



# MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC, NBA & Affiliated to Anna University)  
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

## Curriculum/Syllabus

**Programme Code : MD**

**Programme Name : B.E-Medical Electronics**

**Regulation : R-2019**



# MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, Accredited by NAAC & NBA, Affiliated to Anna University)

Rasipuram - 637 408, Namakkal Dt, Tamil Nadu.

Ph. No.: 04287-220837

Email: [principal@mec.edu.in](mailto:principal@mec.edu.in).



# MUTHAYAMMAL ENGINEERING COLLEGE

**(An Autonomous Institution)**

(Approved by AICTE, New Delhi, Accredited by NAAC, NBA & Affiliated to Anna University)  
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

## INSTITUTION VISION & MISSION

### **INSTITUTION VISION**

To be a Centre of Excellence in Engineering, Technology and Management on par with International Standards.

### **INSTITUTION MISSION**

- To prepare the students with high professional skills and ethical values
- To impart knowledge through best practices
- To instill a spirit of innovation through Training, Research and Development
- To undertake continuous assessment and remedial measures
- To achieve academic excellence through intellectual, emotional and social stimulation

### **INSTITUTION MOTTO**

Rural upliftment through Technical Education.



# MUTHAYAMMAL ENGINEERING COLLEGE

**(An Autonomous Institution)**

(Approved by AICTE, New Delhi, Accredited by NAAC, NBA & Affiliated to Anna University)  
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

## **DEPARTMENT VISION & MISSION**

### **DEPARTMENT VISION**

To prepare the students with Engineering and Medical knowledge in developing various supporting systems using various technologies for healthcare applications

### **DEPARTMENT MISSION**

- To establish a unique learning environment for the students to face the challenges in Medical field.
- To enhance inter and intra personal skills among students to make them employable and entrepreneur.
- To transform the students into professionally competent engineers through innovative, training, Internship and collaboration with industry and hospital.



# MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC, NBA & Affiliated to Anna University)  
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu.

## DEPARTMENT PROGRAM EDUCATIONAL OBJECTIVES, PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES

### PROGRAM EDUCATIONAL OBJECTIVES

The Medical Electronics Graduates should be able to

**PEO1:** Graduate should be able to prepare themselves with strong foundation in Engineering, Science and Technology for a successful career in Medical Electronics field.

**PEO2:** To identify opportunities and develop the level of competency in technical and communication skills to establish their excellence in professionalism.

**PEO3:** To provide ethical and value based education for addressing the society needs.

### PROGRAM OUTCOMES

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
3. **Design/Development solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Lifelong learning:** Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

#### **PROGRAM SPECIFIC OUTCOMES**

**PSO1:** Apply the acquired knowledge in the development and test creative solutions for Medical applications.

**PSO2:** Demonstrate proficiency in ICT and software skills for innovations and solving challenges in health sector.

**PSO3:** Recognize the importance of ethics, Entrepreneurship and Management skills for Indian Industrial needs.



# MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)

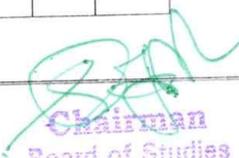
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu

## B.E. MEDICAL ELECTRONICS

### GROUPING OF COURSES

#### FOUNDATION COURSE [FC]

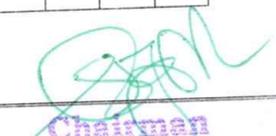
S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	19HSS01	Business English	HS	3	2	0	0	2
2.	19HSS02	English Communicative Skill Laboratory	HS	2	0	0	2	1
3.	19HSS03	Life Skills and Workplace Psychology	HS	3	2	0	0	2
4.	19HSS04	Technical English For Engineers	HS	3	2	0	0	2
5.	19HSS05	Communicative English for Engineers	HS	3	2	0	0	2
6.	19HSS08	Professional Ethics and Human Values	HS	3	3	0	0	3
7.	19BSS01	Engineering Physics	BS	4	3	0	0	3
8.	19BSS02	Physics and Chemistry Laboratory	BS	2	0	0	2	1
9.	19BSS03	Bio and Nanomaterials Sciences	BS	4	3	0	0	3
10.	19BSS11	Engineering Chemistry	BS	4	3	0	0	3
11.	19BSS12	Environmental Science and Engineering	BS	4	3	0	0	3
12.	19BSS21	Algebra and Calculus	BS	5	3	1	0	4
13.	19BSS22	Differential Equations and Vector Analysis	BS	5	3	1	0	4
14.	19BSS23	Transform and Partial Differential Equations	BS	5	3	1	0	4
15.	19BSS27	Probability and Random Processes	BS	5	3	1	0	4
16.	19GES02	Programming for Problem Solving Technique	GES	3	3	0	0	3
17.	19GES03	Programming in C Laboratory	GES	3	0	0	3	1
18.	19GES06	Mechanical and Building Sciences	GES	3	3	0	0	3
19.	19GES09	Programming in Python Laboratory	GES	3	0	0	3	1
20.	19GES10	Soft Skills Laboratory	GES	3	0	0	3	1
21.	19GES11	Electronic Devices	GES	3	3	0	0	3
22.	19GES12	Electronic Simulation	GES	3	0	0	3	1

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist. 637 408.

23.	19GES19	Concepts in Product Design	GES	3	3	0	0	3
24.	19GES20	Renewable Energy Sources	GES	3	3	0	0	3

**PROFESSIONAL CORE [PC]**

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			
					L	T	P	C
1.	19MDC01	Human Anatomy & Physiology	PC	3	3	0	0	3
2.	19MDC02	Biomedical sensors & Measurement Devices	PC	3	3	0	0	3
3.	19MDC03	Bio Signals & Systems	PC	4	4	0	0	4
4.	19MDC04	Logic Circuits for Clinical Engineers	PC	3	3	0	0	3
5.	19MDC05	Control system for Physiology Systems	PC	3	3	0	0	3
6.	19MDC06	Biomaterials and Artificial Organs	PC	3	3	0	0	3
7.	19MDC07	Pathology and Microbiology	PC	3	3	0	0	3
8.	19MDC08	Microprocessor and Microcontroller in medicine	PC	3	3	0	0	3
9.	19MDC09	Biomechanics and Rehabilitation Engineering	PC	4	4	0	0	4
10.	19MDC10	Biomedical Instrumentation	PC	3	3	0	0	3
11.	19MDC11	Hospital Management	PC	3	3	0	0	3
12.	19MDC12	Medical Expert Systems	PC	3	3	0	0	3
13.	19MDC13	Therapeutic Equipments	PC	3	3	0	0	3
14.	19MDC14	Orthotic & Prosthetic Equipments	PC	3	3	0	0	3
15.	19MDC15	Electrical Safety and Quality Assurance	PC	3	3	0	0	3
16.	19MDC16	Principles of Radiological Equipments	PC	3	3	0	0	3
17.	19MDC17	Medical Signal Processing	PC	3	3	0	0	3
18.	19MDC18	Digital Electronics	PC	3	3	0	0	3
19.	19MDC19	Logic Circuits for Clinical Laboratory	PC	2	0	0	2	1
20.	19MDC20	Medical Signal Processing Laboratory	PC	2	0	0	2	1
21.	19MDC21	Medical Expert systems Laboratory	PC	2	0	0	2	1
22.	19MDC22	Pathology and Microbiology Laboratory	PC	2	0	0	2	1
23.	19MDC23	Biomedical sensors & Measurement Laboratory	PC	2	0	0	2	1
24.	19MDC24	Medical Image Processing Laboratory	PC	2	0	0	2	1
25.	19MDC25	Analog Electronics	PC	4	4	0	0	4
26.	19MDC26	Analog Electronics Laboratory	PC	2	0	0	2	1
27.	19MDC27	Microprocessor and Microcontroller Laboratory	PC	2	0	0	2	1

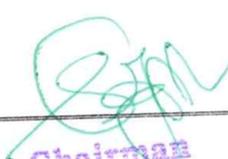
  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 403.

