	25 marks
5. Viva voce	10 marks
6. Practical record note	10 marks

Total 75 marks

6. Passing minimum

- a) There shall be 50% Passing Minimum for Internal.
- b) For External Examination, Passing Minimum shall be of 50% (Fifty Percentage) of the maximum marks prescribed for the paper.
- c) In the aggregate (External + Internal) the passing minimum shall be of 50% for each Paper/Practical/Project and Viva-voce.
- d) Grading shall be based on overall marks obtained (internal + external).

7. Dissertation/Project work (Maximum 200 marks)

The duration of the dissertation research shall be a minimum of three months in the fourth semester.

a) Plan of work

The candidate shall undergo dissertation work during the fourth semester. The candidate should prepare plan of work for the dissertation and should get approval from the guide. The candidate after completing the dissertation work shall be allowed to submit to the university at the end of fourth semester. If the candidate is desirous of availing the facility from other university/laboratory, they will be permitted only after getting approval from the guide. In such case, the candidate shall acknowledge the same in their dissertation.

b) No. of copies of dissertation

The candidate should prepare four copies of dissertation and submit the same for the evaluation of examiners. After evaluation, one copy will be retained in the department library and one copy shall be held by the student.

c) Format to be followed for dissertation

The format /certificate for dissertation to be followed by the student are given below

- 1) Title page
- 2) Bonafide certificate
- 3) Acknowledgement
- 4) Table of content.

Chapter No	Title	Page No
1	Introduction	
2.	Aim and Objectives	
3.	Review of Literature	
4.	Materials and Methods	
5.	Results	
6.	Discussion	
7.	Summary and Conclusion	
8.	References	

COMMON REQUIREMENTS FOR ALL THE COURSES

ATTENDANCE:

Since regular attendance is important for gaining academic success, the students are expected to improve their class attendance for all the courses. They are expected to be present in the classes for the morning session at 9.45 AM and for the forenoon session at 1.45 PM. As per the norms of the University, the students are qualified to write their end-semester examinations only if they have a minimum attendance of 75% in all the courses.

PUNCTUALITY:

Punctuality is the key to success for all the students. The achievement of the students will be better only if they are punctual to the class and attend the class completely. Coming late to the class creates a negative attitude and distracts the other students in the class. Hence students arriving late to the class by 10 minutes, without any valid reason, will be marked absent in the attendance record. However valid excuse including personal or medical emergency is acceptable, with prior approval by the Head of the Department.

CLASS PARTICIPATION:

Knowledge will be effectively imparted to the students only if they concentrate in the class and be more interactive. Also, providing an opportunity to the students to interact in the class will improve their thinking skills and enable the teacher to know the strength and weakness of the students. Hence the students are expected to get involved during the class hours and make the learning process interesting.

PRESENTATION OF SEMINARS:

Each student is supposed to give an oral presentation in the class seminar, where the students discuss about the recent research findings and latest developments related to the topics assigned to them. This promotes the students to read more number of research articles and get acquainted with the scientific research

undertaken around the world on a specified research theme. The other students attending the seminar are encouraged to actively participate in the seminar by asking valid questions.

SUBMISSION OF ASSIGNMENTS:

The students are allocated two assignments for the course, covering the topics included in the course. They are prompted to submit the assignment to the teacher by the deadline. Because timely submission of assignments is a spirit of individual discipline and will add towards showing a student's specialized responsibility in his course work. Careful preparation of the assignment is requested, since assignment preparations will also aid the students for final exam preparation.

PREPAREDNESS:

Prior-learning will help the students to understand better about the topic taken in the class. All the students are anticipated to receive a strong background and be able to participate in group discussions of the assigned topics prior to attending the talk. The students are intimated about the topics to be covered in advance, so that it will also help them to clarify their doubts on the topic, when the class is taken.

ACADEMIC DISHONESTY:

Academic frankness is the detection of scholarly action free from dishonesty and fraud and is an educational idea of this institution. Academic dishonesty includes, but is not limited to, cheating, fabricating of information or citations, plagiarizing, submitting the work of another student or work formerly used by others without informing the concerned teacher, or interference with the other students academic work. Since many of the students don't have proper knowledge about academic integrity, they commit academic dishonesty unintentionally. Hence the students will be first made to understand about what plagiarism is, avoid copying of others assignments, prevent violation of copyright laws and so on, so that academic dishonesty may be avoided.

SUBJECT TO CHANGE CLAUSE:

Depending upon the student's feedback and the requirement of the students, the contents mentioned in the syllabus and the course details are subject to minor changes. The changes will be based on the recent update in the existing topic or new advancement in the subject, which will be informed to the students

Format of the title page

Title of Dissertation

Dissertation submitted in partial fulfilment of the requirement for the degree of Master of Science in Biomedical Science to the Alagappa University, Karaikudi -630004.

By
(Student Name)
(Register Number)
Department of Biomedical Science
Alagappa University

(Re-accredited with “A+” by NAAC)
Karaikudi – 630004.
(year)

Dissertation evaluation

Internal presentation	75 marks
External Dissertation	75 marks
Viva-voce	50 marks
Total	<hr/>
	<u>200 marks</u>

Format of certificate

This is to certify that the dissertation entitled _____
Submitted in partial fulfilment for the requirement of the degree of Master of Science in Biomedical Science to the Alagappa University, Karaikudi is a bonafide research work carried out by _____ under my supervision and guidance and that no part of the dissertation has been submitted for the award of degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or in full in any Scientific journal or magazines.

8. Village Extension Programme

The Sivaganga and Ramnad districts are very backward districts where a majority of people lives in poverty. The rural mass is economically and educationally backward. Thus the aim of the introduction of this village placement programme is to extend out to reach environmental awareness, hygiene and health to the rural people of this region.

The students in their third semester have to visit any one of the village within the jurisdiction of Alagappa University and can arrange various programs to educate the rural mass in the following areas for three days.

1. Environmental awareness
2. Hygiene and Health

A minimum of two faculty members can accompany the students and guide them.

9. Maximum duration for completion of the course

The maximum duration for completion of M.Sc. degree in Biomedical Science shall not exceed eight semesters.

10. Commencement of this regulation

These regulations shall come into effect from the academic year 2019-20 for students who are admitted to the first year of the course during the academic year 2019-20.

11. Classification of successful candidate

Candidate who secured not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in First class. All other successful candidates shall be declared to have passed in the Second class. Candidate who obtains 75% of marks in the aggregate shall be deemed to have passed the examination in first class with distinction provide they should have passed all the examination at the first appearance.

Candidates who passed all the examinations prescribed for the course in the first instance and within a period of two academic years from the year of admission to the course are alone eligible for university ranking.

A candidate is deemed to have secured first rank provided if he/she should have passed all the papers in first attempt itself and should have secured the highest overall grade point average (OGPA).

Each student should have taken 90 + Extra credits to complete M.Sc. Biomedical Science degree course. Each paper carries 2 or 3 or 4 or 5 credits for theory/practical/internship whereas 15 credits for dissertation and viva voce with 50% marks in the university examination and 50% marks in CIA.

Raw score	Grade	Description	Grade points
90 and above	O	Outstanding	9.0-10
80-89	A	Very good	8.0-8.9
70-79	B	Good	7.0-7.9
60-69	C	Very poor	6.0-6.9
50-59	D	Satisfactory	5.0-5.9
Less than 50	F	Failure	
I-inadequate attendance, W-withdraw from the course			

CREDITS, INTERNAL ASSEMENT MARKS AND END SEMESTER EXAM MARKS

SL. No.	Course Code	Name of the Course	Credit	Hrs/week	Mark		Total
					Int.	Ext.	
SEMESTER-I							
1.	508101	Anatomy and Physiology	4	4	25	75	100
2.	508102	Medical Genetics	4	4	25	75	100
3.	508103	Bio instrumentation and Analytical Chemistry	4	4	25	75	100
4.	508104	Introduction to Bioinformatics	3	3	25	75	100
5.	508501	Forensic Science or Medical Oncology [Elective -I]	3	3	25	75	100
6.	508105	Practical-I Anatomy, Physiology and Medical Genetics	3	6	25	75	100
7.	508106	Practical-II Bioinstrumentation and Analytical chemistry	3	6	25	75	100
Semester II							30hrs
8.	508201	Medical Biochemistry	4	4	25	75	100
9.	508202	Clinical Microbiology	4	4	25	75	100
10.	508203	Clinical pathology	4	4	25	75	100
11.	--	Non Major Elective	2	3	25	75	100
12.	508502	Hospital Management and Bio safety (or) Bio-imaging technology [Elective-II]	3	3	25	75	100
13.	508204	Practical-III – Medical Biochemistry and Clinical Microbiology	3	6	25	75	100
14.	508205	Practical - IV - Clinical Pathology	3	6	25	75	100
15.	508888	Summer Training/Internship/Hospital Visit	5	-	25	75	100
-	MOOCS	-	-	-	-	-	-
SEMESTER - III							
16.	508301	Pharmaceutical Chemistry	4	4	25	75	100
17.	508302	Pharmacology and Toxicology	4	4	25	75	100
18.	508303	Biomaterials and Tissue Engineering	4	4	25	75	100
19.	--	Non Major Elective	2	3	25	75	100
20.	508503	Molecular advanced diagnostics or Artificial organs [Elective-III]	3	3	25	75	100
21.	508304	Practical - V- Pharmaceutical Chemistry and Pharmacology and Toxicology	3	6	25	75	100
22.	508305	Practical - VI- Biomaterials and Tissue Engineering	3	6	25	75	100
-	MOOCS	-	-	-	-	-	-
SEMESTER - IV							
23.	508999	Project Report and Viva-voce	15	-	50	150	200
			90 +Extra credits		675	1725	2400

Semester - I			
Course code: 508101	Anatomy and Physiology	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Learn the gross morphology, structure and functions of various organs of the human body. ➤ Describe the various homeostatic mechanisms and their imbalances. ➤ Understand the various tissues and organs of different systems of human body. ➤ Learn special senses and their tests. ➤ Understand the coordinated working pattern of different organs of each system. 		
Unit -I	Cell: Structure of Cell, function of each components of the cell, membrane potential, action potential, generation and conduction, electrical stimulation. Blood Cell – composition, origin of RBC, blood groups, estimation of RBC, WBC and platelet. Tissues: Tissues and histology, embryonic tissue, epithelial tissue, connective tissue, muscle tissue, nervous tissue and tissue membranes.		
Unit-II	Cardiac system: Structure of heart, pericardium, chambers, major blood vessels, blood supply. Cardiac Cycle, ECG, blood pressure, feedback control for blood pressure. Nervous system: Structure of nervous system, functions of neurons, synapse, reflexes and receptors, brain, brainstem, ventricles and spinal cord, peripheral and automatic nervous system and function of nervous tissue, reflex action, velocity of conduction of nerve impulses, autonomic nervous system.		
Unit III	Respiratory system: Parts of respiratory system - trachea and lungs, physiological aspects of respiration, exchange of gases, regulation of respiration, disturbance of respiratory function, pulmonary function test. Digestive system: Organization of GI system, digestion and absorption, movement of GI tract		
Unit IV	Endocrine system: General Characteristic and classification of hormone, synthesis, secretion, transport, metabolism and mechanism of action of pituitary, hypothalamus, thyroid, parathyroid, adrenal, pancreas, thymus hormones. Reproductive system: Structure and function of reproductive organs, hormones of testes and ovary, hormonal regulation of ovulation, fertilization, implantation, gestation, parturition and lactation, oogenesis, spermatogenesis.		
Unit V	Excretory system: Structure of Kidney and Nephron., Urine formation by kidneys: glomerular filtration, renal blood flow and their control, determinants of glomerular filtration rate (GFR)., Reabsorption and secretion along different parts of nephron., Regulation: regulation of extracellular fluid osmolarity and sodium concentration, role of thirst. Renal regulation of potassium, calcium, phosphate and magnesium, acid- base balance. Special senses: Olfaction, taste, visual system, hearing and balance		
Reference and Text Books:			
Gerard, T. J., & Bryan, D. (2015). Anatomy & physiology. <i>Indian edition, Wiley India pvt. Ltd., New Delhi</i> , 603-623.			
Martini, F. H., Nath, J. L. & Bartholomew, E. F. (2015). Fundamentals of Anatomy and Physiology. 2001. <i>Pentice Hall: New Jersey</i> , 538-557.			
VanPutte, C. (2016). <i>Seeley's anatomy & physiology</i> . McGraw-Hill Higher Education.			
Outcomes	<ul style="list-style-type: none"> ➤ Acquire knowledge on the cells and tissues. ➤ Understand the structure and functions of various human body systems. ➤ Acquire knowledge about contribution of each organ system to the maintenance of homeostasis. ➤ Understand the physiological processes accurately with relevant scientific terminology and nomenclature leading to develop more consciousness towards a healthy body. 		

Name of the Course Teacher: Dr. R. Aananthi and Prof. S. Ravikumar

Semester - I			
Course code: 508102	Medical Genetics		Credits:4
Hours: 4			
Objectives	<ul style="list-style-type: none"> ➤ Understand the Law's of inheritance and pedigree analysis. ➤ Describe the human chromosomes banding, nomenclature and pathology of human chromosomes. ➤ Learn molecular cytogenetic technique such as FISH and CGH. ➤ Describe the molecular and biochemical pathways of inborn errors of metabolism. ➤ Learn genetic factors in common diseases. 		
Unit -I	<p>Introduction: History of Human Genetics, Mendelian principles, Allele concept, Correlation between unit factors, Differential mode of functional behavior of Alleles. Pedigrees: gathering family history, pedigree symbols, construction of pedigrees, presentation of molecular genetic data in pedigrees.</p>		
Unit-II	<p>Human cytogenetics: human chromosomes, classification, Chromosome Nomenclature. Methods of chromosome analysis: chromosome banding, karyotype analysis; Molecular cytogenetics: FISH, CGH., Chromosomal aberration: Numerical and Structural aberrations. Common chromosome abnormalities in cancer, Genetics of fetal wastage. Sex-linked inheritance: colour blindness, haemophilia and muscular dystrophy.</p>		
Unit III	<p>Biochemical genetics: Inborn errors of metabolism, disorders of amino acid metabolism, disorders of branched-chain amino acid metabolism, disorders of carbohydrate metabolism, disorders of lipid metabolism, Mucopolysaccharidoses and Albinism., Pharmacodynamics: Definition, drug metabolism, Genetic variation by the effect of drugs, Hereditary disorders with altered drug response, Pharmacogenetics, Pharmacogenomics: Animal models in pharmacogenomics, Ecogenetics.</p>		
Unit IV	<p>Immunogenetics: Inherited immunodeficiency disorders, blood groups., Genetic factors in common diseases: genetic susceptibility to common diseases, types and mechanisms of genetic susceptibility, approaches to demonstrating genetic susceptibility, type 1 diabetes, type 2 diabetes, Crohn disease, hypertension, coronary artery disease, Alzheimer disease.</p>		
Unit V	<p>Haematology genetics: haematological disorders like thalassemia, sickle cell anemia, haemoglobinopathies., Molecular pathology: Classes of gene mutations in humans, Human mitochondrial diseases, Loss of Function and Gain of functional mutations in humans, Agammaglobinemia, Diseases of collagens., Single gene disorders: Huntington disease, myotonic dystrophy, hereditary motor & sensory neuropathy, neurofibromatosis, Marfan syndrome, cystic fibrosis and inherited cardiac arrhythmias & cardiomyopathies.</p>		
Reference and Text Books:			
<p>Chattopadhyay, I. (2018). <i>Fundamentals of Genetiics (1st ed.)</i>. Vinod Kumar Jain, Scientific International (Pvt.) Ltd.</p> <p>Rimoin, D. L., Pyeritz, R. E., & Korf, B. (Eds.). (2013). <i>Emery and Rimoin's essential medical genetics</i>. Elsevier.</p> <p>Turnpenny, P. D., & Ellard, S. (2016). <i>Emery's Elements of Medical Genetics E-Book</i>. Elsevier Health Sciences.</p>			
Outcomes	<ul style="list-style-type: none"> ➤ Acquire knowledge on the family history. ➤ Understand the sex-linked inheritance such as colour blindness and haemophilia. ➤ Acquire knowledge about drug response and metabolism. ➤ Understand the gene mutations in human. ➤ Understand the various genetic disorders. 		

Name of the Course Teacher: Dr. Jilian V. Paul

Semester - I			
Course code: 508103	Bio instrumentation and Analytical Chemistry	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Understand the basic fundamentals of bioelectrodes and its importance of ECG, EEG, EMG and ERG. ➤ Learn various measurements of nonelectrical parameters in the human body. ➤ Describe the principles and applications of centrifugation and electrophoresis. ➤ Describe the radio isotopic techniques and biosensors. 		
Unit -I	Biopotential electrodes: Origin of bio potential and its propagation. Electrode - electrolyte interface; electrode –skin interface; impedance; polarization effects of electrode; nonpolarizable electrodes. Types of electrodes: surface, needle and micro electrodes and their equivalent circuits. Bio-amplifier: Need for bio-amplifier		
Unit-II	Electrode configurations: Biosignals characteristics, frequency and amplitude ranges. ECG: Einthoven’s triangle, standard 12 lead system. EEG: 10-20 electrode system, unipolar, bipolar and average mode. EMG, ERG and EOG - unipolar and bipolar mode.		
Unit III	Measurement of non-electrical parameter: temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods: auscultatory method, oscillometric method; direct methods: electronic manometer. Pressure amplifiers: systolic, diastolic, mean detector circuit. Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method; Electromagnetic and ultrasound blood flow measurement.		
Unit IV	Centrifugation: Principle and application of differential, density and ultracentrifugation. Chromatography: principles, instrumentation and applications of Gas chromatography and HPLC. Electrophoresis: principles, instrumentation and applications of paper and gel (SDS PAGE & Agarose) electrophoresis. Spectroscopy: Basic concepts and application of UV-Visible, fluorescence, IR, NMR, CD, Mass spectrometry & X-ray diffraction in structure determination of biomolecules.		
Unit V	Radioisotopic techniques: Principles and application of tracer techniques in biology, radioactive isotopes and half life of isotopes, cerenkov radiation, liquid scintillation, GM counter. Effect of radiation on biological system, radioactive labeling of biological macromolecules, autoradiography and radiation dosimetry. Biosensors: Principle and application.		
Reference and Text Books:			
Haven, M. C., Tetrault, G. A., & Schenken, J. R. (Eds.). (1994). <i>Laboratory instrumentation</i> . John Wiley & Sons.			
Joseph J. Carr & Brown, J. M. (2001). <i>Introduction to biomedical equipment technology</i> . Prentice hall.			
Khandpur, R. S. (1987). <i>Handbook of biomedical instrumentation</i> . McGraw-Hill Education.			
Larson, M.T (eds). & Donna, D.L.M. (2016). <i>Clinical chemistry: Fundamentals and Laboratory Techniques (1st ed.)</i> . Saunders.			
Outcomes	<ul style="list-style-type: none"> ➤ Basic concepts of biopotential electrodes. ➤ Polarization and functions of electrodes. ➤ Leads system of ECG, EEG, EMG, ERG and Einthoven’s triangle of ECG. ➤ Electrical and nonelectrical physiological measurements. ➤ Indirect and direct methods of blood pressure and blood flow measurements. ➤ Principles and applications of different centrifugation. ➤ Molecular basic instrumentation – chromatography, electrophoresis, spectroscopy. ➤ Radioactive isotopes and counting. ➤ Effect of radiation on biological system. ➤ Applications of biosensors. 		

Name of the Course Teacher: Dr. P. Rameshthangam

Semester - I			
Course code: 508104	INTRODUCTION TO BIOINFORMATICS	Credits: 3	Hours: 3
Objectives	<ul style="list-style-type: none"> ➤ Understand the essential features of the interdisciplinary field of science for better understanding biological data. ➤ With a strong foundation for performing further research in bioinformatics. ➤ To create students opportunity to interact with algorithms, tools and d current scenario. ➤ To make the students look at a biological problem from a computational point of view. ➤ To find out the methods for analyzing the expression, structure and function of DNA, RNA and proteins, and an understanding of the relationships between species. 		
Unit -I	Basics of Bioinformatics: Introduction to Bioinformatics; Computers in Biology to understand Biological System; Basic commands of Windows, Unix and Linux operating systems; Concept of open resources in Bioinformatics.		
Unit-II	Sequence Analysis: Biological background for sequence analysis; Sequence alignment: Global, Local, Pairwise and Multiple sequence analysis; Algorithm for alignments; Database Searching; Tools for Sequence alignment.		
Unit III	Biological Databases: Database concepts; Introduction to Data types and 14source;Protein Sequence and Structural Databases; Nucleic acid databases; Genome databases; Specialized Databases; Carbohydrate Databases; Clinically relevant drug-drug interactions databases; Information retrieval from Biological databases: Entrez system, TCGA data bases, Bioportal		
Unit IV	Cheminformatics: Introduction; Cheminformatics tools; Chemical structure representation (SMILES and SMARTS); Chemical Databases: CSD, ACD, WDI, Chembank, PUBCHEM, Chemical Structure file formats; Structural Isomers: Structure visualization.		
Unit V	Medical and Pharmacy Informatics: Introduction to pharmacy informatics, Medical Transcription, Role of informatics to enhance the services provided by pharmaceutical care givers. Health Information Architecture, Health Data Management, Medical Coding Systems Telemedicine and Telehealth, Ethics in medical informatics, Pharmacy systems and automation, Informatics applications in pharmacy, survey and evaluation of on-line resources.		
Reference and Text Books:			
Anderson, P. O., McGuinness, S. M., & Bourne, P. E. (2009). What Is Pharmacy Informatics?. In <i>Pharmacy Informatics</i> (pp. 21-24). CRC Press.			
Attwood, T. K. (1999). <i>Introduction to bioinformatics</i> . Pearson Education India.			
Augen, J. (2004). <i>Bioinformatics in the post-genomic era: Genome, transcriptome, proteome, and information-based medicine</i> . Addison-Wesley Professional.			
Baxevanis, A. D., & Ouellette, B. F. (2004). <i>Bioinformatics: a practical guide to the analysis of genes and proteins</i> (Vol. 43). John Wiley & Sons.			
Baxevanis, A. D., & Ouellette, B. F. (2004). <i>Bioinformatics: a practical guide to the analysis of genes and proteins</i> (Vol. 43). John Wiley & Sons.			
Clair, C. S., & Visick, J. E. (2013). <i>Exploring bioinformatics</i> . Jones & Bartlett Publishers.			
Claverie, J. M., & Notredame, C. (2006). <i>Bioinformatics for dummies</i> . John Wiley & Sons.			
Edwards, D. (Ed.). (2008). <i>Plant bioinformatics: Methods and protocols</i> (Vol. 406). Springer Science & Business Media.			
Gasteiger, J., & Engel, T. (Eds.). (2006). <i>Chemoinformatics: a textbook</i> . John Wiley & Sons.			

Gilani, H. G., Samper, K. G., & Haghi, R. K. (2012). *Chemoinformatics: advanced control and computational techniques*. Apple Academic Press.

Higgins, D., & Taylor, W. R. (2000). *Bioinformatics: sequence, structure, and databanks: a practical approach* (No. Sirsi) i9780199637904).

Kenney, G. (2016). *Bioinformatics: Principles and Analysis*. Syrawood Publishing House.

Krane, D. E. (2002). *Fundamental concepts of bioinformatics*. Pearson Education India.

Krawetz, S. A., & Womble, D. D. (Eds.). (2003). *Introduction to bioinformatics: a theoretical and practical approach*. Springer Science & Business Media.

Leach, A. R., & Gillet, V. J. (2007). *An introduction to chemoinformatics*. Springer Science & Business Media.

Lesk, A. (2019). *Introduction to bioinformatics*. Oxford University Press.

Lesk, A. (2019). *Introduction to bioinformatics*. Oxford University Press.

Lund, O., Nielsen, M., Brunak, S., Lundegaard, C., & Kesmir, C. (2005). *Immunological bioinformatics*. MIT press.

Mount, D. W. (2004). *Bioinformatics: sequence and genome analysis. 2nd* (Vol. 692). Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.

Najarian, K., Najarian, S., Gharibzadeh, S., & Eichelberger, C. N. (2009). *Systems biology and bioinformatics: a computational approach*. CRC Press.

Rashidi, H. H., & Buehler, L. K. (1999). *Bioinformatics basics: applications in biological science and medicine*. CRC press.

Worley, K. (2003). *Sequence Analysis in a Nutshell: A Guide to Common Tools and Databases*. American journal of human genetics, 73(5), 1213.

Outcomes	<ul style="list-style-type: none"> ➤ The student should be able to understand basic research methods in bioinformatics. ➤ The student will choose biological data, submission and retrieval it from databases and design databases to store the information. ➤ The students will be able to demonstrate the most important bioinformatics databases, perform text-and sequence-based searches, and analyze the results in light of molecular biological knowledge ➤ The students will be able to experiment pair wise and multiple sequence alignment and will analyze the secondary and tertiary structures of protein sequences. ➤ The student should understand the data structure (databases) used in bioinformatics and interpret the information (especially: find genes; determine their functions), understand and be aware of current research and problems relating to this area. ➤ The student should be able to carry out gene and protein expression patterns and modeling cellular interactions and processes.
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Name of the Course Teacher: Dr. Sanjeeve Kumar Singh

Semester - II			
Course code: 508201	MEDICAL BIOCHEMISTRY	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Understand the structure, nomenclature, functions and importance of biomolecules. ➤ Learn the elements of enzyme structure that explains their substrate specificity and catalytic activity. ➤ Outline the sequence of reactions in anaerobic metabolism. ➤ Describe the regulatory role of hormones and basis of innate and adoptive immune response. 		
Unit -I	Molecules and Cells – Amino acids and Proteins, Carbohydrates and Lipids, Membrane and Transport. Metabolism – Oxygen transport, Catalytic proteins – Enzymes, Vitamins and Minerals, Bioenergetics and Oxidative Metabolism, Anaerobic metabolism of carbohydrates in the Red Blood Cells, TCA cycle, Oxidative metabolism of lipids in Liver and Muscle.		
Unit-II	Biosynthesis and storage of carbohydrate in liver and Muscle, Biosynthesis and storage of fatty acids, Biosynthesis of cholesterol and steroids, Biosynthesis and degradation of amino acids, Nucleotides, Complex Carbohydrates – Glycoproteins, Complex lipids, The Extra cellular Matrix.		
Unit III	Molecular basis of inheritance – Deoxyribonucleic acid, Ribonucleic acid, Protein Synthesis and turn over, Regulation of gene Expression: Basic mechanism, Genomics, Proteomics, transcriptomics and Metabolomics. Signaling and Growth – Membrane receptors and signal transduction, Neurotransmitters, Biochemical endocrinology, Cellular Homeostasis: Cell growth and Cancer, Aging.		
Unit IV	Fuels Nutrients and Minerals – Digestion and absorption of nutrients: The gastrointestinal tract, Glucose homeostasis and fuel Metabolism: Diabetes Mellitus, Nutrients and Diets, Lipoprotein Metabolism and Atherogenesis. Specialized tissues and their function - Role of liver in metabolism, Water and electrolyte Homeostasis, The Lung and the regulation of Hydrogen Ion Concentration (Acid – Base Balance).		
Unit V	Muscle: Energy Metabolism, Contraction and exercise, Bone Metabolism and Calcium Homeostasis, Neurochemistry. Blood and Immunity: Blood and Plasma Proteins, Hemostasis, and Thrombosis, Oxidative stress and Inflammation, The Immune response: Innate and adaptive Immunity.		
Reference and Text Books:			
Baynes, J.W. & Dominiczak, M.H. (2019). <i>Medical Biochemistry</i> (5 th ed.).			
Harvey, R. A., & Ferrier, D. R. (2011). Lippincott's illustrated reviews: Biochemistry (7 th ed.). Wolters Kluwer India Pvt. Ltd.			
Voet, D., & Voet, J. G. (2011). Biochemistry, 4-th Edition. <i>NewYork: John Wiley & Sons Inc, 492.</i>			
Outcomes	<ul style="list-style-type: none"> ➤ Acquire knowledge on the biomolecules and their importance in normal functioning of living organisms. ➤ Understand the metabolic pathways linked with pathological conditions ➤ Understand the concept of genomics, proteomics, transcriptomics, and metabolomics. ➤ Understand the role of platelets in hemostasis and thrombosis and basis of immune response. 		