**PROFESSIONAL ELECTIVES [PE]**

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.	19MDE01	Advanced Bio Analytical and Therapeutic Techniques	PE	3	3	0	0	3
2.	19MDE02	Tissue Engineering	PE	3	3	0	0	3
3.	19MDE03	Medical Science	PE	3	3	0	0	3
4.	19MDE04	Biomaterials and Characterization	PE	3	3	0	0	3
5.	19MDE05	Physiological Modeling	PE	3	3	0	0	3
6.	19MDE06	Brain Computer Interface and Applications	PE	3	3	0	0	3
7.	19MDE07	Medical Optics	PE	3	3	0	0	3
8.	19MDE08	Soft Computing	PE	3	3	0	0	3
9.	19MDE09	Virtual Reality	PE	3	3	0	0	3
10.	19MDE10	Wearable Systems	PE	3	3	0	0	3
11.	19MDE11	Internet of Things	PE	3	3	0	0	3
12.	19MDE12	Hospital Waste Management	PE	3	3	0	0	3
13.	19MDE13	Tele health Technology	PE	3	3	0	0	3
14.	19MDE14	Fiber optics and Lasers in Medicine	PE	3	3	0	0	3

**OPEN ELECTIVES [OE]**

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1.		Analytical Instrumentation	OE	3	3	0	0	3
2.		Power Plant Engineering	OE	3	3	0	0	3
3.		Principles of Food Preservation	OE	3	3	0	0	3
4.		Fundamentals of Nutrition	OE	3	3	0	0	3
5.		Air Pollution and Management	OE	3	3	0	0	3
6.		Industrial Waste Management	OE	3	3	0	0	3
7.		Regulatory requirements in Pharmaceutical Industries	OE	3	3	0	0	3
8.		Municipal Solid Waste Management	OE	3	3	0	0	3
9.		Internet and JAVA Programming	OE	3	3	0	0	3
10.		Neural Engineering	OE	3	3	0	0	3
11.		Medical Physics	OE	3	3	0	0	3

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

**EMPLOYABILITY ENHANCEMENT COURSES (EEC)**

S. No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/Week			C
					L	T	P	
1	19MDP1	Project Work Phase - I	EEC	10	0	0	10	3
2	19MDP2	Project Work Phase -II	EEC	18	0	0	18	9
3	19MMP1	Mini Project/Electronic Design workshop	EEC	4	3	0	4	2
4	19MHT1	Hospital Training	EEC	3	0	0	3	2

**Mandatory Course (MC)**

S.No.	Course Code	Course Title	Category	Contact Hours	Instruction Hours/week			Credit
					L	T	P	
1.	19MDH01	Organizational Behavior	MC	3	3	0	0	0
2.	19MDH02	India Constitution (Common to All Branches)	MC	3	3	0	0	0
3.	19MDH03	Essence of Indian Traditional Knowledge	MC	3	3	0	0	0



**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

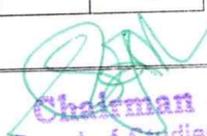
		<b>MUTHAYAMMAL ENGINEERING COLLEGE (Autonomous)</b> (Approved by AICTE & Affiliated to Anna University), RASIPURAM – 637 408				<b>CURRICULUM</b> UG R – 2019	
Department		Medical Electronics					
Programme		B.E.					
<b>SEMESTER – I</b>							
Sl. No.	Course Code	Course Name	Hours/ Week			Credit C	Contact Hours
			L	T	P		
<b>THEORY</b>							
1.	19HSS01	Business English	2	0	0	2	2
2.	19BSS21	Algebra and Calculus	3	1	0	4	4
3.	19BSS01	Engineering Physics	3	0	0	3	3
4.	19BSS11	Engineering Chemistry	3	0	0	3	3
5.	19GES02	Programming for Problem Solving Technique	3	0	0	3	3
6.	19GES06	Mechanical and Building Sciences	3	0	0	3	3
<b>PRACTICALS</b>							
7.	19BSS02	Physics and Chemistry Laboratory	0	0	2	1	2
8.	19GES03	Programming in C Laboratory	0	0	3	1	3
9.	19HSS02	Communicative English Laboratory	0	0	2	1	2
<b>Total Credits</b>						<b>21</b>	

		<b>MUTHAYAMMAL ENGINEERING COLLEGE (Autonomous)</b> (Approved by AICTE & Affiliated to Anna University), RASIPURAM – 637 408				<b>CURRICULUM</b> UG R – 2019	
Department		Medical Electronics					
Programme		B.E.					
<b>SEMESTER – II</b>							
Sl. No.	Course Code	Course Name	Hours/ Week			Credit C	Contact Hours
			L	T	P		
<b>THEORY</b>							
1.	19HSS03	Life Skill Psychology and Ethics	2	0	0	2	2
2.	19BSS22	Differential Equations and Vector Analysis	3	1	0	4	4
3.	19BSS03	Bio and Nano-materials Sciences	3	0	0	3	3
4.	19BSS12	Environmental Science and Engineering	3	0	0	3	3
5.	19GES19	Concepts in Product Design	3	0	0	3	3
6.	19GES11	Electronic Devices	3	0	0	3	3
<b>PRACTICALS</b>							
7.	19GES12	Electronic Simulation Laboratory	0	0	3	1	3
8.	19GES09	Programming in Python Laboratory	0	0	3	1	3
<b>Total Credits</b>						<b>20</b>	

  
 Chairman  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408

		<b>MUTHAYAMMAL ENGINEERING COLLEGE (Autonomous)</b> (Approved by AICTE & Affiliated to Anna University), RASIPURAM – 637 408				<b>CURRICULUM</b> M UG R – 2019	
Department		Medical Electronics					
Programme		B.E.					
<b>SEMESTER – III</b>							
Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P		
<b>THEORY</b>							
1.	19MDC01	Human Anatomy & Physiology	3	0	0	3	3
2.	19MDC03	Bio Signals & Systems	3	1	0	4	4
3.	19MDC04	Logic Circuits for Clinical Engineers	3	0	0	3	3
4.	19BSS23	Transforms & Partial Differential Equations	3	1	0	4	4
5.	19MDC25	Analog Electronics	3	1	0	4	4
6.	19GES20	Renewable Energy Sources	3	0	0	3	3
	19HSS08	Professional Ethics and Human Values	3	0	0	3	3
<b>PRACTICALS</b>							
	19MDC19	Logic Circuits for Clinical Laboratory	0	0	2	1	2
	19MDC26	Analog Electronics Laboratory	0	0	2	1	2
<b>Total Credits</b>						<b>26</b>	

		<b>MUTHAYAMMAL ENGINEERING COLLEGE (Autonomous)</b> (Approved by AICTE & Affiliated to Anna University), RASIPURAM – 637 408				<b>CURRICULUM</b> UM UG R – 2019	
Department		Medical Electronics					
Programme		B.E.					
<b>SEMESTER – IV</b>							
Sl. No.	Course Code	Course Name	Hours/week			Credit	Contact Hours
			L	T	P		
<b>THEORY</b>							
1.	19BSS27	Probability and Random Process	3	1	0	4	4
2.	19MDC07	Pathology and Microbiology	3	0	0	3	3
3.	19MDC08	Microprocessor and Microcontroller in Medicine	3	0	0	3	3
4.	19MDC09	Biomechanics and Rehabilitation Engineering	3	1	0	4	4
5.	19MDC02	Biomedical sensors & Measurement Devices	3	0	0	3	3
6.	19MDC18	Digital Electronics	3	0	0	3	3
<b>PRACTICALS</b>							
7.	19MDC22	Pathology and Microbiology Laboratory	0	0	2	1	2
8.	19MDC23	Biomedical sensors & Measurement	0	0	2	1	2

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

		Laboratory					
9.	19MDC27	Microprocessor and Microcontroller Laboratory	0	0	2	1	2
<b>Total Credits</b>						<b>23</b>	

		<b>MUTHAYAMMAL ENGINEERING COLLEGE (Autonomous)</b> (Approved by AICTE & Affiliated to Anna University), RASIPURAM – 637 408				<b>CURRICULUM</b> UG R – 2019	
Department		Medical Electronics					
Programme		B.E.					
<b>SEMESTER – V</b>							
Sl. No.	Course Code	Course Name	Hours/ Week			Credit C	Contact Hours
			L	T	P		
<b>THEORY</b>							
1.	19MDEXX	Program Elective – 1	3	0	0	3	3
2.	19MDC05	Control System for Physiological Systems	3	0	0	3	3
3.	19MDC11	Hospital Management	3	0	0	3	3
4.	19MDC12	Medical Expert Systems	3	0	0	3	3
5.	19MDC17	Medical Signal Processing	3	0	0	3	3
6.		Open Elective I	3	0	0	3	3
<b>PRACTICALS</b>							
7.	19MDC21	Medical Expert Systems Laboratory	0	0	3	1	2
8.	19MDC20	Medical Signal Processing Laboratory	0	0	3	1	2
<b>Total Credits</b>						<b>20</b>	

		<b>MUTHAYAMMAL ENGINEERING COLLEGE (Autonomous)</b> (Approved by AICTE & Affiliated to Anna University), RASIPURAM – 637 408				<b>CURRICULUM</b> UG R – 2019	
Department		Medical Electronics					
Programme		B.E.					
<b>SEMESTER – VI</b>							
Sl. No.	Course Code	Course Name	Hours/ Week			Credit C	Contact Hours
			L	T	P		
<b>THEORY</b>							
1.	19MDC06	Biomaterials and Artificial Organs	3	0	0	3	3
2.	19MDC13	Therapeutic Equipments	3	0	0	3	3
3.	19MDC14	Orthotic & Prosthetic Equipments	3	0	0	3	3
4.	19MDC10	Biomedical Instrumentation	3	0	0	3	3
5.	19MDC16	Principles of Radiological Equipments	3	0	0	3	3
6.	19MDEXX	Program Elective - II	3	0	0	3	3
<b>PRACTICALS</b>							

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Tirunelveli Dist - 637 408

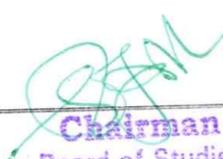
Programme Code & Name: MD & B.E.-Medical Electronics