Name of the Course Teacher: Dr. P. Rameshthangam

SEMESTER - II			
Course code: 508202	CLINICAL MICROBIOLOGY	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ To acquire knowledge about morphology, growth, nutrition and multiplication of micro organisms. ➤ Learn various pathogenesis, infections and then to prevent the disease using lab diagnosis for humans. ➤ Understand the general properties of different viruses and describe the various methods of lab diagnosis and prevention. 		
Unit -I	General Microbiology -Morphology and classification of microorganisms. Growth, nutrition and multiplication of bacteria. Sterilization and disinfection - Principles and use of equipment's of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, antiseptics and disinfectants. Immunology - antigen, antibodies, immunity, vaccines, types of vaccine and immunization schedule. Hospital acquired infection - Causative agents, transmission methods, investigation, prevention and control of hospital Acquired infections.		
Unit-II	Bacteriology -Classification of bacteria, morphology, infections, lab diagnosis, treatment and prevention of common bacterial infections. <i>Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacteriumdiphtheriae, Clostridia, Enterobacteriaceae - Shigella, Salmonella, Klebsiella, E.coli, Proteus, Vibrio cholerae, Pseudomonas and Spirochetes</i>		
Unit III	Mycobacteriology & Parasitology -Mycobacteria- classification, pathogenesis, lab diagnosis and prevention. Classification, infections and lab diagnosis of following parasites. Entamoeba, Giardia, Malaria, Hookworm, Roundworm and Filarial worms.		
Unit IV	Mycology -Morphology, disease caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi (<i>Aspergillus, Zygomycetes and Penicillium</i>)		
Unit V	General properties of viruses, diseases caused lab diagnosis and prevention of following viruses-Herpes, Hepatitis, HIV, Dengue, Influenza, Chikungunya, Rabies and Poliomyelitis.		
Reference and Text Books: Ananthanarayan, R., & Ananthanarayan, P. C. (2009). Paniker's textbook of microbiology. Aneja, K. R. (2018). <i>Laboratory manual of microbiology and biotechnology</i> . ED-TECH. Barer, M. R., & Irving, W. L. (2018). <i>Medical Microbiology E-Book: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Investigation and Control</i> . Elsevier Health Sciences. Bauman, R. W., Machunis-Masuoka, E., & Cosby, C. D. (2012). <i>Microbiology: with diseases by body system</i> . San Francisco: Benjamin Cummings. Baveja, C.P. (2015). <i>Text book of Microbiology (5th ed.)</i> . Arya Publications. Delves, P. J., Martin, S. J., Burton, D. R., & Roitt, I. M. (2017). <i>Essential immunology</i> . John Wiley & Sons. Edwards, M. R., Bartlett, N. W., Hussell, T., Openshaw, P., & Johnston, S. L. (2012). The microbiology of asthma. <i>Nature Reviews Microbiology</i> , 10(7), 459. Rajan, S. (2018). <i>Essentials Microbiology</i> . CBS Publisher.			
Outcomes	<ul style="list-style-type: none"> ➤ Learn opportunities in the basic principles of clinical microbiology, infectious disease and bacteriology techniques. ➤ Understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue. 		

	<ul style="list-style-type: none">➤ Understand the salient features of antigen antibody reaction and its uses in diagnostics and various other studies.➤ Understand the interactions between viruses and the host immune system and vaccine strategies.
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Name of the Course Teacher: Prof. S. Ravikumar

SEMESTER - II			
Course code: 508203	CLINICAL PATHOLOGY	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Understand the concepts of cell injury, clinico-pathological correlation of common infectious and non-infectious diseases. ➤ Correlate normal and altered morphology of different organ systems in different diseases to the extent needed for understanding of disease processes and their clinical significance. ➤ Learn the common immunological disorders and their resultant effects on the human body. ➤ Have an understanding of the common haematological disorders and the investigations necessary to diagnose them and to determine their prognosis 		
Unit -I	Introduction to Pathology – Cell Injury, wound healing. Circulatory Disturbances: Edema, chronic venous congestion, thrombosis and embolism, Infarction, shock, fluid and electrolyte imbalance. Growth disturbances and neoplasia; carcinogenesis, tumor; Laboratory diagnosis: cytological techniques including FNAC, Biopsy. Immune system: Organization, cells, antibodies and regulation of immune responses. Auto-immune disorders like systemic lupus erythematosus; Organ transplantation: Immunologic basis of rejection and graft versus host reaction.		
Unit-II	Infectious Diseases Mycobacterial diseases: tuberculosis and leprosy; bacterial diseases: typhoid, diphtheria, syphilis; Viral: rabies, measles; rickettsial; Fungal diseases and opportunistic infections; Parasitic diseases - malaria, filaria, Amebiasis; AIDS: aetiology, modes of transmission, diagnostic procedures and handling of infected material and health education. Cardiovascular Pathology: Rheumatic heart disease, atherosclerosis and Ischemic heart disease; myocardial infarction, Hypertensive heart disease, Congenital heart disease, cardiomyopathy; diagnosis of cardiovascular diseases.		
Unit III	Respiratory Pathology: Inflammatory diseases of bronchi; pneumonia; pulmonary tuberculosis; occupational lung disorders and diagnosis. Urinary Tract Pathology: basis of impaired function, urine analysis; nephrotic syndrome; acute, progressive and end stage renal disease; Polycystic kidneys, diagnosis of urinary tract infections. Pathology of the Gastro-Intestinal Tract: Leukoplakia; carcinoma of oral cavity and esophagus; salivary gland tumors; peptic ulcer; tumors of stomach; inflammatory diseases of small intestine, appendix and large intestine; pancreatitis; diagnosis of gastro-intestinal tract diseases..		
Unit IV	Hematopathology: Regulation of hematopoiesis; nutritional anaemias: Iron deficiency anaemia, folic Acid/Vit. B12 deficiency anaemia including pernicious anaemia, hemolytic anaemias; hemostatic disorders: Platelet deficiency; Polycythemia, myelofibrosis, multiple myeloma; Blood transfusion : grouping and cross matching. Liver and Biliary Tract Pathology: Jaundice, hepatitis, cirrhosis, hepatocellular and metastatic carcinoma; Diseases of the gall bladder: Cholecystitis, cholelithiasis. Lymphoreticular System: Lymphadenitis, Hodgkin's and Non-Hodgkin's lymphoma; Diseases of spleen - Splenomegaly & Thymus -myasthenia gravis. Diagnosis of liver and biliary tract diseases.		
Unit V	Reproductive System - Diseases of cervix, Hormonal influences and histological appearances of different phases of menstrual cycle and the abnormalities associated with it, Diseases of uterus, trophoblastic disease. Diseases of the breast; prostate; ovarian and testicular tumors; Diagnosis of reproductive system diseases. Osteopathology: Osteomyelitis; Metabolic diseases Rickets/osteomalacia, osteoporosis, osteosarcoma, osteoclastoma, Ewing's Sarcoma; Arthritis -Rheumatoid. Endocrine Pathology: Diagnosis of Diabetes Mellitus; goiter, tumors of thyroid, adrenal diseases; pituitary tumors. Neuropathology: Diagnosis of pyogenic and tuberculous meningitis, brain abscess, tuberculoma; CNS tumors; CSF and its disturbances.		

Reference and Text Books:

Goodman, C. C., & Fuller, K. S. (2016). *Pathology for the Physical Therapist Assistant-E-Book*. Elsevier Health Sciences.

Larson, M.T (eds). & Donna, D.L.M. (2016). *Clinical chemistry: Fundamentals and Laboratory Techniques (1st ed.)*. Saunders.

Mete, O., & Asa, S. L. (Eds.). (2016). *Endocrine Pathology with Online Resource*. Cambridge University Press.

Rubin, R., Strayer, D. S., & Rubin, E. (Eds.). (2008). *Rubin's pathology: clinicopathologic foundations of medicine*. Lippincott Williams & Wilkins.

Salvo, S. G. (2017). *Mosby's Pathology for Massage Therapists-E-Book*. Elsevier Health Sciences.

Outcomes

- Acquire knowledge on the cytological techniques and Graft-versus-host disease.
- Understand the mode of transmission of diseases and its diagnosis.
- Understand the pathogenesis of renal and gastrointestinal tract diseases.
- Understand the necessity of Hemostatic disorders and abnormalities associated with menstrual cycle.
- Acquire knowledge on Pyogenic and tuberculous meningitis.

Name of the Course Teacher: Dr. Elanchezhian Rajan

SEMESTER - III			
Course code: 508301	PHARMACEUTICAL CHEMISTRY	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Learn physical and chemical properties and pharmaceutical uses of inorganic and organic compounds. ➤ Know the stability and storage conditions and the different type of pharmaceutical formulations of these drugs and their popular brand names. ➤ Have an understanding of radio pharmaceuticals and contrast media. ➤ Understand about the quality control of drugs and pharmaceuticals 		
Unit -I	Introduction on the following inorganic compounds including important physical and chemical properties, medicinal and pharmaceutical uses storage conditions and chemical incompatibility. Acids, bases and buffers - Hydrochloric acid, sodium hydroxide and official buffers. Antioxidants - Sulphur dioxide and sodium nitrite. Gastrointestinal agents -Acidifying agents- Dilute hydrochloric acid. Antacids - Sodium bicarbonate. Antimicrobials - Hydrogen peroxide, potassium permanganate, chlorinated lime. Astringents - Alum and zinc sulphate.		
Unit-II	Dental Products - Sodium fluoride, calcium carbonate. Inhalants - Oxygen, carbon dioxide, nitrous oxide. Respiratory stimulants - Ammonium carbonate. Expectorants and Emetics -Ammonium chloride, potassium iodide. Antidotes - Sodium nitrite. Major Intra and Extra cellular electrolytes - Electrolytes used for replacement therapy - Sodium chloride, potassium chloride and its preparations. Physiological acid-base balance and electrolytes used- Sodium acetate, potassium Acetate, sodium bicarbonate injection.		
Unit III	Antiseptics and Disinfectants - Proflavine, benzalkonium chloride, phenol, formaldehyde solution, nitrofurantoin. Antileprotic Drugs - Clofazimine, thiambutosine. Anti-tubercular Drugs - Streptomycin, rifampicin. Antimoebic and Anthelmintic Drugs - Emetine, Mebendazole. Antibiotics -ampicillin, gentamicin, erythromycin, tetracycline. Antifungal agents - Udecylenic acid, amphotericin. Antimalarial Drugs - Chloroquine, Amodiaquine. General Anaesthetics -Halothane, diethyl ether. Antidepressant Drugs - Amitriptyline, nortriptyline. Analeptics - Theophylline, caffeine. Adrenergic drugs - Adrenaline, noradrenaline. Diuretic Drugs - Furosemide, mannitol.		
Unit IV	Cardiovascular Drugs - Ethylnitrite, glyceryl trinitrate. Hypoglycemic Agents - Insulin, phenformin, metformin. Coagulants and Anti coagulants - Heparin, thrombin, warfarin sodium. Analgesics and Anti-pyretics -Morphine, Pethidine, Aspirin, Paracetamol, Pentazocine. Non-steroidal anti-inflammatory agents - Indomethacin, phenylbutazone. Thyroxine and Antithyroids - Thyroxine, methimazole. Diagnostic Agents - Evans blue, congo Red. Steroidal Drugs - Cortisone, prednisolone, progesterone, testosterone. Anti-Neoplastic Drugs - Actinomycin, mercaptopurine.		
Unit V	Radio pharmaceuticals and contrast media - Radio activity-alpha; beta and gamma radiations, biological effects of radiations, measurement of radio activity, G.M. Counter, radio isotopes-their uses, storage and precautions with special reference to the official preparations. Quality control of Drugs and pharmaceuticals -Importance of quality control, significant errors, methods used for quality control, sources of impurities in pharmaceuticals. Limit tests for arsenic, chloride, sulfate, iron and heavy metals. Identification tests for cations and anions as per Indian Pharmacopoeia.		

Reference and Text Books:

August, J.T., Anders, M.W., Murad, F., & Coyle, J.C (eds.) (1994). *Advances in Pharmacology (1st ed.)*. Academic Press

Chisholm-Burns, M. A., Wells, B. G., & Schwinghammer, T. L. (2016). *Pharmacotherapy principles and practice*. McGraw-Hill.

Katzung, B. G. (2017). *Basic and clinical pharmacology*. McGraw-Hill Education.

Larson, M.T (eds). & Donna, D.L.M. (2016). *Clinical chemistry: Fundamentals and Laboratory Techniques (1st ed.)*. Saunders.

Satoskar, R. S., Bhandarkar, S. D., & Ainapure, S. S. (1997). *Pharmacology and pharmacotherapeutics*. Indian Journal of Pharmacology, 29(5), 330.

Outcomes

- About inorganic and organic compounds.
- On electrolytes used for replacement therapy.
- The uses of antitubular, anti-inflammatory and anti-neoplastic drugs.
- Identification tests for cations and anions as per Indian Pharmacopoeia.

Name of the Course Teacher: Dr. P. Rameshthangam

SEMESTER - III			
Course code: 508302	PHARMACOLOGY AND TOXICOLOGY	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ To acquire knowledge about the basic principles of pharmacology and toxicology. ➤ Learn various drug action on the nervous system, respiratory system and digestive system. ➤ Describe the hormones and hormone antagonists. ➤ Understand the synthetic organic compounds, inorganic toxicants and pharmacokinetics aspects of toxicants. 		
Unit -I	Introduction to pharmacology, scope of pharmacology. Routes of administration of drugs, their advantages and disadvantages. Various processes of absorption of drugs and the factors affecting them; Adsorption, metabolism, distribution and excretion of drugs. Pharmacodynamics: General mechanism of drug action and the factors, which modify drug action.		
Unit-II	Pharmacological classification of drugs; the discussion of drugs should emphasize the following aspects: Drugs acting on the central nervous system: Anesthetics, psychopharmacological agents. Drugs acting on the autonomic nervous system: Cholinergic drugs, anticholinergic drugs, anticholinesterase drugs, Adrenergic drugs and adrenergic receptor blockers, Neuron blockers and ganglion blockers, Neuromuscular blockers, drugs used in myasthenia gravis.		
Unit III	Hormones and hormone antagonists, Drugs acting on the respiratory system- bronchodilators, expectorants and antitussive agents, Drugs acting on the digestive system, Cardiovascular drugs, cardiotonics, antianginal agents, antihypertensive agents, peripheral vasodilators and drugs used in atherosclerosis, coagulants and anticoagulants.		
Unit IV	Synthetic organic compounds: Chemical additives in food, Chemicals in the work place, Solvents, Pesticides, Cosmetics, Drugs of abuse. Inorganic chemicals: Industrial and chemical environmental inorganic toxicants polluting air/ water/ food. Naturally occurring poisons: Mycotoxins, Bacterial toxins, Plant toxins and Animal toxins. Types of toxicity and its measurement: Acute, Sub-acute or Chronic and its manifestations. Acute toxicity: Mode of application/ administration/ exposure, in-vitro tests, Dose response relationship, Measurement of TD 50/ TC 50 and LD 50/ LC 50. Subacute and chronic toxicity. Special toxicity studies: Carcinogenicity, teratogenicity, in-vitro mutagenicity tests.		
Unit V	Pharmacokinetic aspects of toxicants- Absorption, Distribution, Metabolism and Excretion (ADME) of drugs and chemicals. A general study only. Site of metabolism, Metabolizing enzymes of liver, kidney, lung, GI tract, skin and their role in activation and detoxification of drugs and chemicals. Physiological (route of exposure, species, sex and age), Organ toxicities- Hepatotoxicity Nephrotoxicity: A brief description of morphological and functional aspects of kidney in relation of nephrotoxicity, Cardiovascular toxicity, Neurotoxicity, Broncho-pulmonary (inhalation) toxicity. Gastro-intestinal toxicity. Skin toxicity/ photosensitivity.		

Reference and Text Books:

August, J.T., Anders, M.W., Murad, F., & Coyle, J.C (eds.) (1994). *Advances in Pharmacology (1st ed.)*. Academic Press

Barile, F. A. (2013). *Principles of Toxicology Testing (2nd ed.)*. CRC Press.

Karmakar, R. N. (2007). *Forensic medicine and toxicology*. Academic Publishers.

Katzung, B. G. (2017). *Basic and clinical pharmacology*. McGraw-Hill Education.

Klaassen, Curtis D., and John B. Watkins. *Casarett & Doull's essentials of toxicology*. McGraw Hill Professional, 2015.

Reddy, K. N., & Murty, O. P. (2014). *The essentials of forensic medicine and toxicology* (Vol. 2010, pp. 296-297). New Delhi: Jaypee Brothers Medical Publishers.

Satoskar, R. S., Bhandarkar, S. D., & Ainapure, S. S. (1997). *Pharmacology and pharmacotherapeutics*. Indian Journal of Pharmacology, 29(5), 330.

Outcomes

- Understand the fundamental principles of pharmacology and toxicology, their mechanism of action and the factors.
- Acquire knowledge on the basic principles of central and peripheral neurotransmission.
- Understand the mechanisms of action of drugs within the following fields: anesthetics, cardiovascular pharmacology, respiratory pharmacology and gastrointestinal pharmacology.

Name of the Course Teacher: Prof. S. Ravikumar and Dr. R. Elanchezian

SEMESTER - III			
Course code: 508303	BIOMATERIALS AND TISSUE ENGINEERING	Credits:4	Hours: 4
Objectives	<ul style="list-style-type: none"> ➤ Understand the basic concepts of biomaterials implant and tissue interactions. ➤ Learn applications of biomaterials in various body parts. ➤ Describe the Biological response of implanted materials. ➤ Describe the applications of natural and degradable polymers for tissue engineering. 		
Unit -I	Introduction of biomaterial, types of biomaterials, advantages and disadvantages., Bio ceramics for implant coating, calcium phosphates, hydroxy apatite Ti6Al4V and other biomedical alloys, implant and tissue interaction.		
Unit-II	Advantages of nanomaterials use as implants, biological response of implanted materials, desirable and undesirable reactions of the body with implanted materials., Materials used for orthopaedic implants, bioceramics, modes of failure.		
Unit III	Materials used for dental, modes of dental implant failure, wear debris, materials used for cartilage and vascular, bladder, modes of cartilage implant, vascular implant, implant failure study, modes of bladder implant failure.		
Unit IV	Protein interactions with implanted materials, cellular recognition of proteins adsorbed on material surfaces, adhesion, migration, differentiation, cellular extra cellular matrix deposition leading to tissue regeneration, foreign-body response, inflammatory response		
Unit V	Tissue engineering introduction, stem cells, morphogenesis, generation of tissue in the embryo, tissue homeostasis, cellular signaling, extracellular matrix as a biologic scaffold for tissue engineering, scaffold fabrication, bioactive scaffold, natural polymers in tissue engineering applications, degradable polymers for tissue engineering.		
Reference and Text Books:			
Basu, B. (2017). <i>Biomaterials science and tissue engineering: principles and methods</i> . Cambridge University Press.			
Miller, E. G. (2006). <i>Artificial Organs</i> . Morgan & claypool publishers.			
Ong, J. L., Appleford, M. R., & Mani, G. (2014). <i>Introduction to biomaterials: basic theory with engineering applications</i> . Cambridge University Press.			
Poole, D. L., & Mackworth, A. K. (2010). <i>Artificial Intelligence: foundations of computational agents</i> . Cambridge University Press.			
Outcomes	<ul style="list-style-type: none"> ➤ Acquire knowledge on the biomaterials, implant and tissue engineering. ➤ Understand the desirable and undesirable reactions of the body with implanted materials. ➤ Acquire knowledge about tissue engineering and bioactive scaffold. 		

Name of the Course Teacher: Dr. R. Elanchezian

ELECTIVE COURSES

SEMESTER - I			
Course code: 508501	FORENSIC SCIENCE	Credits: 3	Hours: 3
Objectives	<ul style="list-style-type: none"> ➤ Understand the basic concepts of forensic science and their scope. ➤ Learn crime scene procedures and types of crimes. ➤ Describe the various divisions of crime investigation. ➤ Understand the basic concepts of psychology. 		
Unit -I	Definition and scope of forensic science, history and development of forensic science. Scope and development of forensic science in India, growth of core laboratories, set up in country.		
Unit-II	Introduction to crime, sociological aspect in society, types of crimes, crimes in India, crime scene management, crime scene procedures, protection of crime scene physical evidence- scientific collection of physical evidence, crime scene management in manmade and natural disaster.		
Unit III	Duties of forensic scientist, various divisions of crime investigation – toxicology, biology, serology, chemistry, physics ballistics prohibition document and other divisions.		
Unit IV	Specialised facilities offered by forensic science laboratory – DNA fingerprinting, polygraph, narco analysis, brain electrical oscillation signature proficiency (BEOSP); Cyber forensic- tape and video authentication, speaker identification etc.		
Unit V	Concepts of psychology, history of psychology, modern perspectives, types of psychological professionals psychology; The science and research methods, professional and ethical issues in psychology.		
Reference and Text Books:			
Barile, F. A. (2007). <i>Principles of toxicology testing</i> . CRC Press.			
Basu, R. (2009). <i>Fundamentals of Forensic Medicine and Toxicology (2nd ed.)</i> . Arunabha Sen Books & Allied (P) Ltd.			
Bertino, A. J. (2012). <i>Forensic Science: Fundamentals and Investigations 2012 Update</i> . Nelson Education.			
Forensic Science. The basics, 1 st edition, (2018) by Leela Dubey, Publishers- Oxford Book Company.			
Heath, W. (2018). <i>Psychology Research Methods: Connecting Research to Students' Lives</i> . Cambridge University Press.			
Sharma, R.K. (2008). <i>Practical and Viva in Forensic Medicine and Toxicology</i> . Vitasta Publishing Pvt. Ltd.			
Outcomes	<ul style="list-style-type: none"> ➤ Acquire knowledge on the forensic laboratories and development. ➤ Understand the duties of forensic scientists. ➤ Acquire knowledge about research methods and ethical issues in psychology 		

Name of the Course Teacher: Dr. Leema and Dr. R. Aananthi

SEMESTER - I			
Course code: 508501	MEDICAL ONCOLOGY		Credits: 3
Hours: 3			
Objectives	<ul style="list-style-type: none"> ➤ Understand the cell cycle ligands and receptors & cell – cell interactions. ➤ Know the degree of malignancy and types of chromosomal translocations ➤ Learn the Oncogenic mutations in growth promoting proteins ➤ Have an understanding of targeted delivery of anticancer agents 		
Unit -I	Modulations of Cell- Cell cycle- ligands and receptors, cell- cell interactions, integrins, invasions by cancerous cells, angiogenesis, morphogens, mechanism of deregulation of cell cycle during cancer, Apoptosis.		
Unit-II	Types of tumor-Benign and malignant tumor, localized and metastasis disease, tumor classification-WHO classification, staging and grading, degree of malignancy, types of chromosomal translocations, Relationship between oncogene products and growth factors- Src, Wnt, GAP		
Unit III	Carcinogenesis-Oncogenic mutations in growth promoting proteins, Mutations causing loss of cell cycle control, evasion of growth inhibitory signals, cancer genes (oncogenes and tumor suppressor genes), necrosis.		
Unit IV	Cancer Diagnosis-Cancer Imaging Techniques, Drug targeting and anti cancer delivery system, Targeted delivery of anticancer agents using Nanoparticles, colloidal systems for the delivery of anticancer agents.		
Unit V	Cancer therapy-Modulations of immune response, immunotherapy, Conventional chemotherapy, photodynamic therapy of cancer, Critical analysis of cancer therapy, Cancer vaccines.		
Reference and Text Books:			
<p>Cavalli, F., Kaye, B.K., Hansen, H.H., Armitage, O.J., Piccart, J.M. & Gebhart. (2009). <i>Cancer-Principles and practice of oncology</i> (4th ed.). Informa</p> <p>Cavalli, F., Kaye, S. B., Hansen, H. H., Armitage, J. O., & Piccart-Gebhart, M. (Eds.). (2009). <i>Textbook of medical oncology</i>. CRC Press.</p> <p>Rudolph K Lenhard, <i>Nanomaterials for cancer diagnosis</i></p> <p>Wang, E. (Ed.). (2010). <i>Cancer systems biology</i>. CRC Press.</p>			
Outcomes	<ul style="list-style-type: none"> ➤ About Mechanism of deregulation of cell cycle during cancer. ➤ Relationship between oncogene products and growth factors ➤ Mutations causing loss of cell cycle control ➤ Critical analysis of cancer therapy and vaccines 		

Name of the Course Teacher: Dr. R. Elanchezian

SEMESTER - II			
Course code: 508502	HOSPITAL MANAGEMENT AND BIOSAFETY	Credits: 3	Hours: 3
Objectives	<ul style="list-style-type: none"> ➤ Understand the theories of management. ➤ Manage hospitals by understanding the complexity, levels and role of hospital administrator. ➤ Describe the management process and integrated approach in management. ➤ Understand the current issues that have an implication in administration. 		
Unit -I	Introduction to management, Evolution of management, Definition and importance of management, Different bodies of management thought- overall support and utility services management, Medical record maintenance and computer applications.		
Unit-II	Epidemiological basis for healthcare management, Management development-towards development of professional management of Indian hospitals, Management of Indian hospitals, challenges ,strategies, modern techniques of hospital management, Operation concept- use of models, Health services research & formalized managerial methods.		
Unit III	Hospital planning, guiding principles in planning hospital facilities, services, Planning the hospital building, finance, need assessment survey of community, factors determining site, legal requirements, design consideration, project management & implementation, planning the operational units, engineering, lighting etc.		
Unit IV	Organization of the hospital, management structure, types of hospitals, governing body, hospital committee and hospital functionaries, duties and responsibilities of various positions hospital operational management, management of quality assured services of professional service units of hospital.		
Unit V	Waste disposal management, hospital waste management, Biosafety- regulatory frame work for GMOs, bioethics and its socio economic impact.		
Reference and Text Books:			
Subrahmanyam, B.V. (2018). <i>Hospital Management and Administration</i> . CBS Publishers and Distributors Pvt. Ltd.			
Outcomes	<ul style="list-style-type: none"> ➤ Understand the importance of management and different bodies of management thought overall support and utility services management. ➤ Acquire knowledge on the epidemiological basis for healthcare management and management development towards development of professional management of Indian hospitals. ➤ Understand the organization of the hospital, structure, types, governing body, hospital committee and hospital functionaries. ➤ Learn opportunities in the hospital waste management, waste disposal management, Biosafety regulatory frame work for GMOs, bioethics and its socio economic impact. 		

Name of the Course Teacher: Dr. Jilian V. Paul

SEMESTER - II			
Course code: 508502	BIOIMAGING TECHNOLOGY		Credits: 3
Hours: 3			
Objectives	<ul style="list-style-type: none"> ➤ Learn the basic concepts of bioimaging techniques. ➤ Understand the essential principles of ultrasound, X-ray imaging (CT), SPECT, PET. ➤ To Acquired knowledge of imaging system theory and their applications. 		
Unit -I	Introduction of Microscope, principles and applications of optical microscope, confocal microscope, fluorescens microscope, scanning electron microscope, transmission electron microscope, Live and dead assay with dyes.		
Unit-II	Ultrasound imaging, physics of ultrasound- principles of image formation, capture and display- principles of A, B M Mode, scan converters- Doppler ultrasound- pulsed and continuous.		
Unit III	Principles and production of X-rays-soft and hard, radiographic and fluoroscopic images in X-Ray systems, screen-film and image intensifier systems, computed and digital radiography, flat panel detectors.		
Unit IV	Introduction to emission tomography, mammography, transverse tomography, optical coherence tomography (OCT)- medical applications, CT Angiography basic physics of radioisotope imaging, Nuclear imaging, PET scanner principles, SPECT, Computer techniques in fast acquisition.		
Unit V	Image acquisition in magnetic resonance imaging MRI-T1 MRI-T2 proton density weighted images spin-echo technique and spin relaxation technique- various types of pulse sequences for fast acquisition of imaging, NMR spectroscopy.		
Reference and Text Books:			
<p>Cromwell, L., Weibell, F. J., Pfeiffer, E. A., & Usselman, L. B. (1973). <i>Biomedical instrumentation and measurements</i> (Book- Biomedical instrumentation and measurements.). Englewood Cliffs, N. J., Prentice-Hall, Inc., 1973. 457 p.</p> <p>Drexler, W., & Fujimoto, J. G. (Eds.). (2008). <i>Optical coherence tomography: technology and applications</i>. Springer Science & Business Media.</p> <p>Hendee, W. R., & Ritenour, E. R. (2003). <i>Medical imaging physics</i>. John Wiley & Sons.</p> <p>Khandpur, R. S. (1987). <i>Handbook of biomedical instrumentation</i>. McGraw-Hill Education.</p>			
Outcomes	<ul style="list-style-type: none"> ➤ Understand the imaging concepts that characterize the quality of imaging techniques ➤ Acquired knowledge about the principles of image formation, capture and display of ultrasound and X-ray. ➤ Understand and describe the mechanisms of tomography, MRI and NMR spectroscopy 		