19MDC24	Medical Image Processing Laboratory	0	0	2	1	2
19MMP1	Mini Project/Electronic Design workshop	0	0	2	1	2
<b>Total Credits</b>					<b>20</b>	

		<b>MUTHAYAMMAL ENGINEERING COLLEGE (Autonomous)</b> (Approved by AICTE & Affiliated to Anna University), RASIPURAM – 637 408				<b>CURRICULUM</b> UG R – 2019	
Department		Medical Electronics					
Programme		B.E.					
<b>SEMESTER – VII</b>							
Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P		
<b>THEORY</b>							
1.	19MDC15	Electrical Safety and Quality Assurance	3	0	0	3	3
2.	19MDEXX	Program Elective - III	3	0	0	3	3
3.	19MDEXX	Program Elective - IV	3	0	0	3	3
4.		Open Elective II	3	0	0	3	3
5.		Open Elective III	3	0	0	3	3
<b>PRACTICALS</b>							
6.	19MDS1	Project Stage-I	0	0	6	3	6
7.	19MDS4	Hospital Training	0	0	4	2	4
8.	19GES10	Soft Skills Laboratory	0	0	2	1	2
<b>Total Credits</b>					<b>21</b>		

		<b>MUTHAYAMMAL ENGINEERING COLLEGE (Autonomous)</b> (Approved by AICTE & Affiliated to Anna University), RASIPURAM – 637 408				<b>CURRICULUM</b> UG R – 2019	
Department		Medical Electronics					
Programme		B.E.					
<b>SEMESTER – VIII</b>							
Sl. No.	Course Code	Course Name	Hours/ Week			Credit	Contact Hours
			L	T	P		
<b>PRACTICAL</b>							
1.	19MDS2	Project Work Phase II	0	0	18	9	18
<b>Total Credits</b>					<b>9</b>		

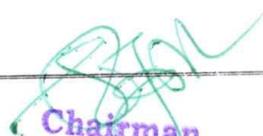
Total Credits to Be Earned For the Award of Degree: 160

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

**COURSE COMPONENT SUMMARY**

S. No.	Subject Area	Credits Per Semester								Credits Total	AICTE Credits
		I	II	III	IV	V	VI	VII	VIII		
1	FC	21	20	10	4			1		56	66
2	PC			16	19	14	16	3		68	55
3	PE					3	3	6		12	12
4	OE					3		6		9	12
5	EEC						1	5	9	15	15
<b>TOTAL</b>		<b>21</b>	<b>20</b>	<b>26</b>	<b>23</b>	<b>20</b>	<b>20</b>	<b>21</b>	<b>15</b>	<b>160</b>	<b>160</b>

Total Credits: 160

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Resipuram, Namakkal Dist - 637 408.

19MDC01

**ANATOMY AND HUMAN PHYSIOLOGY**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

1. Know basic structural and functional elements of human body.
2. Learn organs and structures involving in system formation and functions.
3. Understand circulatory system.
4. Learn urinary and special sensory system
5. Study about nervous system

**COURSE OUTCOMES**

1. To Know basic structural and functional elements of human body.
2. To Learn organs and structures involving in system formation and functions.
3. To Understand circulatory system.
4. To Learn urinary and special sensory system
5. To Study about nervous system

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC01.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDC01.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC01.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC01.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC01.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

**UNIT I**

**BASIC ELEMENTS OF HUMAN BODY**

9

Cell: Structure and organelles - Functions of each component in the cell. Cell membrane – transport across membrane – origin of cell membrane potential – Action potential Tissue: Types – Specialized tissues – functions, Types of glands.

**UNIT II**

**SKELETAL SYSTEM**

9

Bone, Types of bone, structure, bone cells, functions of bone. Axial skeleton- skull, sinuses, Fontanelles, vertebral column- characteristics of typical vertebra, different parts of vertebral column (parts only), features of vertebral column, movements and functions of vertebral column, sternum, ribs, shoulder girdle and upper limb, pelvic girdle and lower limb

**UNIT III**

**CIRCULATORY SYSTEM**

9

Blood composition - functions of blood – functions of RBC. WBC types and their functions Blood groups – importance of blood groups – identification of blood groups. Blood vessels - Structure of heart – Properties of Cardiac muscle – Conducting system of heart – Cardiac cycle – ECG - Heart sound - Volume and pressure changes and regulation of heart rate –Coronary Circulation. Factors regulating Blood flow.

**UNIT IV**

**URINARY AND NERVOUS SYSTEM**

9

Urinary system: Structure of Kidney and Nephron. Mechanism of Urine formation and acid base regulation – Urinary reflex – Homeostasis and blood pressure regulation by urinary system. -Structure of a Neuron – Types of Neuron. Synapses and types. Conduction of action potential in neuron Brain – Divisions of brain lobes - Cortical localizations and functions - EEG. Spinal cord – Tracts of spinal cord - Reflex mechanism – Types of reflex. Autonomic nervous system and its functions.

**UNIT V**

**MUSCLES AND JOINTS**

9

Muscle tissue:Skeletal muscle, Smooth muscle, Cardiac muscle, functions of muscle tissue, muscle tone and fatigue. Types of joint- Fibrous, Cartilaginous, Synovial, characteristics of synovial joints, shoulder joint, elbow joint, radioulnar joint, wrist joint, joints of hands and fingers, Hip joint, Knee joint, ankle joint, joints of foot and toes.

  
**Chairman**  
**Board of Studies**  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Elaine.N. Marieb,	Essential of Human Anatomy and Physiology	Pearson Education NewDelhi..	Eight edition,, 2007.
2.	Gillian Pocock, Christopher D. Richards	The Human Body An introduction for Biomedical and Health Sciences	Oxford University Press,USA	2009
3.	William F. Ganong	Review of Medical Physiology	Mc Graw Hill New Delhi	22nd edition
4.	Eldra Pearl Solomon	Introduction to Human Anatomy and Physiology	W.B.Saunders Company	2003
5.	Arthur C. Guyton	Text book of Medical Physiology	11 th Edition, Elsevier Saunders,	11th Edition, 2006

**WEB REFERENCE(s)**

1. <https://nptel.ac.in/courses/104101093/3>
2. <https://nptel.ac.in/courses/122103039/19>
3. [https://nptel.ac.in/noc/individual\\_course.php?id=noc18-ch11](https://nptel.ac.in/noc/individual_course.php?id=noc18-ch11)
4. <https://nptel.ac.in/courses/102104058/19>
5. <https://nptel.ac.in/courses/102104058/19>

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

19MDC02

**BIOMEDICAL SENSORS & MEASUREMENT DEVICES**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

1. To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
2. To understand the purpose of measurement, the methods of measurements, errors associated with measurements.
3. To know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications.
4. To know the different display and recording devices.
5. To study signal conditioning & signal analyser

**OUTCOMES**

1. Comprehend and appreciate the significance and role of this course in the present contemporary world
2. Describe the purpose and methods of measurements
3. Analyze the characteristics of different transducers
4. Explain different display and recording devices for various applications.
5. To study signal conditioning & signal analyser

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC02.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDC02.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC02.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC02.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC02.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

**SCIENCE OF MEASUREMENT**

7

**UNIT I**  
Measurement System – Instrumentation – Classification and Characteristics of Transducers – Static and Dynamic – Errors in Measurements – Calibration – Primary and secondary standards.

**UNIT II** **DISPLACEMENT, PRESSURE, TEMPERATURE SENSORS**

11

Resistive Transducers: Strain Gauge: Gauge factor, sensing elements, configuration, biomedical applications; strain gauge as displacement & pressure transducers, RTD materials & range, Characteristics, thermistor characteristics, biomedical applications of Temperature sensors Capacitive transducer, Inductive transducer, LVDT, Active type: Thermocouple – characteristics.

**UNIT III** **PHOTOELECTRIC AND PIEZO ELECTRIC SENSORS**

9

Phototube, scintillation counter, Photo Multiplier Tube (PMT), photovoltaic, Photo conductive cells, photo diodes, phototransistor, comparison of photoelectric transducers, spectrophotometric applications of photo electric transducers. Piezoelectric active transducer and biomedical applications as pressure & Ultrasound transducer.

**UNIT IV** **SIGNAL CONDITIONING & SIGNAL ANALYSER**

9

AC and DC Bridges –wheat stone bridge, Kelvin, Maxwell, Hay, Schering – Concepts of filters, Pre-amplifier – impedance matching circuits – isolation amplifier. Spectrum analyzer.

**UNIT V** **DISPLAY AND RECORDING DEVICES**

9

Digital voltmeter – Multi meter – CRO – block diagram, CRT – vertical & horizontal deflection system, DSO, LCD monitor, PMMC writing systems, servo recorders, photographic recorder, magnetic tape recorder, Inkjet recorder, thermal recorder. Demonstration of the display and recording devices.