Name of the Course Teacher: Dr. Jilian V. Paul

SEMESTER - III			
Course code: 508503	MOLECULAR ADVANCED DIAGNOSTICS	Credits: 3	Hours: 3
Objectives	<ul style="list-style-type: none"> ➤ Understand the genetic basis of diseases and inherited diseases. ➤ Learn the molecular DNA isolation and quantification, Probe and primer designing. ➤ Determine the Paternity and diagnosis of fungal pathogens ➤ Outline the good Laboratory practices, different levels of biosafety and containment. 		
Unit -I	Introduction and History of diagnostics, Diseases- infectious, physiological and metabolic errors, genetic basis of diseases, inherited diseases. Infection – mode of transmission in infections, factors predisposing to microbial pathogenicity, types of infectious diseases- bacterial, viral, fungal, protozoans and other parasites. Philosophy and general approach to clinical specimens, Sample collection- method of collection, transport and processing of samples, Interpretation of results, Normal microbial flora of the human body, Host - Parasite relationships.		
Unit-II	Cytogenetics - Karyotype analysis, blood , bone marrow, amniotic fluid, chorionic villus samples, products of conception Fluorescent <i>in situ</i> hybridization, Cytogenetic studies using microarrays. Molecular DNA isolation and quantification, Probe and primer designing, PCR -standard and various modifications, Real time PCR, Multiplex Ligation-dependent Probe Amplification (MLPA) analysis, SNP, Single-strand conformation polymorphism (SSCP).		
Unit III	Blotting techniques - Southern, Northern & Western, isotopic and non-isotopic methods, DNA Sequencing, including massively parallel sequencing. Use of microarrays, Bioinformatics as applied to sequencing and microarrays		
Unit IV	Applications of PCR- PCR based microbial typing: Bacterial identification based on 16S rRNA sequences - Amplified Ribosomal DNA Restriction analysis (ARDRA)- Culture independent analysis of bacteria - Denaturing gradient gel electrophoresis (DGGE). Molecular diagnosis of fungal pathogens based on 18SrRNA sequences - Detection of viral pathogens through PCR. RAPD for animal. PCR in forensic science- AFLP, STR, Multiplex PCR- Determination of Paternity- Human identification and sex determination.		
Unit V	Clinical Proteomics- Overview of immune system , Antigens and antibodies , Antigen-antibody interactions, Major Histocompatibility Complex (MHC), HLA typing , Immunotherapy and immunodiagnostics. Immunodiagnostics - Introduction, antigen antibody binding interactions and assays; antibodies- polyclonal and monoclonal antibodies, Immunoassays – types [RIA, ELISA] and specific applications; Immunohistochemistry – principle and techniques. Good Laboratory Practices. Different Levels of Biosafety, Containment.		
Reference and Text Books:			
<p>Bruns, D. E., Ashwood, E. R., & Burtis, C. A. (2007). <i>Fundamentals of molecular diagnostics</i>. Elsevier Health Sciences.</p> <p>Jain, K. K. (2006). <i>Nanobiotechnology in molecular diagnostics</i>. Horizon Bioscience.</p> <p>Walker, P., & Subasinghe, R. P. (Eds.). (2000). <i>DNA-based molecular diagnostic techniques: research needs for standardization and validation of the detection of aquatic animal pathogens and diseases</i> (No. 395). Food & Agriculture Org.</p> <p>Warford, A. & Presneau, N. (Eds.). (2019). <i>Molecular Diagnostics</i>. Paperback.</p>			

Outcomes	<ul style="list-style-type: none">➤ Acquire knowledge on the method of collection, transport, processing of samples and interpretation.➤ Understand about the Real time PCR and Multiplex Ligation-dependent Probe Amplification (MLPA) analysis.➤ Understand the role of Bioinformatics applied to sequencing and microarrays.➤ Understand about the role of Immunotherapy and immunodiagnostics
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Name of the Course Teacher: Dr. R. Elanchezian

SEMESTER - III			
Course code: 508503		ARTIFICIAL ORGANS	
		Credits: 3	Hours: 3
Objectives	<ul style="list-style-type: none"> ➤ Understand the substitutive medicine and organ replacement. ➤ Describe the artificial heart and circulatory assist devices. ➤ Learn artificial lung and cardio pulmonary bypass. ➤ Describe the renal transplantation and dialysis. 		
Unit -I	Design of artificial organs-substitutive medicine, biomaterial concentration, outlook for organ replacement, design consideration, evaluation of artificial organs.		
Unit-II	Artificial heart and circulatory assist devices- design of artificial heart, history of artificial heart, types of valve prostheses, thrombus deposition, durability, mechanical circulatory assistance, two main categories, intra- aortic balloon pump, percutaneous cardiopulmonary bypass.		
Unit III	: Artificial lungs and blood gas exchange devices- artificial lung ventilation, gas exchange systems, cardio pulmonary bypass, ECMO, comparison of artificial lungs and natural lungs, oxygen transport, carbon-di-oxide transport.		
Unit IV	Artificial kidney and artificial pancreas- Artificial kidney: renal transplantation, mass transfer in dialysis, membranes, hemofiltration, peritoneal dialysis equipment. Artificial pancreas: insulin therapy, therapeutic options in diabetes, insulin administration system, insulin production system.		
Unit V	Artificial blood and artificial liver- Artificial blood: plasmapheresis, blood substitutes, hemodilution, classification, characterisation of substitutes. Artificial liver: liver support systems, global liver function replacement, hybrid liver function replacement.		
Reference and Text Books:			
Basu, B. (2017). <i>Biomaterials science and tissue engineering: principles and methods</i> . Cambridge University Press.			
Miller, E. G. (2006). <i>Artificial Organs</i> . Morgan & claypool publishers.			
Ong, J. L., Appleford, M. R., & Mani, G. (2014). <i>Introduction to biomaterials: basic theory with engineering applications</i> . Cambridge University Press.			
Poole, D. L., & Mackworth, A. K. (2010). <i>Artificial Intelligence: foundations of computational agents</i> . Cambridge University Press.			
Outcomes	<ul style="list-style-type: none"> ➤ Acquire knowledge on the evaluation of artificial organs. ➤ Understand the artificial organs and their mechanisms. ➤ Acquire knowledge about artificial lungs and blood gas exchange devices. ➤ Understand the functions of artificial blood and artificial liver. 		

Name of the Course Teacher: Dr. R. Elanchezhian

PRACTICAL

SEMESTER - I			
Course code: 508105	ANATOMY, PHYSIOLOGY & MEDICAL GENETICS	Credits: 3	Hours: 6
Objectives	<ul style="list-style-type: none"> ➤ Learn the blood pressure measurements. ➤ Understand the osmotic fragility of blood. ➤ Learn the pedigree construction of family data. ➤ Understand chromosome karyotyping of hereditary disorders. 		
Unit -I	Measurement of blood pressure, Osmotic fragility of blood, Effect of hypotonic, isotonic salt solutions on red blood cells, Study of human tissues in normal and diseased condition from permanent slides.		
Unit-II	Demonstration of bones identification and side determination upper limb-clavicle, scapula, humerus, radius, ulna, lower limb-femur, hip bone, tibia, fibula, vertebral column, ribs, sternum, sacrum., Demonstration of major muscles of the body-limbs, head & neck.		
Unit III	Demonstration of heart, Demonstration of major vessels of the body-Aorta, subclavian, carotid, brachial, radial, ulna, femoral, renal., Demonstration of different parts of respiratory system., Demonstration of the part of digestive system., Demonstration of other organs- spleen, testis, uterus.		
Unit IV	Medical Genetics		
Unit V	Simple Mendelian traits on man observation and recording, Construction of pedigree chart for family history, Studies of inversion polymorphism in Chironomous/mosquito polytene chromosomes, Mitosis in onion root tip		
Unit VI	Feulgen staining of DNA, Study of hereditary disorder with the aid of chromosome karyotyping (Klinefelter syndrome, Down syndrome, Turner syndrome), Identification of Barr body in buccal epithelial cell, Diagnosis of biochemical disorder- Alkaptonuria		
Reference and Text Books:			
Amitrano, R., & Tortora, G. (2012). <i>Update: anatomy & physiology laboratory manual</i> . Cengage Learning.			
Chattopadhyay, I. (2018). <i>Fundamentals of Genetics</i> . New Delhi: Medtech.			
Pal, G. K., & Pravati, P., (2010). <i>Text Book of Practical Physiology, (3rd edn.)</i> .Universities Press (India) Private Limited.			
Pal, G. K., Pal, P., Nanda. N. & Amudharaj. D. (2015). <i>Atlas of Human Anatomy, (1st ed.)</i> . Jordi Vigue. Chambarlen Press.			
Rimoin, D. L., Pyeritz, R. E., & Korf, B. (Eds.). (2013). <i>Emery and Rimoin's essential medical genetics</i> . Elsevier.			
Tortora, G. J., & Derrickson, B. (2014). <i>Anatomy and Physiology-WorkBook</i> . CBS publication.			
Outcomes	<ul style="list-style-type: none"> ➤ Acquire knowledge about the identification and anatomical position of bones. ➤ Acquire knowledge on structure and functions of internal organs. ➤ Acquire knowledge on mitosis cell division. ➤ Understand the simple Mendelian traits. 		

Name of the Course Teacher: Prof. S. Ravikumar and Dr. Jilian V. paul

SEMESTER - I			
Course code: 508106	BIO INSTRUMENTATION AND ANALYTICAL CHEMISTRY	Credits: 3	Hours: 6
Objectives	<ul style="list-style-type: none"> ➤ Learn the basic concepts and applications of instruments applied in biochemical analysis. ➤ The principles of spectrometric analysis will be introduced and their practical application explored. ➤ Describe the features of chromatography techniques and their biological applications. 		
Unit -I	pH meter and preparation of buffers of pH range 2 to 11. Derivation of Henderson-Hasselbach equation and evaluation of pKa values in acid-base titrations. Determination of pI value of amino acids.		
Unit-II	Biochemical separation techniques: Separation of amino acids and sugars by Paper chromatography and plant pigments by TLC, separation of organic compounds by column chromatography and caffeine by HPLC.		
Unit III	Basic concepts and applications of the instruments used in biochemical analysis: Colorimetry and spectrophotometry. Colorimeter: Evaluation of Beer's law, complementary colour and wavelength of coloured solutions.		
Unit IV	Principle, instrumentation and application of GC, FPLC and affinity chromatography. Centrifugation and types of rotors.		
Unit V	Principle, instrumentation and application of Atomic Absorption spectroscopy, Circular dichroism spectroscopy, Electron spin resonance spectroscopy, NMR and Mass spectroscopy.		
Reference and Text Books:			
<p>Baynes, J. W., & Dominiczak, M. H. (2014). <i>Medical Biochemistry E-Book</i>. Elsevier Health Sciences.</p> <p>Carr, J. J., & Brown, J. M. (1981). <i>Introduction to biomedical equipment technology</i>. John Wiley & Sons.</p> <p>Haven, M. C., Tetrault, G. A., & Schenken, J. R. (Eds.). (1994). <i>Laboratory instrumentation</i>. John Wiley & Sons.</p> <p>Joseph J. Carr & Brown, J. M. (2001). <i>Introduction to biomedical equipment technology</i>. Prentice hall.</p> <p>Khandpur, R. S. (1987). <i>Handbook of biomedical instrumentation</i>. McGraw-Hill Education.</p> <p>Larson, M.T (eds). & Donna, D.L.M. (2016). <i>Clinical chemistry: Fundamentals and Laboratory Techniques (1st ed.)</i>. Saunders.</p>			
Outcomes	<ul style="list-style-type: none"> ➤ At the end of this course student will be able to instruments such as UV-VIS, Fluorescence and CD spectrophotometer. ➤ They will be able to analyze samples using column chromatography, thin layer chromatography and HPLC. ➤ They will also learn to study the biomolecular interactions using the spectroscopic techniques, analyzing secondary structure of a biomolecule etc. 		

Name of the Course Teacher: Dr. P. Rameshthangam

SEMESTER-II			
Course code: 508204	MEDICAL BIOCHEMISTRY AND CLINICAL MICROBIOLOGY	Credits: 3	Hours: 6
Objectives	<ul style="list-style-type: none"> ➤ Learn the basic concepts and instrumentation of biochemical and microbial analysis. ➤ Learn the estimation of various enzymes and protein by standard protocol. ➤ Understand the clinical studies of various enzymes. ➤ Understand the laboratory diagnosis of microbial infections. 		
Unit -I	Laboratory Instrumentation, salting in and salting out of proteins, Desalting of proteins by dialysis and Sephadex G-25. Protein estimation by Lowry's & Bradford methods, To check purity of protein & subunit structure by SDS page & silver staining. Western blot analysis to check special proteins.		
Unit-II	Chromatography for protein purification, Isolation of genomic & plasmid DNA, Agarose gel electrophoresis, Estimation of blood analytes: glucose, total cholesterol and HDL, cholesterol, uric acid, electrolytes, urea.		
Unit III	Cerebrospinal fluid analyses, Gastric juice analyses, Urine analyses, Amniotic fluid analyses, Enzymes: amylase, lactate dehydrogenase and alkaline phosphatase, Liver function tests, Renal function tests.		
	Clinical Microbiology		
Unit IV	Microscopy and micrometry: Introduction to microscopes, Focusing slides under low/high power and oil immersion, Principles and demonstration of various types of microscopes. Direct demonstration of bacteria by staining: Gram staining, Albert's staining, Acid fast staining. Motility tests and biochemical tests for bacterial identification: Hanging drop method for motility testing. Laboratory diagnosis of viral infections: Collection and transport of samples, Demonstration of egg inoculation techniques, serological tests (complement fixation, haemagglutination inhibition, neutralization, ELISA).		
Unit V	Laboratory diagnosis of fungal infections: Collection and transport of specimens, Sabouraud's dextrose agar/media, Lactophenol cotton blue for identification, Latex agglutination test. Stool examination for cysts: Collection and transport of stool sample for parasites, Direct examination (saline and iodine preparations), Concentration of stool for parasites, Identification of cysts. Demonstration of sterilization equipments: hot air oven, autoclave, bacterial filters. Demonstration of commonly used culture media: LB broth, LB agar, nutrient broth, nutrient agar, blood agar, Chocolate agar, MacConkey medium, Lowenstein Jensen (LJ) media, Robertson cooked meat media; Antibiotic sensitivity test. Principles and practice of Biomedical waste		

Reference and Text Books:

- Aneja, K. R. (2018). *Laboratory manual of microbiology and biotechnology*. ED-TECH.
- Arora, D.R., & Arora, B. (2007). *Practical microbiology (2nd ed.)*. CBS Publication.
- Barer, M. R., & Irving, W. L. (2018). *Medical Microbiology E-Book: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Investigation and Control*. Elsevier Health Sciences.
- Baynes, J.W. & Dominiczak, M.H. (2019). *Medical Biochemistry (5th ed.)*.
- Chen, C. & Yaming. (2017). *Biochemistry*. Medtech.
- Harvey, R. A., & Ferrier, D. R. (2011). *Lippincott's illustrated reviews: Biochemistry (7th ed.)*. Wolters Kluwer India Pvt. Ltd.
- Keen, M. G. (2007). *Microbial Life*, James T. Stanley, Robert P. Gunsalus, Stephen Lory, and Jerome J. Perry.
- Naigaonkar, M. A. (2008). *A manual of medical laboratory technology*. Pragati Books Pvt. Ltd..
- Perry, J. J., Staley, J. T., & Lory, S. (2002). *Microbial life*. Sinauer Associates Incorporated.
- Voet, D., & Voet, J. G. (2011). *Biochemistry, (4th ed.)*. New York: John Wiley & Sons Inc, 492.