  
**Chairman**  
**Board of Studies**  
**Department of Medical Electronics**  
**Muthayammal Engineering College (Autonomous)**  
**Marupuram, Namakkal Dist - 637 408.**

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	L.A Geddes and L.E.Baker.	Principles of Applied Biomedical Instrumentation	Third Edition, – John Wiley and sons,	Reprint 2008
2.	Albert D.Helfrick	Modern Electronic Instrumentation and Measurement Techniques	William D.Cooper. Prentice Hall of India,	2007
3.	A.K.Sawhney	Electrical & Electronics Measurement and Instrumentation	10th Edition, Dhanpat Rai&Co,New Delhi	2000
4.	Ernest o Doebelin and dhanesh N manik	Measuremet systems, Application and design	5th Edition, Mc Graw-Hill	2007.
5.	Khandpur R.S	Handbook of Biomedical Instrumentation	Tata McGraw Hill, New Delhi, 3rd Edition	2014.

**WEB REFERENCE(s)**

1. <https://nptel.ac.in/courses/112106139/>
2. <https://nptel.ac.in/courses/112103174/3>
3. <https://nptel.ac.in/courses/108105064/24>
4. <https://nptel.ac.in/courses/108105062/8>
5. <https://nptel.ac.in/courses/Webcourse-contents/IIT-Delhi/.../mod1/10.htm>

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 402

19MDC03

BIO SIGNALS & SYSTEMS

L T P C  
3 2 0 4

**COURSE OBJECTIVES**

1. To understand the basic properties of signal & systems and the various methods of classification.
2. To learn Laplace Transform & Fourier transform and their properties.
3. To Learn Continuous Time LTI System.
4. To know Z transform & DTFT and their properties.
5. To characterize LTI systems in the Time domain and various Transform domains.

**COURSE OUTCOMES**

1. Able to describe classification of signals and systems
2. Analyze the Laplace transform, Fourier transform
3. Ability to analyze continuous time LTI systems using Fourier and Laplace Transforms
4. Analyze Z Transform and DTFT
5. Ability to analyze discrete time LTI systems using Z transform and DTFT

Course Outcomes	Program Outcomes											PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC03.CO1	X	X	X	X	X	-	-	-	-	-	-	X	X	X	X
19MDC03.CO2	X	X	X	X	X	-	-	-	X	-	-	X	X	X	X
19MDC03.CO3	X	X	X	X	X	-	-	-	X	-	-	X	X	X	X
19MDC03.CO4	X	X	X	X	X	-	-	-	X	-	-	X	X	X	X
19MDC03.CO5	X	X	X	X	X	-	-	-	X	-	-	X	X	X	X

9

**UNIT I FUNDAMENTAL OF SIGNALS AND SYSTEMS**

Signals- Classification of signals- Continuous –time and Discrete time signals, Deterministic and random signal, even and odd signals, periodic and periodic signals, energy and power signals, Basic Continuous –time and Discrete time signals- Unit step, Unit impulse, Unit Ramp, Exponential, sinusoidal ,Exponentially damped sinusoidal signals, Pulse signals, Transformation of independent variables, Basic operations on signals-amplitude scaling ,addition, multiplication, differentiation and integration, Representation of signals in terms of impulses, Systems-Classification of systems - Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non causal, Stable & Unstable.

**UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS**

9

The Laplace Transform : The region of convergence for Laplace Transforms, The Inverse Laplace Transform, Properties of the Laplace Transform, Fourier series analysis-spectrum of Continuous -Time (CT) signals, Continuous-time Fourier Transform : Representation of A periodic signal , The Fourier transform for periodic signals, Properties of the continuous- time Fourier transform, The convolution property, The multiplication property, Application of Fourier Transform, the relationship between Laplace transform and Fourier transform.

**UNIT III LINEAR TIME INVARIANT SYSTEMS**

9

Continuous –time LTI systems: Block diagram representation-impulse response, Convolution integrals, Properties of Linear Time Invariant Systems, Casual LTI systems Described by differential equations, Fourier and Laplace transforms in Analysis of CT systems

**UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS**

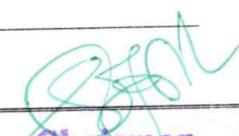
9

DTFT– Properties of DTFT, Application of DTFT, Discrete Time Fourier series – Definition, properties ,Sampling theorem, Z Transform- The region of convergence for Z transform, The inverse Z transform, Properties of Z Transform, the unilateral Z transform , Geometric evaluation of the Fourier transform from the pole zero plot, The relationship between Z transform and DTFT.

**UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS**

9

Casual LTI system described by difference equation, solving differential equation using Z transform, Block diagram representation-impulse response - Convolution sum, Discrete Fourier and Z Transform Analysis of Recursive & Non-Recursive systems



**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Alan V. Oppenheim, Alan S. Willsky	Signals and Systems	Pearson education	2nd Edition, 2015.
2.	P. Ramakrishna Rao	Signals and Systems	McGraw Hill	2nd Edition, 2013
3.	B P Lathi	Signals and Systems	B S Publisher	2001
4.	Nagrath, Sharan	Signals and Systems	McGraw Hill	2009
5.	S.Salivahanan, N.Sureshkumar and A.Vallavaraj	Signals and Systems	Tata McGraw Hill	2011

**WEB REFERENCE(s)**

1. [www.youtube.com/watch?v=oJpUbfwvzKA](http://www.youtube.com/watch?v=oJpUbfwvzKA)
2. [www.youtube.com/watch?v=oJpUbfwvzKA](http://www.youtube.com/watch?v=oJpUbfwvzKA)
3. [www.youtube.com/watch?v=ghz\\_puTV198](http://www.youtube.com/watch?v=ghz_puTV198)
4. [www.youtube.com/watch?v=wG6VUnkrO90](http://www.youtube.com/watch?v=wG6VUnkrO90)
5. [www.youtube.com/watch?v=AkBaDKYmQQI](http://www.youtube.com/watch?v=AkBaDKYmQQI)

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

19MDC04

**DIGITAL ELECTRONICS**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

- To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits
- To outline the formal procedures for the analysis and design of sequential circuits
- To illustrate the concept of synchronous and asynchronous sequential circuits
- To introduce the concept of Different Logic Families and programmable logic devices.

**COURSE OUTCOMES**

- Apply Boolean algebra, Karnaugh map and Tabulation method for simplification of Boolean expressions
- Design combinational logic circuits for various applications
- Design shift registers, Modulo-N asynchronous and synchronous counters
- Design and analyze state machines for the given specifications
- Discuss different logic families and Implement digital circuit in programmable logic devices

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC04.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDC04.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC04.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC04.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC04.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

**BASIC CONCEPTS OF DIGITAL SYSTEMS**

9

**UNIT I**

Review of Number systems, Number Representation, Boolean algebra, Boolean postulates and laws - De-Morgan's Theorem - Principle of Duality, Simplification using Boolean algebra, Canonical forms - Sum of product and Product of sum - Minimization using Karnaugh map and Tabulation method.

**UNIT II**

**COMBINATIONAL CIRCUITS**

9

Realization of combinational logic using gates, Design of combinational circuits: Adder, Subtractor, Parallel adder Subtractor, Carry look ahead adder, Magnitude Comparator, Parity generator and checker, Encoder, Decoder, Multiplexer, Demultiplexer - Function realization using Multiplexer, Decoder - Code converters.

**UNIT III**

**SEQUENTIAL CIRCUITS**

9

Flip-flops - SR, JK, D and T- Master-Slave - Triggering - Characteristic table and equation - Application table - Asynchronous and synchronous counters - Shift registers - Types - Universal shift registers - Ring counter - Johnson Counters- Serial adder / Subtractor.

**UNIT IV**

**SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS**

9

Mealy and Moore models - State diagram - State table - State minimization - State assignment - Excitation table - Design of Synchronous sequential circuits: Counters and Sequence generators- Circuit implementation - Asynchronous sequential circuits - Hazards and Races, Hazard free combinational circuits

**UNIT V**

**LOGIC FAMILIES AND PROGRAMMABLE DEVICES**

9

Introduction to Logic families - TTL & CMOS Logic and their characteristics - Tristate gates - Programmable Logic Devices - Programmable Logic Array (PLA) - Programmable Array Logic (PAL), Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using PLA, PAL

**LIST OF EXPERIMENTS**

- Design and implementation of Combinational logic functions
- Design and implementation of Adders and Subtractors
- Design and implementation of Code Converters
- Design and implementation of Parity Generator and Checker

5. Design and implementation of Magnitude Comparator
6. Design and implementation of Multiplexer and De-multiplexer
7. Design and implementation of Encoders and Decoders
8. Design and implementation of Asynchronous Counters
9. Design and implementation of Synchronous Counters
10. Design and implementation of Shift registers

Total:30 Hrs

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Morris Mano M. and Michael D. Ciletti	Digital Design	Pearson Education	V Edition, 2013.
2.	Donald D.Givone,	Digital Principles and Design	Tata Mc-Graw Hill Publishing company limited, New Delhi	2002
3.	Thomas L. Floyd	Digital Fundamentals	Pearson Education Inc	10th Edition, 2011
4.	Charles H. Roth Jr,	Fundamentals of Logic Design	Jaico Publishing House	Fifth Edition-, Mumbai, 2003
5.	Leach D, Malvino A P & Saha	Digital Principles and Applications	Tata McGraw-Hill Publishing Company	8th Edition, , 2014

**WEB REFERENCE(s)**

1. [www.nptel.ac.in/courses/117105080/7](http://www.nptel.ac.in/courses/117105080/7)
2. [www.nptel.ac.in/video.php?subjectId=117105080](http://www.nptel.ac.in/video.php?subjectId=117105080)
3. [www.nptelvideos.in/2012/12/digital-systems-design.html](http://www.nptelvideos.in/2012/12/digital-systems-design.html)
4. [www.allaboutcircuits.com](http://www.allaboutcircuits.com)
5. [www.electronicsforu.com](http://www.electronicsforu.com)

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

19MDC05

**CONTROL SYSTEM FOR PHYSIOLOGY SYSTEMS**

L T P C  
3 2 0 4

**COURSE OBJECTIVES**

- To introduce the elements of control system and their modeling using various Techniques.
- To introduce methods for analyzing the time response, of systems
- To introduce methods for analyzing, the frequency response of systems
- To introduce methods for analyzing the stability of systems
- To introduce the state variable analysis method

**COURSE OUTCOMES**

- Analysis the knowledge of various control models
- Perform time domain control systems required for system analysis.
- Perform frequency domain analysis of control systems required for system analysis.
- Performance analysis of control systems required for stability analysis
- Design the state variable analysis method.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC05.CO1	X	X	X	X	X	-	-	-	-	-	-	X	X	X	X
19MDC05.CO2	X	X	X	X	X	-	-	-	X	-	-	X	X	X	X
19MDC05.CO3	X	X	X	X	X	-	-	-	X	-	-	X	X	X	X
19MDC05.CO4	X	X	X	X	X	-	-	-	X	-	-	X	X	X	X
19MDC05.CO5	X	X	X	X	X	-	-	-	X	-	-	X	X	X	X

9

**UNIT I**

**CONTROL SYSTEM MODELING**

Basic Elements of Control System – Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph

**UNIT II**

**TIME RESPONSE ANALYSIS**

Time response analysis - First Order Systems - Impulse and Step Response analysis of second order systems - Steady state errors – P, PI, PD and PID Compensation, Analysis using MATLAB

**UNIT III**

**FREQUENCY RESPONSE ANALYSIS**

Frequency Response - Bode Plot, Polar Plot, Nyquist Plot - Frequency Domain specifications from the plots - Constant M and N Circles - Nichol's Chart - Use of Nichol's Chart in Control System Analysis.

**UNIT IV**

**STABILITY ANALYSIS**

Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Stability, Dominant Poles, Application of Root Locus Diagram - Nyquist Stability Criterion - Relative Stability, Analysis using MATLAB

**UNIT V**

**STATE VARIABLE ANALYSIS AND BIOMEDICAL APPLICATIONS**

State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation – Solutions of the state equations - Concepts of Controllability and Observability – Sampling Theorem – Sampler & Hold – Open loop & Closed loop sampled data systems - Lung mechanics model with proportional control

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	J.Nagrath and M.Gopal	J.Nagrath and M.Gopal	New Age International Publishers, 5th Edition	2007.
2.	Benjamin.C.Kuo	Automatic control systems	Prentice Hall of India, 7th Edition	1995

*[Signature]*  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Mahayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

3.	M.Gopal	Control System – Principles and Design	Tata McGraw Hill, 2nd Edition	2002
4.	Schaum's Outline Series	Feed back and Control Systems	Tata Mc Graw-Hill	2007
5.	John J.D'Azzo & Constantine H.Houpis	Linear Control System Analysis and Design	Tata Mc Graw-Hill, Inc.,	1995

**WEB REFERENCE(s)**

1. <https://www.javatpoint.com/control-system-tutorial>
2. <https://lecturenotes.in/notes/6579-notes-for-control-system-engineering-cse-by-gyana-ranjan-biswal>
3. <https://nptel.ac.in/courses/108101037/>
4. [https://nptel.ac.in/noc/individual\\_course.php?id=noc18-ec41](https://nptel.ac.in/noc/individual_course.php?id=noc18-ec41)
5. [https://www.tutorialspoint.com/control\\_systems/control\\_systems\\_introduction.htm](https://www.tutorialspoint.com/control_systems/control_systems_introduction.htm)



**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

19MDC06

**BIO-MATERIALS AND ARTIFICIAL ORGANS**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

1. To learn characteristics and classification of Biomaterials.
2. To understand different metals and ceramics used as biomaterials.
3. To learn polymeric materials and combinations
4. To study about tissue replacement implants.
5. To know artificial organ developed using these materials.

**COURSE OUTCOMES**

1. Analyze different types of Biomaterials and its classification.
2. Understand different metals and ceramics used as biomaterials.
3. Learn about the polymeric materials and combinations.
4. Perform combinations of materials that could be used as a tissue replacement implant.
5. Know about the artificial organ development.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC06.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
19MDC06.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDC06.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDC06.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDC06.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

**UNIT I**

**STRUCTURE OF BIO-MATERIALS**

9

Definition and classification of bio-materials, mechanical properties, visco-elasticity, wound healing process, body response to implants, blood compatibility

**UNIT II**

**IMPLANT MATERIALS**

9

Metallic implant materials, stainless steels, co-based alloys, Ti-based alloys, ceramic implant materials, aluminum oxides, hydroxyl-apatite glass ceramics carbons, medical applications

**UNIT III**

**POLYMERIC MATERIALS**

9

Polymerization, polyamides, Acrylic polymers, rubbers, high strength thermoplastics, medical applications. Bio polymers: Collagen and Elastin.

**UNIT IV**

**TISSUE REPLACEMENT MATERIALS**

9

Soft-tissue replacements, sutures, surgical tapes, adhesive, Percutaneous and skin implants, maxillofacial augmentation, blood interfacing implants, hard tissue replacement implants, internal fracture fixation devices, joint replacements.

**UNIT V**

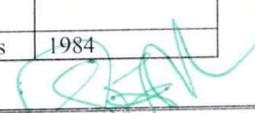
**ARTIFICIAL ORGANS**

9

Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenator), Artificial Kidney (Dialyser membrane), Dental Implants – Artificial limb & hand. Ethical, Environmental and Safety issues in the implantation of artificial organs.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Sujata V. Bhatt	Biomaterials Second Edition	Narosa Publishing House	2005
2.	JoonB.Park Joseph D. Bronzino	Biomaterials - Principles and Applications	CRC Press	2003
3.	Park J.B	Biomaterials Science and	Plenum Press	1984

  
**Chairman**  
**Board of Studies**  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

		Engineering		
4.	Myer Kutz	Standard Handbook of Biomedical Engineering & Design	McGraw-Hill	2003
5.	John Enderle, Joseph D. Bronzino, Susan M. Blanchard	Introduction to Biomedical Engineering	Elsevier	2005

**WEB REFERENCE(S)**

1. <https://www.elsevier.com/books/biomaterials-artificial-organs-and-tissueengineering/>
2. <https://sites.google.com/site/.../seweh/Biomaterials-An-Introduction.pdf>
3. [http://ocw.uc3m.es/ciencia-e-oin/materials-science-and-engineering/lecture-notes-1/Chapter\\_7\\_1.pdf](http://ocw.uc3m.es/ciencia-e-oin/materials-science-and-engineering/lecture-notes-1/Chapter_7_1.pdf)
4. <https://emedicine.medscape.com/article/843730-overview>
5. <https://www.mirm.pitt.edu/our-research/focus-areas/medical-devices-and-artificial-organs/>



**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayaminal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 407

19MDC07

**PATHOLOGY AND MICROBIOLOGY**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

1. Gain knowledge on the structural and functional aspects of living organisms.
2. Know the etiology and remedy in treating the pathological diseases.
3. Empower the importance of public health.
4. To study identification of bacteria
5. To study Antibodies and its types

**COURSE OUTCOMES**

1. Analyze structural and functional aspects of living organisms.
2. Explain the function of microscope
3. Discuss the importance of public health.
4. Describe methods involved in treating the pathological diseases.
5. Able to know study Antibodies and its types

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC07.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDC07.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC07.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC07.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC07.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

9

**UNIT I CELL DEGENERATION, REPAIR AND NEOPLASIA**

Cell injury - Reversible cell injury and Irreversible cell injury and Necrosis, Apoptosis, Intracellular accumulations, Pathological calcification- Dystrophic and Metastatic. cellular adaptations of growth and differentiation, Inflammation and Repair including fracture healing, Neoplasia, Classification, Benign and Malignant tumours, carcinogenesis, spread of tumours Autopsy and biopsy.

**UNIT II FLUID AND HEMODYNAMIC DERANGEMENTS**

Edema, Hyperemia/Ischemia, normal hemostasis, thrombosis, disseminated intravascular coagulation, embolism, infarction, shock, Chronic venous congestion. Hematological disorders-Bleeding disorders, Leukaemias, Lymphomas Haemorrhage.