Outcomes

- Practical approach in biochemistry and microbiology.
- The separation techniques.
- Bacterial staining and identification.
- Biomedical waste management

Name of the Course Teacher: Dr. R. Elanchezian

SEMESTER-II			
Course code: 508205	CLINICAL PATHOLOGY	Credits: 3	Hours: 6
Objectives	<ul style="list-style-type: none"> ➤ Learn specimen collection and processing. ➤ Learn cytological techniques. ➤ Understand common blood tests analysis. ➤ Understand the laboratory diagnosis of infectious infections 		
Unit -I	Specimen collection and Processing: Collection of specimen, labeling, documentation Fixation – grossing techniques Tissue processing - Cutting and staining of sections, use of special stains Cytological techniques– preparation, staining and reporting Immunocytochemistry, Immunohistochemistry Immunofluorescence		
Unit-II	Determination of Blood Groups Hemoglobin estimation Blood counts - Staining and reporting of smears Determination of White Blood Cell count Determination of Red Blood Cell count		
Unit III	Differential leukocyte count using Leishman stain Determination of packed cell Volume Determination of Erythrocyte sedimentation rate [ESR] Calculation of Blood indices Determination of Clotting Time, Bleeding Time Examination of CSF - Routine and Special tests		
Unit IV	Estimation of blood sugar, urea, creatinine, proteins, bilirubin, cholesterol, uric acid, electrolytes, calcium and enzymes Physical and chemical examinations of urine including sugar, protein, acetone, bile salts, bile pigments.		
Unit V	Diagnostic procedures in important microbial infections- Widal, Weil Felix, VDRL, HIV, HBV, CRP, RF, ASO and pregnancy tests - ELISA Clinical Laboratory Improvement Amendments (CLIA).		
Reference and Text Books:			
Aneja, K. R. (2018). <i>Laboratory manual of microbiology and biotechnology</i> . ED-TECH Cotran, R. S., Kumar, V., & Robbins, S. L. (1994). <i>Robbins pathologic basis of disease</i> (No. RB 111. R623 1994). Degos, L., Linch, D. C., & Löwenberg, B. (1999). <i>Textbook of malignant haematology</i> . CRC Press. Goodman, C. C., & Fuller, K. S. (2016). <i>Pathology for the Physical Therapist Assistant-E-Book</i> . Elsevier Health Sciences. Larson, M.T (eds). & Donna, D.L.M. (2016). <i>Clinical chemistry: Fundamentals and Laboratory Techniques (1st ed.)</i> . Saunders. Lowe, J. S., Anderson, P. G., & Anderson, S. I. (2018). <i>Stevens & Lowe's Human Histology-E-Book</i> . Elsevier Health Sciences. Mete, O., & Asa, S. L. (Eds.). (2016). <i>Endocrine Pathology with Online Resource</i> . Cambridge University Press. Salvo, S. G. (2017). <i>Mosby's Pathology for Massage Therapists-E-Book</i> . Elsevier Health Sciences.			
Outcomes	<ul style="list-style-type: none"> ➤ Tissue processing. ➤ Cytological techniques. ➤ Packed cell volume, erythrocyte sedimentation rate and differential leukocyte count. ➤ Role of microbial infections. 		

Name of the Course Teacher: Dr. Jilian V. Paul

SEMESTER-III			
Course code: 508304	PHARMACEUTICAL CHEMISTRY, PHARMACOLOGY AND TOXICOLOGY	Credits: 3	Hours: 6
Objectives	<ul style="list-style-type: none"> ➤ Learn the routes of administration in animal model. ➤ Understand the effect of drugs action and general anesthesia. ➤ Learn the acute toxicity in given drugs. ➤ Understand the specific activity of enzymes in rat brain homogenate. 		
Unit -I	Animal handling and precautions. Study the routes of administration. Topical application of atropine on rabbit eye. Topical application of pilocarpine on rabbit eye.		
Unit-II	Analgesic effect of diclofenac on mice or rat. Study the effects of acetylcholine (Ach) and plot the dose-response curve. Study the effect of general anaesthesia with ketamine.		
Unit III	Determine the effect of promethazine on phenobarbitone induced sleeping time in mice. Determine the acute toxicity of a given drug. Calculate the LD ₅₀ value.		
Unit IV	Detection of organophosphorous pesticides in biological sample. Test the presence of paracetamol in the given biological sample.		
Unit V	Study the effect of organophosphate malathion on the specific activity of the enzyme acetylcholinestrerase in rat brain homogenate.		
Reference and Text Books:			
Chisholm-Burns, M. A., Wells, B. G., & Schwinghammer, T. L. (2016). <i>Pharmacotherapy principles and practice</i> . McGraw-Hill. Sharma, R. K. (2008). <i>Practical and viva in Forensic Medical Toxicology</i> , (1 st ed.). Vitasta Publishing Pvt. Ltd.			
Outcomes	On successful completion of pharmacology and toxicology practical, students will be able to acquire knowledge on the: <ul style="list-style-type: none"> ➤ Animal model studies. ➤ Effect of drugs. ➤ Detection of pesticides. ➤ Acute toxicity. 		

Name of the Course Teacher: Prof. S. Ravikumar and Dr. R. Elanchezhian

SEMESTER-III			
Course code: 508305	BIOMATERIALS AND TISSUE ENGINEERING	Credits: 3	Hours: 6
Objectives	<ul style="list-style-type: none"> ➤ Learn the basic study of culturing techniques and cell viability study. ➤ Understand the cell counting and staining techniques. ➤ Learn to study the cytotoxicity assays, DPPH radical scavenging assay, LDH assay, DNA fragmentation assay. 		
Unit -I	Types of sterilization techniques- autoclave, boiling water, dry heat or hot air oven, ultraviolet light, filtration., Preparation of media and sera.		
Unit-II	Techniques for the in vitro culture of animal cells- primary cell culture, preparation of secondary growth or established cell lines, cell counting method and its viability by vital staining methods.		
Unit III	Differentiation of live cells from dead cells by giemsa stain method, preserve the cells in viable condition by using proper preservative.		
Unit IV	Preparation of Suitable Cell Culture for the Adaptation of Animal virus and to study its Cytopathic effects. Culture of cell lines- MCF, Vero; Cytotoxicity assay- MTT assay, apoptosis assay, neutral red assay.		
Unit V	DPPH radical scavenging assay, LDH (Lactate dehydrogenase assay), DNA fragmentation assay, microscopic analysis of cell culture- DAPI staining.		
Reference and Text Books:			
<p>Ian, F. R. (2006). <i>Culture of animal cells: a manual of basic technique</i>, (5th ed.). Wiley-Liss publication.</p> <p>Davis, M. (2005). <i>Basic Cell Culture</i>, (2nd ed.). Humana Press.</p> <p>Walker, J. M., & Wilson, K. (Eds.). (2010). <i>Principles and Techniques of biochemistry and molecular biology</i>. Cambridge university press.</p> <p>Wilson, L., Matsudaira, P. T., Mather, J. P., & Barnes, D. (1998). <i>Animal Cell Culture Methods</i> (Vol. 57). Academic Press.</p> <p>Picot, J. (2005). <i>Human cell culture protocols</i> (Vol. 107). Springer Science & Business Media.</p> <p>Jenkins, N. (Eds.). (1999). <i>Animal cell biotechnology: methods and protocols</i> (Vol. 8). Clifton, NJ: Humana Press.</p>			
Outcomes	<ul style="list-style-type: none"> ➤ Understand sterilization techniques and media preparation. ➤ Prepare primary cell culture and secondary cell growth. ➤ Execute the cytotoxicity assays and staining techniques. 		

Name of the Course Teacher: Dr. R. Elanchezian

Courses offer to other Departments

Course code	Name of the Course	
508501	Forensic Sciences	Medical oncology
508502	Hospital Management and Biosafety	Bioimaging technology
508503	Molecular advanced diagnostics	Artificial organs

Department of Biomedical Sciences Members of Broad Based Board of Studies

Sl. No.	Name and Address of the Members	Position
1.	DR. S. RAVIKUMAR , Head i/c, Department of Biomedical Sciences, Alagappa University, Karaikudi	Chairman
2.	DR. PARASURAMAN PADMANABHAN , Deputy Director (Translational Neuroscience), Head of operation, Centre for Neuroimaging Research at NTU (CeNReN), Research administration and support services (RASS), Lee Kong Chian School of Medicine Nanyang Technological University (NTU), 59, Nanyang Drive, Experimental Medicine Building (EMB), Level7, Room 07-19, Cognitive Neuroimaging centre (CoNic), Singapore 636 921	Member
3.	DR. DINESHKUMAR SRINIVASAN , Associate Professor, Yong Loo Lin School of Medicine, National University of Singapore, MD10,4 Medical Drive, #04-01Q, Singapore 117594	Member
4.	DR. JOUSMAKI VEIKKO TAPANI , Director of Aalto Neuroimaging Research infrastructure Aalto Senior Scientist, Department of Neuroscience and Biomedical Engineering Aalto University School of Science, Espoo, Finland	Member
5.	DR. DOMOKOS MATHE , Senior Scientist, Department of Biophysics and Radiation Biology, Faculty of Medicine, Semmelweis University	Member
6.	DR. N. KABILAN , Professor and Head, Department of Siddha, The Tamilnadu Dr. MGR, Medical University, 69 Anna salai, Guindy Chennai	Member
7.	DR. M. KUMARAVEL General Manager-Herbal Research, Tablets (India) Limited, Jhaver Centre, IVth floor, R.A. Building, 72, Marshalls Road, Chennai 600 008	Member
8..	DR. J. SUJATHAMALINI , Associate Professor and Head i/c, Department of Special Education and Rehabilitation Science, Alagappa University Karaikudi	Special invitee
9.	DR. P. RAMESHTHANGAM , Assistant Professor in Biotechnology-DDE	Member
10.	DR. R. AANANTHI , Assistant Professor & Medical Officer, Alagappa University College of physical education	Special invitee
11.	DR. E. KANNAPIRAN , Director, Curriculum Design and Development Cell, Alagappa University, Karaikudi	Ex-officio Member

CURRICULUM VITAE OF DR. S. RAVIKUMAR



Name: **DR. S. Ravikumar**

Designation: Professor and Head

Address: Department of Biomedical Sciences

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Phone:04565-226482

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Educational qualification:

1988-M.Sc., Biology, School of Biological Sciences, Madurai Kamaraj University, Madurai, Tamil Nadu, India

1990-M.Phil Marine Biology and Oceanography, CAS in Marine Biology, Annamalai University, Tamil Nadu, India

1997-Ph.D in Marine Biology, CAS in Marine Biology, Annamalai University, Tamil Nadu, India

Professional experience: Teaching/Research Experience: 22 years

1996-1998-Guest lecturer, Department of Biochemistry, Govt. Arts college, M.K. University, Tamil Nadu, India

1998-1999-Lecturer (senior scale), PG Department of Microbiology, Thiagarajar Arts College (Autonomous), Tamil Nadu, India

1999-2006-Lecturer- Centre for Marine Science and Technology, Manonmaniam Sundaranar University, Tamil Nadu, India

2006-2011-Lecturer, School of Marine Sciences, Alagappa University, Tamil Nadu, India

2011-2013-Reader, School of Marine Sciences, Alagappa University, Tamil Nadu, India

2013-2018-Professor, School of Marine Sciences, Alagappa University, Tamil Nadu, India

2018-onwards, Professor and Head i/c, Department of Biomedical Sciences, Alagappa University, Tamil Nadu, India

Administrative experience

S. No.	Post Held	Organization	Duration
1	Co-Ordinator	Alagappa University Evening College, Thondi	2008 to 2012
2.	Executive Member	Alagappa University Faculty Association, Karaikudi	2011-2012
3.	Principal i/c	Alagappa University Arts and Science College, Paramakudi	July 2012 to 2014

4.	Senate Member	Manonmaniam Sundaranar University, Tirunelveli	Since 11.09.2013 to 10.09.2016
5.	Member –IQAC	Manonmaniam Sunaranar University, Tirunelveli	Since February, 2014 to 2016
6	Member- RAG	Gulf of Mannar Marine Biosphere Reserve Trust, Ramanathapuram	Since March 2015
7	Deputy Co-ordinator	Special Assistance Programme (SAP) UGC, New Delhi	Since 2015
8	Scientific Expert	Mount Litzera Zee School-Management Committee	Since 2016
9.	Member-Planning Board	Manonmaniam Sundaranar University, Tirunelveli	2016 to 2019
10.	Member	Expert committee-Identification of critical wildlife habitats in Therthankal-Tamil Nadu, India.	Since 2018
11.	Co-ordinator	Vivekananda Centre for Higher Education and Research	Since 2018
12.	Head	Department of Biomedical Sciences, Alagappa University, Karaikudi	Since 2018
13.	Member Senate-Special invitee	Alagappa Unviersity, Karaikudi	Since 2018
14.	Member-Standing Committee on Academic Affairs-Special invitee	Alagappa Unviersity, Karaikudi	Since 2018

Honours and Awards:

S. No.	Name of Award/ Fellowship	Name of the Organisation	Year/Duration
1	Indo-Mauritius Post Doctoral Fellowship	University of Mauritius, Mauritius	8-12 Weeks
2.	Shri. P. K. Doss memorial Best Faculty award in Marine Sciences	Nehru Group of Institution, Tamil Nadu, India	2010
3.	Young Innovator Award	EPS Global Medical Development and Inc., Canada	2012
4.	UGC-BSR Award	University Grants Commission, New Delhi	2012
5.	Alagappa University Research Excellence Award	Alagappa University	2016
6.	Best Professor Award in Oceanography and Coastal	PEARL Foundation, Tamil Nadu, India	2016

	Area Studies		
7.	Life Time Achievement Award	Nehru Group of Institution, Tamil Nadu, India	2018
8.	Fellow	Institute of Biomedical Science, London	2018
9.	Life Member	Indian Association of Biomedical Science	2018
10.	Life Member	National Academy of Biological Sciences	2018
11.	Honorary Professor	Indira Gandhi Technological and Medical University, Arunachal Pradesh	2018

Recent publications:

1. Mathivanan, A., S. Ravikumar and G. Selvakumar, 2019. Bioprospecting of sponge and symbionts: New tool for mosquitocidal and insecticidal metabolites, *Biocatalysis and Agricultural biotechnology*, 19 (2019)101158. ISSN:1878-8181 (online); Impact factor-1.43.
2. Pandi Boomi, Gurumallesh Prabu Poorani, Subramaniyan Palanisamy, Samayanan Selvam, Ganesan Ramanathan, Sundaram Ravikumar, Hamed Barabadi, Halliah Gurumallesh Prabu, Jeyaraman Jeyakanthan, Muthupandian Saravanan, 2019. Evaluation of Antibacterial and Anticancer Potential of Polyaniline Bimetal Nanocomposites Synthesized from Chemical Reduction Method, *Journal of Cluster Science* <https://doi.org/10.1007/s10876-019-01530-x>, ISSN: 1040-7278 (Print) 1572-8862 (Online); Impact Factor-1.715,
3. Boomi, P. R. M. Ganesan, G. Poorani, H. Gurumallesh Prabu, S. Ravikumar and J. Jeyakanthan, 2019. Biological synergy of greener gold nanoparticles by using *Coleus aromaticus* leaf extract, *Material Science and Engineering C*, 99: 202-210. ISSN: 0928-4931; Cite Score-5.02; Impact factor-5.08; SNIP-1.384; SJR-1.110.
4. Chandralekha, Margaret Beula, Sundaram Ravikumar, Banergee Rajkumar, Sundaram, Prasannakumar, 2018. Antimalarial activity of chosen marine halophytes from Tuticorin coast against chloroquine sensitive *Plasmodium falciparum*, *International Journal of Recent Research Aspects* ISSN: 2349-7688, Special Issue: Conscientious Computing Technologies, pp. 338-342.
4. Sowmiya, R., G. Balasubramani, P. Deepak, D. Aiswarya, S. Ravikumar, S. Prasannakumar and P. Perumal., 2017. Characterisation and screening of *in vitro* antimalarial and larvicidal activities of selected seaweeds from southeast coast of India against *Plasmodium falciparum* and *Anopheles stephensi*. *Journal of Coastal Life Medicine*, 5(6): 242 to 248.
5. Rajamani Sowmiya, Govindasamy Balasubramani, Paramasivam Deepak, Dilipkumar Aiswarya, Sundaram Ravikumar, Sundaram Prasannakumar, Pachiappan Perumal, 2017. Characterization and screening of *in vitro* antimalarial and larvicidal activities of selected seaweeds from southeast coast of India against *Plasmodium falciparum* and *Anopheles stephensi*, *Journal of Coastal Life Medicine*, 5(6): 242-248
6. Perumal, P. R. Sowmiya, R., S. Prasannakumar, S. Ravikumar, P. Deepak, G. Balasubramani, 2017. Isolation, structural elucidation and antiplasmodial activity of fucosterol compound from brown seaweed, *Sargassum linearifolium* against malarial parasite *Plasmodium falciparum*, *Natural Product Research*, <https://doi.org/10.1080/14786419.2017.1342081> Impact Factor 1.828 ISSN: 1478-6427.