**UNIT III MICROBIOLOGY**

Structure of Bacteria and Virus. Routes of infection and spread; endogenous and exogenous infections, Morphological features and structural organization of bacteria and virus, growth curve, identification of bacteria , culture media and its types , culture techniques and observation of culture. Disease caused by bacteria, fungi, protozoal, virus and helminthes.

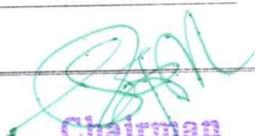
**UNIT IV MICROSCOPES**

Light microscope – bright field, dark field, phase contrast, fluorescence, Electron microscope (TEM & SEM). Preparation of samples for electron microscope. Staining methods – simple, gram staining and AFB staining.

**UNIT V IMMUNOPATHOLOGY**

Natural and artificial immunity, types of Hypersensitivity, antibody and cell mediated tissue injury: opsonization, phagocytosis, inflammation, Secondary immunodeficiency including HIV infection. Auto-immune disorders: Basic concepts and classification, SLE. Antibodies and its types, antigen and antibody reactions, immunological techniques: immune diffusion, immuno electrophoresis, RIA and ELISA, monoclonal antibodies

9

  
**Chairman**  
**Board of Studies**  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 403.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Ramzi S Cotran, Vinay Kumar & Stanley L Robbins,	Pathologic Basis of Diseases,	7th edition, WB Saunders Co	2005 (Units I & II).
2.	Ananthanarayanan & Panicker,	Microbiology	Orientblackswan, 10th edition. (Units III, IV and V).	2017
3.	Underwood JCE	General and Systematic Pathology	Churchill Livingstone, 3rd edition,	: 2000.
4.	Dubey RC and Maheswari DK.	A Text Book of Microbiology &	Chand Company Ltd,	2007
5.	Prescott, Harley and Klein	Microbiology	10th edition, McGraw Hill	2017

**WEB REFERENCE(s)**

1. <https://nptel.ac.in/courses/102106025/36>
2. <https://nptel.ac.in/courses/112104118/43>
3. <https://nptel.ac.in/courses/102103015/>
4. <https://nptel.ac.in/courses/115103030/9>
5. <https://nptel.ac.in/courses/102103038/>

  
**Chairman**  
 Board of Studies

**19MDC08 MICROPROCESSOR AND MICROCONTROLLER IN MEDICINE** L T P C  
3 0 0 3

**COURSE OBJECTIVES**

1. Understand the fundamental concepts of 8086 microprocessors Explain the basic concepts of 8051 microcontroller
2. Obtain knowledge on interfacing devices Familiarize about ARM microcontroller
3. Acquire knowledge on applications of microprocessor and microcontroller in biomedical domain.
4. Understand the fundamental concepts of 8086 microprocessors Explain the basic concepts of 8051 microcontroller
5. Obtain knowledge on interfacing devices Familiarize about ARM microcontroller

**COURSE OUTCOMES**

1. Understand the fundamental concepts of 8086 microprocessors Explain the basic concepts of 8051 microcontroller
2. Obtain knowledge on interfacing devices Familiarize about ARM microcontroller
3. Acquire knowledge on applications of microprocessor and microcontroller in biomedical domain.
4. Understand the fundamental concepts of 8086 microprocessors Explain the basic concepts of 8051 microcontroller
5. Obtain knowledge on interfacing devices Familiarize about ARM microcontroller

Course Outcomes	Program Outcomes												PSOs		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	PS03
19MDC08.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDC08.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC08.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC08.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC08.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

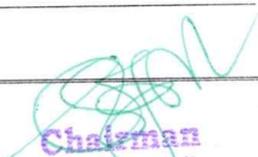
**UNIT I OVERVIEW OF 8086 MICROPROCESSOR** 9  
Evolution of Microprocessor and its importance in biomedical domain, Architecture and signal description of 8086, Minimum and maximum mode, addressing modes, Instruction set, Programs

**UNIT II 8051 MICROCONTROLLER** 9  
Introduction to 8 bit microcontroller, signal descriptions of 8051-Architecture of 8051-Register set of 8051-Instruction set-Addressing mode

**UNIT III INTERFACING DEVICES** 9  
Timer-serial communication-interrupts programming - Interfacing to external memory- Basic techniques for reading & writing from I/O port pins- Interfacing 8051 to ADC-Liquid crystal display (LCD), keyboard-Stepper motor

**UNIT IV ARM MICROCONTROLLER** 9  
Fundamentals: registers, current program status register - Pipeline, exceptions- Interrupts and vector table-ARM architecture - ARM instruction set, thumb instruction set.

**UNIT V APPLICATION IN MEDICINE** 9  
Mobile phone based bio signal recording - Design of pulse oximeter circuit using ARM microcontroller- Design of EOG based home appliances using PIC microcontroller - Design of heart rate monitoring circuit using ARM Microcontroller

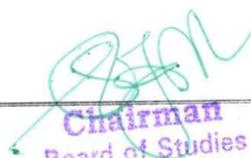
  
**Chairman**  
**Board of Studies**  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	A.K.Ray, K.M. Bhurchandi	Advanced Microprocessor and Peripherals	Tata McGraw Hill	3 <sup>rd</sup> edition, 2013.
2.	Douglas V. Hall	Microprocessor and Interfacing: Programming and Hardware	Glencoe,	2nd edition, 2006
3.	Andrew N.Sloss, Donimic Symes, Chris Wright	ARM System Developer's Guide	Elsevier,	1st edition, 2007.
4.	Muhammad Ali Mazidi and JanicaGilliMazidi,	The 8051 microcontroller and embedded systems	Pearson Education,	5th Indian reprint, 2003

**WEB REFERENCE(s)**

1. [www.microchip.com/medical](http://www.microchip.com/medical)
2. [www.freescale.com/medical](http://www.freescale.com/medical).
3. <https://www.javatpoint.com/microprocessor-vs-microcontroller>
4. [https://www.vssut.ac.in/lecture\\_notes/lecture1423813120.pdf](https://www.vssut.ac.in/lecture_notes/lecture1423813120.pdf)
5. <https://www.totalphase.com/blog/2019/12/microcontroller-vs-microprocessor-what-are-the-differences/>

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

19MDC09

**BIOMECHANICS AND REHABILITATION ENGINEERING**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

- To understand the rehabilitation concepts and Rehabilitation team members for future development and applications.
- To study various Principles of Rehabilitation Engineering.
- To understand different types of Therapeutic Exercise Technique
- To understand the tests to assess the hearing loss, development of electronic devices to compensate for the loss and various for visually and auditory impaired.
- To study the various orthotic devices and prosthetic devices to overcome orthopedic problems.

**COURSE OUTCOMES**

- Ability to apply knowledge of mathematics, science and engineering to understand the fundamentals of moving systems and familiarity with human anatomy to competently analyze the movement of the human body.
- Ability to analyze the dynamics of human movement flow properties of blood and comprehend the biomechanical principles that relate to movement and communication disabilities.
- Have an in depth idea about Engineering Concepts in Sensory & Motor rehabilitation.
- Apply the different types of Therapeutic Exercise Technique to benefit the society.
- Gain in-depth knowledge about different types of models of Hand and arm replacement.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC09.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDC09.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC09.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC09.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC09.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

**UNIT I INTRODUCTION TO BIOMECHANICS 9**

What Is Biomechanics, Mechanics in Physiology Definition of Stress ,Strain and Strain Rate,The Non viscous Fluid, Newtonian Viscous Fluid, The Hookean Elastic Solid, Viscoelasticity, Response of a Viscoelastic Body to Harmonic Excitation, Use of Viscoelastic Models ,Methods of Testing

**UNIT II THE FLOW PROPERTIES OF BLOOD 9**

Blood rheology, the constitutive equation of blood based on viscometric Data and casson's equation, Laminar flow of blood in tube, blood with viscosity described by casson's equation. Bioviscoelastic fluids:Introduction, small deformation experiments, mucus from the respiratory tract, saliva, cervical mucus and semen, synovial fluid, flow properties of synovial fluid

**UNIT III INTRODUCTION TO REHABILITATION 9**

What is Rehabilitation, Epidemiology of Rehabilitation, Health, Levels of Prevention, Preventive Rehabilitation, Diagnosis of Disability, Functional Diagnosis, Importance of Psychiatry in Functional diagnosis, Impairment disability handicap, Primary & secondary Disabilities

**UNIT IV REHABILITATION TEAM & THERAPEUTIC EXERCISE TECHNIQUE 9**

Rehabilitation team Classification of members, The Role of Psychiatrist, Occupational therapist, Physical therapist, Recreation therapist, Prosthetist - Orthotist, Speech pathologist, Rehabilitation nurse, Social worker, Corrective therapist, Psychologist, Music therapist, Dance therapist & Biomedical engineer, Co-ordination exercises, Frenkels exercises, Gait analyses-Pathological Gaits, Gait Training, Relaxation exercises-Methods for training Relaxation, Strengthening exercises-Strength training, Types of Contraction, Mobilization exercises, Endurance exercises.

**UNIT V ORTHOTIC, PROSTHETIC DEVICES & RESTORATION TECHNIQUES 9**

General orthotics, Classification of orthotics-functional & regional, General principles of Orthosis, Calipers- FO, AFO, KAFO, HKAFO. Prosthetic devices: Hand and arm replacement, Body powered prosthetics, Myo-electric controlled prosthetics and externally powered limb prosthetics. Functional Electrical Stimulation systems- Restoration of hand function, restoration of standing and walking, Hybrid Assistive Systems (HAS).

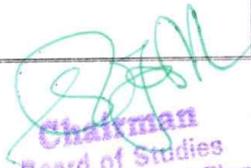
*Chairman*  
Board of Studies  
Department of Medical Electronics  
Muthayammal Engineering College (Autonomous)  
Rasipuram, Namakkal Dist - 637 409.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Y.C.Fung	Biomechanics- Mechanical Properties of Living tissues	Springer Verlag.	2 <sup>nd</sup> Edition
2.	Sunder	Textbook of Rehabilitation 2 <sup>nd</sup> Edition	Jaypee Brothers Medical Publishers Pvt. Ltd, New Delhi	2007
3.	Schneck and Bronzino	Biomechanics principles and applications	CRC;	2003
4.	Keswick. J	What is Rehabilitation Engineering, Annual Reviews of Rehabilitation	Springer	1982
5.	Warren E. Finn, Peter G. LoPresti	Handbook of Neuroprosthetic Methods	CRC	2002

**WEB REFERENCE(s)**

1. <https://www.slideshare.net/nameeda15/rehabilitation-67292430>
2. <https://www.slideshare.net/Yogeshkewlani/virtual-reality-39791892>
3. <https://www.slideshare.net/drdsabat/orthotics-and-prosthetics-ug-lecture>
4. <https://www.slideshare.net/sundarganeshkandaswamy/therapeutic-exercise-physiotherapy>
5. <https://www.slideshare.net/kpml419/orthotics-15550568>  
<https://www.slideshare.net/nameeda15/rehabilitation-67292430>

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

19MDC10

**BIOMEDICAL INSTRUMENTATION**

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

1. Apply knowledge of mathematics science and engineering
2. fundamentals in designing, analyzing and/or working of biomedical circuits and instruments.
3. Understand the health, safety, Environmental, legal and ethical issues
4. designing/working of a biomedical circuits and instruments.
5. Work, document and present as an individual and as a team-member

**COURSE OUTCOMES**

1. Differentiate different bio potentials and its propagations.
2. Illustrate different electrode placement for various physiological recordings
3. Design bio amplifier for various physiological recordings
4. Explain various technique for non-electrical physiological measurements
5. Demonstrate different biochemical measurement techniques.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC10.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDC10.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC10.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC10.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC10.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

9

**UNIT I**

**PHYSIOLOGICAL TRANSDUCERS**

Classification of transducers, performance characteristics of transducers. Pressure transducers, transducers for body temperature measurement, photoelectric transducers, optical fiber sensor, biosensor and smart sensor. Biomedical recorders and biofeedback instruments. Patient Monitoring Systems: System concepts, cardiac monitor, bedside patient monitoring system, central monitors, measurement of heart rate, measurement of pulse rate, blood pressure measurement, measurement of temperature, measurement of respiratory rate, catheterization laboratory instrumentation.

**UNIT II**

**OXIMETERS**

9

Oximetry, ear oximeter, pulse oximeter, skin reflectance oximeter and intravascular oximeter. Blood Flow Meters: Electromagnetic blood flow meters different types, Ultrasonic blood flow meters, NMR blood flow meters and Laser Doppler blood flow meters. Cardiac output measurements: Indicator dilution method, Dye dilution method, Thermal dilution techniques, Measurement of continuous cardiac output derived from the aortic pressure waveform, Impedance technique. Pulmonary Function Analyzer: Pulmonary function measurement, Spirometry, Pneumotachometer, Measurement of volume by Nitrogen washout technique.

**UNIT III**

**BLOOD GAS ANALYZERS**

9

Acid-base balance, blood pH measurement, measurement of blood pCO<sub>2</sub>, intra-arterial blood gas monitoring, complete blood gas analyzer. Audiometer and Hearing Aids: Mechanism of hearing, measurement of sound, basic audiometer, pure-tone audiometer, speech audiometer, audiometer system, Bekesyevoked response audiometer system, calibration of audiometer and hearing aids.

**UNIT IV**

**MEASUREMENT OF NON-ELECTRICAL PARAMETERS**

9

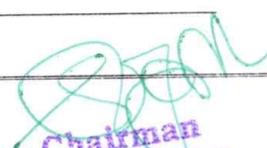
Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers, Systolic, diastolic, mean detector circuit. Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurement.

**UNIT V**

**CARDIAC PACEMAKERS AND DEFIBRILLATORS**

9

Need for cardiac pacemaker, External ace maker, Implantable pacemaker, Types of Implantable pacemakers and recent developments. Programmable pacemaker, Rate-responsive pacemakers, pacing system Analysers, Need for Defibrillator, Dc defibrillators, Implantable Defibrillators, Defibrillator analysers.

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	R.S.Khandpur	Hand Book of Bio-Medical instrumentation	Tata McGraw Hill Publishing Co Ltd	2004
2.	Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer	Bio-Medical Instrumentation and Measurements	Pearson Education	2nd edition, 2002
3.	M.Arumugam	Bio-Medical Instrumentation	Anuradha Agencies	2003.
4.	L.A. Geddes and L.E.Baker	Principles of Applied Bio-Medical Instrumentation	John Wiley & Sons	1975
5.	J.Webster	Medical Instrumentation	John Wiley & Sons	1995

**WEB REFERENCE(s)**

1. <https://www.slideshare.net/jineshkj/ec09-125-biomedical-instrumentation-module-1>
2. <https://www.slideshare.net/ErFarukBinPoyen/bio-potential-and-bio-electrode>
3. <https://www.slideshare.net/stootypal/biopotentials>
4. <https://www.slideshare.net/MariaRominaAngustia/measurement-and-control-of-nonelectrical-quantitie>
5. <https://www.slideshare.net/ShmmonAhmad/biochemical-analysis-techniques>

  
Chairman  
Board of Studies

Department of Medical Electronics  
Muthayyanmal Engineering College (Autonomous)  
Rasipuram, Namakkal Dist - 637 400.

19MDC11

HOSPITAL MANAGEMENT

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

1. To understand the fundamentals of hospital administration and management.
2. To study the importance of human resource management
3. To know the market related research process
4. To explore various information management systems and relative supportive services.
5. To learn the quality and safety aspects in hospital.

**COURSE OUTCOMES**

1. Explain the principles of Hospital administration.
2. Identify the importance of Human resource management.
3. List various marketing research techniques.
4. Identify Information management systems and its uses.
5. Understand safety procedures followed in hospitals

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC11.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
19MDC11.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDC11.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDC11.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDC11.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

**UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION 9**  
Hospital and Industry relationship, Challenges in Hospital Administration – Hospital Planning- Equipment Planning – Functional Planning – Organizing - Current Issues in Hospital Management – Telemedicine - Bio-Medical Waste Management. – Color coding

**UNIT II HUMAN RESOURCE DEPARTMENT MANAGEMENT 9**  
Principles & Functions of HRM – Profile of HRD Manager – Tools of HRD –Human Resource Inventory – Manpower Planning. Departments - Hospital, Recruitment, Selection, Training Guidelines –Methods & Evaluation of Training – Leadership, Promotion – Transfer, Communication – nature, scope, barriers, styles and modes of communication.

**UNIT III MARKETING RESEARCH PROCESS 9**  
Marketing information systems - assessing information needs, developing & disseminating information - Market Research process - Other market research considerations – Consumer Markets & Consumer Buyer Behaviour - Model of consumer behaviour - The buyer decision process - Model of business buyer behavior – Major types of buying situations - WTO and its implications.

**UNIT IV HOSPITAL INFORMATION SYSTEMS & SUPPORTIVE SERVICES 9**  
Management Decisions and Related Information Requirement - Clinical Information Systems - Administrative Information Systems - Support Service Technical Information Systems - Medical Transcription, Medical Records Department – Central Sterilization and Supply Department – Pharmacy– Food Services - Laundry Services

**UNIT V QUALITY AND SAFETY ASPECTS IN HOSPITAL 9**  
Quality system – Elements, implementation of quality system, Documentation, Quality auditing, International Standards ISO 9000 – 9004 – Features of ISO 9001 – ISO 14000 – Environment Management Systems. NABA, JCI, NABL. Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules. Health Insurance & Managing Health Care – Medical Audit – Hazard and Safety in a hospital Setup.