7. Jeyaraj,N. , S. Ravikumar, C. Rajthilak, S. Prasanna Kumar, P. Santhanam, 2016. Abundance and Diversity of Zooplankton along the Gulf of Mannar Region, Southeast Coast of India, International Journal of Marine Science, 6(28), 1-9.
8. Ferosekhan,M.,A. Ramu and S. Ravikumar, (2016). Anti-inflammatory activity of traditionally important insulin plant *Costus* species for the treatment of inflammation in human. International journal of current research in biosciences and plant biology, 3(10): 144-149 (ISSN: 2349-8080).
9. Gnanadesigan, M. S. Ravikumar and M. Anand, (2016). Hepatoprotective activity of *Ceriops decandra* (Griff.) Ding Hou mangrove plant against CCl₄ induced liver damage. Journal of Taibah University for Science. <http://dx.doi.org/10.1016/j.jtusci.2016.07.004>. (ISSN:1658-3655).1-34. Online first. Impact Factor 2.4092
10. Sowmya ,R, S. Prasannakumar, P. Deepak, R. Ramkumar, G. Balasubramani, D. Aiswarya, P. Peerumal and S. Ravikumar, (2016).In vitro antiplasmodial activity of native Indian seaweed *Sargassum* sp.9(2):101-106 (ISSN: 0974-2441)

Cumulative Impact factor: 58.20

Total Citation: 2442

h- index: 31

i10- index: 56

CURRICULUM VITAE

Name: Dr Parasuraman Padmanabhan

Designation: Deputy Director (Translational Neuroscience)
Head of Operation, Centre for Neuroimaging Research at
NTU(CeNReN)

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Lee Kong Chian School of Medicine
Nanyang Technological University (NTU)
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Experimental Medicine Building (EMB),
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Singapore-636 921

Phone: (65) 6904 1186/93873979

Email: ppadmanabhan1@gmail.com or ppadmanabhan@ntu.edu.sg



Educational qualification:

S. No.	Degree	Subject	University/ Institute	Percentage/ Class/Grade	Year of Passing
1.	B. Sc.	Zoology	Annamalai University, Tamil Nadu, India	First Class	1983
2.	M. Sc.	Zoology	Annamalai University, Tamil Nadu, India	First Class	1985
3.	Ph.D	Zoology	Annamalai University, Tamil Nadu, India	-	1992

Professional experience:

- Senior Research Fellow, Lee Kong Chian School of Medicine, Nanyang Technological University (NTU), Singapore (December 2012 to June, 2014)
- Vice President, BioPharma Training Institute Pte Ltd, Singapore (June 2012- November 2012)
- Director, Bioimaging Centre, PWG Genetics Pvt. Ltd, Pre-Clinical CRO, Singapore (June 2011- May 2012)
- Research Manager, Translational Molecular Imaging Group (TMIG), Singapore BioImaging Consortium (SBIC), A-STAR (2007- 2011)
- Senior Research Fellow, Singapore BioImaging Consortium (SBIC), A-STAR, Singapore (2006 – 2007)
- 2003-05 Research Associate, Stanford Medical School, USA
- 2000-01 Visiting Scientist, Dept. Microbiology, Cornell University, Ithaca, USA
- 1996-02 Senior Scientist, DRD (Environmental Biotechnology), NEERI (CSIR), Nagpur, INDIA
- 1993-96 Scientist Fellow, DRD (Environmental Biotechnology), NEERI (CSIR), Nagpur, INDIA

Honours and Awards:

Scientific Awards

- **2006 Young Investigator award**, Academy of Molecular Imaging, USA
- 2005 Academy of molecular Imaging (AMI) **Young Investigator Travel Award**, Orlando, Florida, USA
- 2004 Society for Molecular Imaging **Young Scientist Travel award**, St. Louis, Missouri, USA.

Other Awards:

- Long Service award at LKC Medicine-NTU
- **US Patent Awarded: Publication date- 2012-05-03**
Title of Invention: Coated-water soluble quantum dots for stem cells labeling

Inventors: S.T. Selvan, P. Padmanabhan, D. Janczewski, and Kishore K. Bhakoo

Patent ID Singapore: 201006; US Patent Number: 20120107800

Link: <http://www.faqs.org/patents/app/20120107800>

Recent publications:

1. Chang-Tong Yang, Krishna K. Ghosh, Parasuraman Padmanabhan, Oliver Langer, Jiang Liu, Christer Halldin and Balázs Gulyás (2018). PET-MR and SPECT-MR Multimodality Probes: Development and Challenges. *Theranostics*, 8 (22), 6211
2. Karthikeyan Narayanan, Parasuraman Padmanabhan, Balázs Gulyás, Andrew C. A. Wan and Vazhaikkurichi M. Rajendran (2018) Lineage-Specific Exosomes Override Extracellular Matrix Mediated Human Mesenchymal Stem Cell Differentiation. *Biomaterials*, 182:312-322. doi: 10.1016/j
3. Sahana Ramanathan, Govindaraju Archunan, Muthusamy Sivakumar, Subramanian Tamil Selvan, Sundramurthy Kumar, Balázs Gulyás, Parasuraman Padmanabhan* (2018). *Theranostics Applications of Nanoparticles in Neurodegenerative Disorders. International Journal of Nanomedicine* ; 13, 5561
4. Subramanian Muthukumar, Durairaj Rajesh, Ramu Muthu Selvam, Ganesan Saibaba, Mohammad Abdulkader Akbarsha, Parasuraman Padmanabhan*, Balázs Gulyás, Govindaraju Archunan. (2018). Buffalo nasal odorant-binding protein (bnOBP) and its structural evaluation. *Nat. Sci Rep.* 2018 Jun 19;8(1):9323. doi: 10.1038/s41598-018-27550-7
5. Rajamanickam R, Shanmugam A, Thangavel R, Devaraj S, Soundararajan K, Ponnirul P, Ramalingam R, Ganesan RV, Parasuraman P*, Govindaraju A (2018). Localization of α 2u-globulin in the acinar cells of preputial gland, and confirmation of its binding with farnesol, a putative pheromone, in field rat (*Millardiameltada*), *PLoS One*. 2018 Jun 1;13(6):e0197287. doi: 10.1371/journal.pone.0197287

Cumulative Impact factor: Nil

Total Citation: 2050

h- index: 25

i10- index: Nil

CURRICULUM VITAE

Name: Dinesh Kumar Srinivasan
Designation: Associate Professor
Co-chair, Integration Lead Educators
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Email: dineshkumar@nus.edu.sg



Educational qualification:

2010	Fellow	Cleveland Clinic Foundation, Cleveland, OH, USA
2008	PhD	National University of Singapore
2000	MS	National University of Singapore
1995	MBBS	Stanley Medical College, Madras, India

Professional experience:

- Associate Professor, Anatomy & Medical Education, National University of Singapore (2017 – Present)
- Lead for Anatomy, Co-Lead for Human Structure & Function, Nanyang Technological University (2012 – 2016)
- Assistant Professor, Nanyang Technological University (2012 – 2016)
- Faculty-in-Residence, Nanyang Technological University (2012 – 2016)
- Assistant Dean, Exams and Assessments (Phase 1), Nanyang Technological University (2012 – 2014)
- Senior Lecturer, Anatomy, National University of Singapore (2011-2011)
- Research Staff, Case Western Reserve Univ, Cleveland, OH, USA (2010 – 2010)
- Fellow, Cleveland Clinic Lerner Research Inst, Cleveland, OH, USA (2009 – 2010)
- Lecturer, Anatomy, National University of Singapore (2008 – 2009)
- Teaching Assistant, Anatomy, National University of Singapore (2003 – 2008)
- Clinical Fellow, CTVS, National University Hospitals Singapore (2001 – 2002)
- Research Assistant, Surgery, National University of Singapore (2000 – 2001)
- Research Scholar, National University Singapore (1998 – 2000)
- Medical Officer, St Isabel's Hospital, Chennai, India (1997 – 1997)
- House Officer, Government Stanley Hospitals, Chennai, India (1996 – 1996)

Honours and Awards:

- Excellence in Medical Research Award, iCiAsT, NTU, Singapore (2017)
- Long Service Award (10 Yrs.), Service to Education, MOE, Singapore (2015)
- Silver Award, SHBC Best Poster Award (BP) - Health Professions Education (2014)
- Silver Award, Singapore Young Investigator Award (YIA) - Basic Science/ Translational Research (2014)
- Favorite Faculty, LKCMedicine (2014)
- Reviewer Recognition Award, Singapore Medical Journal (2012)
- Pewter Award, Service to Education, MOE, Singapore (2011)
- Fellow, Cleveland Clinic Lerner Research Inst, Cleveland, OH, USA (2009 – 2010)

- AAA Postdoctoral Travel Award, New Orleans, USA (2009)
- Finalist, AAA Postdoctoral Poster Award, EB2009, USA (2009)
- Letter of Appreciation - Dean, YLLSoM, NUS (2008)
- Letter of Appreciation - Vice Dean (Edu), YLLSoM, NUS (2006)
- Travel Award, Japan Kazato Res Foundation & 8th APEM, Japan (2004)
- Letter of Appreciation from CEO, NUH, Singapore (2002)
- Travel Award, Microscopy Society Singapore (1998 & 2000)
- Graduate Research Scholarship, National University of Singapore (1998 – 2000)

Recent publications:

International refereed journals:

- Published/ Accepted	50
- Revised	03
Chapters	05
Magazine article	01
Edited book	01
Conference papers	45
Thesis	02
Total	107

Cumulative Impact factor: 120

Total Citation: 1639

h- index: 22

i10- index: 31

CURRICULUM VITAE

Name : Veikko Jousmäki
Designation : Senior scientist
Address : Aalto NeuroImaging
Department of Neuroscience and Biomedical Engineering Aalto
University, Espoo,00076 AALTO, Finland
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Educational qualification:

- Bachelor of Science (BSc) Nov 1986
- Master of Science (MSc) Jan 1993
- Doctor of Philosophy (PhD) Mar 2000
- Title of Docent (adjunct professor) in functional brain imaging Nov 2006

Professional experience:

- Visiting scientist (honorary) 2019– Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore
- Visiting professor (honorary) 2016–2019 Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore
- Guest professor 2015–2018 Department of Clinical Neuroscience, Karolinska Institutet, Stockholm, Sweden
- Certified Elekta MEG trainer, Elekta Oy, MEGIN 2016
- Director, Aalto NeuroImaging Research Infrastructure, Aalto University 2013–2014
- Technical director, MEG Core. Aalto University 2011
- Senior scientist, Helsinki University of Technology/Aalto University 1998–2010
- MEG consultant, Neuromag Oy/Elekta Neuromag Oy/Elekta Oy/MEGIN 2000

Honours and Awards:

- Brains (Back) to Brussels Post-doc fellowship 2008–2010 Hôpital Erasme, Bruxelles, Belgium
- Japan Society for Promotion of Science Short-term post-doc fellowship 2004–2005 National Rehabilitation Center, Tokorozawa, Japan
- Japan Foundation for Aging and Health Short-term post-doc fellowship 2004–2005 National Rehabilitation Center, Tokorozawa, Japan
- Runar Bäckström's Foundation grant 2003 Vibration stimulator for functional brain imaging
- Six innovation disclosures, one provisional application, and one patent cooperation treaty application

Recent publications:

1. Eriksson Hagberg E, Ackerley R, Lundqvist D, Schneiderman J, Jousmäki V, Wessberg J. Spatio-temporal profile of brain activity during gentle touch investigated with magnetoencephalography. *Neuroimage*. 2019 Jul 16;201:116024. PMID: 31323258.
2. Marty B, Naeije G, Bourguignon M, Wens V, Jousmäki V, Lynch DR, Gaetz W, Goldman S, Hari R, Pandolfo M, De Tiège X. Evidence for genetically determined degeneration of proprioceptive tracts in Friedreich ataxia. *Neurology*. 2019 Jul 9;93(2):e116-e124. PMID: 31197032.
3. Vinding MC, Tsitsi P, Piitulainen H, Waldthaler J, Jousmäki V, Ingvar M, Svenningsson P, Lundqvist D. Attenuated beta rebound to proprioceptive afferent feedback in Parkinson's disease.

Sci Rep. 2019 Feb 22;9(1):2604. PMID: 30796340.

4. Cortical Tracking of Speech-in-Noise Develops from Childhood to Adulthood.

5. Vander Ghinst M, Bourguignon M, Niesen M, Wens V, Hassid S, Choufani G, Jousmäki V, Hari R, Goldman S, De Tiège X.

Total Citation: 7622

h- index: 43

i10- index: 72

CURRICULUM VITAE

Name: Domokos Máthé

Designation: Senior Scientific Fellow

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Phone: +36 1 4591500 ext. 60210

Fax: +36 1 266 6656

Email: mathe.domokos@med.semmelweis-univ.hu



Educational qualification:

- 2010 PhD, Radiopharmacy in Veterinary Medicine, Szent István University, Budapest Hungary
- 2009 European Radiopharmacy Certificate, EANM, Vienna, Austria
- 2000 DVM, Szent István University Faculty of Veterinary Medicine, Budapest Hungary

Professional experience:

- 2016- Lecturer, Senior Scientific Fellow, Department of Biophysics and Radiation Biology, Faculty of Medicine, Semmelweis University Budapest Hungary
- 2010- CEO, CROmed Translational Research Centers Ltd Budapest, Hungary
- 2008 Invited Expert of the IAEA at Centro de Desenvolvimento de Tecnologia Nuclear, Belo Horizonte, MG, Brazil
- 2007 Invited Expert at IAEA HQ, Vienna, Austria
- 2003 Postdoctorate Fellow, Center for Molecular Imaging Research, Mass. General Hospital/Harvard University, Cambridge, MA, USA

Recent publications:

- Veres DS, Mathe D, Hegedűs N, Horváth I, Kiss FJ, Taba G, Tóth-Bodrogi E, Kovács T, Szigeti K. Radiomic detection of microscopic tumorous lesions in liver SPECT imaging
EUR J NUCL MED MOL IMAGING RESEARCH, 2019 In Press
- Cooper CE, Silkstone GGA, Simons M, Rajagopal B, Syrett N, Shaik T, Gretton S, Welbourn E, Bülow L, Eriksson NL, Ronda L, Mozzarelli A, Eke A, Mathe D, Reeder BJ. Engineering tyrosine residues into hemoglobin enhances heme reduction, decreases oxidative stress and increases vascular retention of a hemoglobin based blood substitute.
FREE RADIC BIOL MED. 2018 Dec 27;134:106-118.
- Szöllősi D, Hegedűs N, Veres DS, Futó I, Horváth I, Kovács N, Martinecz B, Dénes Á, Seifert D, Bergmann R, Lebeda O, Varga Z, Kaleta Z, Szigeti K, Máthé D. Evaluation of Brain Nuclear Medicine Imaging Tracers in a Murine Model of Sepsis-Associated Encephalopathy. MOL IMAGING BIOL 2018 Dec;20(6):952-962.
- David T, Hlinová V, Kubiček V, Bergmann R, Striese F, Berndt N, Szöllősi D, Kovács T, Máthé D, Bachmann M, Pietzsch HJ, Hermann P. Improved Conjugation, ⁶⁴Cu Radiolabeling, in Vivo Stability, and Imaging Using Nonprotected Bifunctional Macrocyclic Ligands: Bis(Phosphinate) Cyclam (BPC) Chelators. J MED CHEM 2018 Oct 11;61(19):8774-8796.

- Nagy CT, Koncsos G, Varga ZV, Baranyai T, Tuza S, Kassai F, Ernyey AJ, Gyertyán I, Király K, Oláh A, Radovits T, Merkely B, Bukosza N, Szénási G, Hamar P, Mathé D, Szigeti K, Pelyhe C, Jelemenský M, Onódi Z, Helyes Z, Schulz R, Giricz Z, Ferdinandy P. Selegiline reduces adiposity induced by high-fat, high-sucrose diet in male rats. *BRIT JPHARM* 2018 Sep;175(18):3713-3726.

Cumulative Impact factor: 130.11

Total Citation: 802

i10- index: 24



**CURRICULUM
VITAE**

NAME : Dr. N. KABILAN, MD (S), Ph.D.,
DESIGNATION : PROFESSOR & HEAD
DATE OF BIRTH & AGE : 06.06.1971 & 47 YEARS
OFFICE ADDRESS : DEPARTMENT OF
SIDDHA,
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EDUCATIONAL QUALIFICATION:

DEGREE	YEAR OF PASSING	INSTITUTION	UNIVERSITY
PhD	2016	Dept. of Siddha, The Tamil Nadu Dr. M.G.R. Medical University	The Tamil Nadu Dr. M.G.R. Medical University
MD (Siddha)	1999	Government Siddha Medical College, Palayamcottai	
BSMS	1993		

PROFESSIONAL EXPERIENCE:

PERIOD	DESIGNATION	INSTITUTION / UNIVERSITY
11.12.2015 to till date	Professor & Head	The Tamil Nadu Dr. M.G.R. Medical University, Chennai-600 032
01.06.2011 to 10.12.2015	Associate Professor & HOD	
30.03.2010 to 31.05.2011	Professor & HOD	

27.02.2009 to 16.02.2010	Reader	Sri Sai Ram Siddha Medical College & Research Centre, Chennai-600 044
02.05.2005 to 26.02.2009	Professor & HOD	
20.11.2003 to 01.05.2005	Reader	
16.10.2001 to 19.11.2003	Lecturer	

HONOURS AND AWARDS:

- 'BEST EMPLOYEE AWARD- 2011' -The Tamil Nadu Dr. M.G.R. Medical University.

RECENT PUBLICATIONS:

1. **N. Kabilan**, S. Tamil Selvi and N. Senthamarai Selvi, “Anti-hyperglycemic activity of the herbo-mineral Siddha preparation in alloxan induced diabetic rats”- J. Nat. Prod. Plant Resour., 2013, 3 (2):42-47 (<http://scholarsresearchlibrary.com/archive.html>)
2. **N. Kabilan** and M. Murugesan, “Toxicological profiling of traditional Siddha formulation Pooraparvam in rodents: A comparative evaluation between natural and synthetic Pooraparvam”- Der Pharmacia Lettre, 2016, 8 (2):110-130 (<http://scholarsresearchlibrary.com/archive.html>)
3. **N. Kabilan** and M. Murugesan, “In vivo Evaluation of Analgesic, Antipyretic and Anti-inflammatory potential of Siddha Formulation Natural and Synthetic Pooraparvam in selective Rodent Model” - Journal of Chemical and Pharmaceutical Research, 2016, 8(4):643-656
4. **N. Kabilan** and M. Murugesan, “ Hepatoprotective activity of Natural and Synthetic Pooraparvam against Carbon Tetrachloride induced Hepatotoxicity in Wistar Rats” - World Journal of Pharmacy and Pharmaceutical Sciences Volume 5, Issue 8, 1822-1831 SJIF Impact Factor 6.041
5. **N. Kabilan** and M. Murugesan, “ Anti-Ulcerogenic Potential of Natural and Synthetic Pooraparvam against Indomethacin induced Gastric Ulcer in Wistar Rats” - World Journal of Pharmacy and Pharmaceutical Sciences Volume 5, Issue 12, 905- 916. SJIF Impact Factor 6.041

TOTAL CITATION: 5

H- INDEX: 2

I10- INDEX: Nil

CURRICULUM VITAE

Name: **DR.M.KUMARAVEL**
Designation: General Manager
Address:Tablets(India)Limited,
Jhaver centre 4th Floor
72, Marshalls Road,
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Chennai 600008.
Phone:044 42050000
Email: -mk@tabletsindia.com



Educational qualification:

S. No.	Degree	Subject	University/ Institute	Percentage/ Class/Grade	Year of Passing
1.	B. Sc.	Botany	Madura college Madurai kamaraj university	First Class	1986
2.	M. Sc.	Botany	Madura college Madurai Kamaraj University	First Class	1988
3.	Ph.D	Botany Pharmacology and Environmental Toxicology	University of Madras	-	1998

Professional experience:

- a) worked as a scientist in M/S.Velvette international Pharma, Chennai from February 1997 to June 1998.
- b)Worked as a Senior scientist in M/S.NESSO Pvt . Limited, Mysore from June 1998 toMarch 2001
- c). Working as a General Manager – Herbal Research in M/S.Tablets(India)Limited from April 2001 to Till date.

Recent publications:

- Pharmacological studies of active principles isolated from Coleus aromaticus benth.M.Kumaravel,R.Dhananjayan, V.Arul.(2003). Biomedicne.
- Effect of herbal dietary supplementation, MFA on feeding, feed binding and prevention of gut infection during the grow out tenure in semi-intensive farming of Pacific white leg shrimp. Edward gnana jothi George, Godfred Ponraj Jeyaraj, Kumaravel Muthukamatchi, Veera Ravi Arumugham(2018)
manuscript number: JKAU-MARSCI-D-18-00027

Cumulative Impact factor: -

Total Citation: -

h- index: -

i10- index: -

CURRICULUM VITAE

Name: Dr. P. Rameshthangam
Designation: Assistant Professor
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Email: rameshthangam@alagappauniversity.ac.in



EDUCATIONAL QUALIFICATION: M.Sc., Ph.D

PROFESSIONAL EXPERIENCE: 11 years 7 months

HONOURS AND AWARDS:

- **INSA VISITING SCIENTIST** awarded by Indian National Science Academy, New Delhi, 2018.
- **FELLOW OF ACADEMY OF SCIENCES** awarded by The Academy of Sciences, Chennai, 2018
- **Dr. APJ ABDUL KALAM AWARD FOR SCIENTIFIC EXCELLENCE** awarded by MARINA LABS, Research and Development, Chennai, 2018.
- **HAR GOBIND KHORANA BEST YOUNG SCIENTIST AWARD** awarded by Tamilnadu Scientific Research Organization, Tamilnadu, 2018.

RECENT PUBLICATIONS:

1. D. Solairaj, **P. Rameshthangam**, V. Suryanarayanan, S. K. Singh, V. Sri Ramkumar (2018), “*In vitro* and *in silico* studies of chitin and chitosan based nanocarriers for curcumin and insulin delivery” *Journal of Polymers and the Environment*, 26(10): 4095-4113. [Springer, United States] (**IF-2.765**)
2. **P. Rameshthangam**, J. P. Chitra, (2018), “Synergistic anticancer effect of green synthesized nickel nanoparticles and quercetin extracted from *Ocimum sanctum* leaf extract” *Journal of Materials Science & Technology* 34(3):508-522 [DOI: 10.1016/j.jmst.2017.01.004] [Elsevier, Netherlands] (**IF-5.040**)
3. J. P. Chitra and **P. Rameshthangam**, B. Usha, (2017), “Green synthesized nickel nanoparticles for targeted detection and killing of *S. typhimurium*” *Journal of Photochemistry and Photobiology B: Biology* 174:58-69 [Elsevier, Netherlands] (**IF- 4.067**).
4. D. Solairaj, **P. Rameshthangam**, A. Gnanapragasam, (2017), “Anticancer effect of chitin encapsulated silver and copper nanocomposites against breast cancer (MCF-7) cells” *International Journal of Biological Macromolecules* 105(1):608-619 [Elsevier, Netherlands] (**IF-4.784**).
5. D. Solairaj, **P.Rameshthangam**, P. Muthukumaran and J. Wilson, (2017), “Studies on electrochemical glucose sensing, antimicrobial activity and cytotoxicity of fabricated copper nanoparticle immobilized chitin nanostructure” *International Journal of Biological Macromolecules* 101:668-679 [Elsevier, Netherlands] (**IF-4.784**)
6. D. Solairaj, **P.Rameshthangam**, (2017), “Silver nanoparticle embedded α -chitin nanocomposite for enhanced antimicrobial and mosquito larvicidal activity” *Journal of Polymers and the Environment* 25(2): 435–452 [Springer, United States] (**IF-2.765**).
7. P. Muthukumaran, Chikkili Venkateswara Raju, C. Sumathi, S. Ravi, D. Solairaj, **P. Rameshthangam**, J. Wilson, Subbiah Alwarappan, Sathish Rajendran, (2016), “Cerium doped nickel-oxide nanostructures for riboflavin biosensing and antibacterial applications” *New Journal of Chemistry* 40:2741-2748 [Royal Society of Chemistry, United Kingdom] (**IF-3.069**).
8. D. Solairaj, **P.Rameshthangam**, P. Srinivasan, (2016), “Adsorption of Methylene Blue, Bromophenol Blue and Coomassie Brilliant Blue by α -chitin nanoparticles” *Journal of Advanced Research* 7(1):113–124 [Elsevier, Netherlands](**IF-5.045**).
9. J. P. Chitra, **P. Rameshthangam**, D. Solairaj, (2015), “Green synthesis of nickel nanoparticles using *Ocimum sanctum* and their application in dye and pollutant adsorption” *Chinese Journal of Chemical Engineering* 23(8):1307-1315 [Elsevier, Netherlands] (**IF- 1.911**).

Cumulative Impact Factor: 51.34, Total Citation: 375, h- Index: 11,i10- Index: 11

CURRICULUM VITAE



Name: Dr.R.Aanandhi

Designation: Assistant Professor cum Medical Officer

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Email: anandhi2087@gmail.com

Educational qualification:

Academic Qualifications					
Examinations	Subject	Nae of the Board / University	Year of Passing	Percentag e of marks obtained	Division/Class/ Grade
High School/ Matric.		Tamil nadu matric board, Kamala Subramaniam Matriculation School, Thanjavur	2001-2002	75.8%	I
Intermediate/ PUC		State board VidyaVikas higher secondary school, tiruchengode	2003-2004	77.9%	I
M.B.B.S	Medicine & Surgery	Mahatma Gandhi Medical College & Research Institute, Pondicherry	2004-2008	67.1%	I
C.R.R.I (Complete Rotatory Residential Internship)		Mahatma Gandhi Medical College & Research Institute, Pondicherry	Jan 2009-Dec 2009		
Trained for Basic Life support(BLS)		Mahatma Gandhi Medical College & Research Institute, Pondicherry	2009		

Professional experience:

Period of teaching experience: UG teaching (in years):7

PG teaching (in years):7

Honours and Awards:Nil

Recent publications:

<i>Title of the Article</i>	<i>Author</i>	<i>Name of the Programme</i>	<i>Organiser</i>	<i>Date</i>
International				
Basic first aid, shoulder and elbow injuries	Dr.R.Aanandhi	International conference on health indicators for physical and cognitive fitness education	Faculty of education, Alagappa University, Karaikudi	26 th &27 th Feb 2016
Fitness effects on cognitive function of older adults	Dr.R.Aanandhi	International conference on health indicators for physical and cognitive fitness education	Faculty of education, Alagappa University, Karaikudi	26 th &27 th Feb 2016
Physical activity and health related physical fitness in adolescence	Dr.R.Aanandhi	International conference on health indicators for physical and cognitive fitness education	Faculty of education, Alagappa University, Karaikudi	26 th &27 th Feb 2016
Specificity of treatment of sports injuries in children and adolescents	Dr.R.Aanandhi	International conference on emerging trends in Sports medicine, physical education, sports science and yoga	TamilNadu Physical education and Sports University, Chennai	18 & 19 th Jan 2017
Positive and negative effects of caffeine on athletic performance	Dr.R.Aanandhi	International Conference on Emerging Trends in Sports Medicine, Physical Education, Sports Science and Yoga	Tamil Nadu Physical Education and Sports University, Chennai	18 th to 19 th January 2017
Sports physiology and its effect on Athletic Performance	Dr.R.Aanandhi	International Conference on Sports Vision and Mission for grooming Athletes and Paraathletes for Olympics 2020	AUCPE	16 th &17 th March 2018

Cumulative Impact factor: -

Total Citation: -

h- index:-

i10- index: -