**Chairman**  
Board of Studies  
Department of Medical Electronics  
Muthayammal Engineering College (Autonomous)  
Rasipuram, Namakkal Dist - 637 408.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	R.C.Goyal	Hospital Administration and Human Resource Management – Fourth Edition	Academic Press, New York	2006.
2.	G.D.Kunders	Hospitals Facilities Planning and Management Fifth Reprint	TMH, New Delhi	2007
3.	Cesar A. Caceres Albert Zara	The Practice of Clinical Engineering	Academic Press, New York	1977
4.	Norman Metzger	Handbook of Health Care Human Resources Management 2nd edition	Aspen Publication Inc. Rockville, Maryland, USA	1990.
5.	Peter Berman	Health Sector Reform in Developing Countries	Harvard University Press	1995

**WEB REFERENCE(s)**

1. <https://www.slideshare.net/drjayeshpatidar/hospital-administration-53507341>
2. <https://www.slideshare.net/dharmendragahwai/human-resource-management-in-public-health-ppt>
3. <https://www.slideshare.net/RajeshKuthalingam/marketing-research-process-9625550>
4. <https://www.slideshare.net/vijayrajnazzi/information-technology-in-hospitals>
5. <https://www.slideshare.net/akhileshbargava/quality-in-health-care>

  
**Chairman**  
 Board of Studies

Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 400.

19MDC12

**MEDICAL EXPERT SYSTEMS**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

1. To develop informed opinions about the present and past opinion leaders in the artificial intelligence
2. To develop a simple, informal expert system in medical field.
3. To Perform an effort of knowledge engineering of a real, human expert.
4. To develop a series of Web pages that will serve as a current "state of the art" review of the various AI application areas,
5. To study the areas which may be suggested by the instructor or brought to the course by participants.

**COURSE OUTCOMES**

1. Explain the role of Artificial Intelligence, Expert Systems and Decision Models in managerial decision-making.
2. Learn about data structures.
3. Study the basic concepts of multimedia
4. Apply, build and modify decision models to solve real problems
5. Design and develop Artificial Intelligence Based Decision Support Systems

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC12.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDC12.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC12.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC12.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC12.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

**UNIT I**

**INTRODUCTION TO DATA STRUCTURES**

9

Elements, arrays, records, sets, tables etc. Singly and doubly linked data, stacks, queues, trees etc. Introduction to database, data models, Relational, distributed and other types of databases, data indexing and structuring techniques: data independence, data definition language and data manipulation language. E-R diagram with examples. Relational model, structure of Relational databases, Query language, views, Examples.

**UNIT II**

**RELATIONAL DATABASE DESIGN**

9

Normalisation – 1NF, 2NF and 3NF. Indexing and Hashing. Security of databases. Design example on a popular RDBMS package. Miniaturized data storage and retrieval system like CD- ROM, Magneto Optical Discs, optical juke boxes, write many read many devices and miniature magnetic tape devices. Interfacing and retrieval details.

**UNIT III**

**EXPERT SYSTEMS**

9

Introduction – basic concepts – structure of expert systems – types of expert systems – knowledge engineering – methods & difficulties in knowledge acquisition – Search and real time search – constraint satisfaction – robot motion planning. Medical data acquisition and database systems. Visual programming concepts; Visual Basic environment, tools and controls; Dynamic data exchange; VB based Medical information System

**UNIT IV**

**BASIC CONCEPTS OF MULTIMEDIA**

9

Design of Multimedia information systems; Components of virtual reality; Virtual reality applications in medicine. Medical Informatics and its levels; Design and development of educational packages on medical sciences; Integrated design concepts; Interactive multimedia, Virtual and digital libraries; Internet and its applications.

**UNIT V**

**DECISION MAKING METHODS FOR BIOMEDICINE**

9

Bayesian statistics – decision analysis – Bayesian belief networks – Markov models – Markov decision Process – Applications to speech recognition, medical diagnosis. Hospital information System its design and functional characteristics; Principles and applications of Artificial Intelligence, Pattern Recognition, Neural Network and Fuzzy Logic in Medicine.

  
**Chairman**  
**Board of Studies**  
**Department of Medical Electronics**  
**Muthayammal Engineering College (Autonomous)**  
**Rasipuram, Namakkal Dist. 637 14**

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	J. Van Bommel, Mark A. Musen	Handbook of Medical Informatics	Springer Publications (UNITS III, IV & V)	Latest Edition
2.	Date C J	An introduction to Database Systems	Addison	Latest Edition
3.	M F Collen	Hospital Computer Systems	Addison Wesley	Latest Edition
4.	Lee	Computers in Medicine	Mc Graw Hill	Latest Edition
5.	H Dominic Covvey et al	Computer in the practice of, medicine	Addison Wesley	Latest Edition

**WEB REFERENCE(S)**

1. <http://www.eurekaselect.com/82021/articie/medical-expert-systems>
2. <https://link.springer.com/article/10.1007/BF02718262>
3. <https://pdfs.semanticscholar.org/48b7/a833992e9f5117614e9eb808942c614e2328.pdf>
4. <https://worldwidescience.org/topicpages/m/medical+expert+systems.html>.
5. <https://www.expertsystem.com/expert-system-artificial-intelligence-public-health/>



**Chairman**

Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 403

19MDC13

**THERAPEUTIC EQUIPMENTS**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

1. To Familiarize the working of cardiac equipments and use
2. To introduce the principles of life- support and arrhythmia equipment in clinical use.
3. To familiarize with design and system level analysis different therapeutic equipments.
4. To identify the application and safety aspects of different equipments
5. To learn the different monitoring techniques for internal organs

**COURSE OUTCOMES**

1. Describe the working setup of all basic cardiac equipment.
2. Students will have acquired thorough life support equipment in clinical use.
3. Learned the design and system level analysis different therapeutic equipments
4. Analyzing the application and safety aspects of different equipments
5. Studied various internal organ monitoring devices

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC13.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDC13.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC13.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC13.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC13.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

**CARDIAC EQUIPMENT**

9

**UNIT I**

Cardiac Pacemaker – Need for cardiac pacemaker – External pacemakers- types - voltage pacemakers – current-pacemakers - current limited voltage pacemakers. Internal pacemakers - basic requirement – types: fixed rate, demand pacemakers, R wave triggered, R wave blocked, Atrial triggered pacemakers. Programmable pacemakers - Functional block diagram and description

**UNIT II**

**DEFIBRILLATOR EQUIPMENT**

9

Defibrillators - Need for a defibrillator- basic principle and comparison of output wave forms of different DC defibrillators - Defibrillator electrodes - DC defibrillator with synchronizer Functional block diagram. Automatic external defibrillators - Block diagram. Implantable defibrillators – components - block diagram defibrillator analyzers - RF ablation treatment for arrhythmia

**UNIT III**

**VENTILATORS AND STIMULATORS**

9

Ventilators: Physiological factors affecting Volume exchange - Compliance - respiratory resistance. Functional specification - inspiratory phase – change over from inspiratory to expiratory phase – inspiratory phase, expiratory phase Electrical stimulators, nerve and muscle stimulators - - Stimulators for pain and relief- functional electrical stimulation- Ultrasonic stimulator

**UNIT IV**

**DIATHERMY**

9

Surgical diathermy -Principles and applications, Functional block diagram - monopolar & bipolar techniques, Electrodes and Safety aspects in electrosurgical units, electro surgical analyzers. Principles of short wave and microwave diathermy

**UNIT V**

**ENDOSCOPY AND ANESTHESIA**

9

Endoscopy – Principles, types & applications. Block diagram of a fiber optic endoscope with integral TV cameras. Anesthetic machines: Need of anesthesia, gas used and their sources, gas blending and vaporizers, anesthesia delivery system, breathing circuits

  
**Chairman**  
**Board of Studies**  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 143

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Joseph J. Carr John M. Brown	Introduction to Biomedical Equipment Technology	Pearson education	2012
2.	R S Khandpur	Handbook of Bio medical Instrumentation	Tata McRaw Hill	2004
3.	Bronzino	Hand book of Biomedical Engineering	IEEE press book	2000
4.	Mushin	Automatic Ventilation of Lung	Black Well	1980
5.	Joseph J. Carr, John M. Brown	Introduction to Biomedical Equipment Technology	Pearson Education	2001

**WEB REFERENCE(s)**

1. <https://www.slideshare.net/abhilashachaudhary4/pacemaker-71996509>
2. <https://www.slideshare.net/niteshkumarsinghh/defibrillator-ppt>
3. <https://www.slideshare.net/RajneeMishra/ventilator-61330983>
4. <https://www.slideshare.net/HemangiParmar4/neuromuscular-electrical-stimulation>
5. <https://www.slideshare.net/UthamalingamMurali/diathermy-in-surgery>



**Chairman**  
Board of Studies  
Department of Medical Electronics  
Muthayammal Engineering College (Autonomous)  
Rasipuram, Namakkal Dist - 637 408.

19MDC14

**ORTHOTIC & PROSTHETIC EQUIPMENTS**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

1. The objective of this to know the principle, design and application of various human assist devices
2. Brief introduction to design aspects of prosthetic and orthotic devices will be given.
3. Brief introduction to design aspects of Visual Aids devices will be given
4. Brief introduction to design aspects of Hearing And Speech Aids devices will be given
5. Brief introduction to design aspects of Rehabilitation Medicine and Advocacy will be given

**COURSE OUTCOMES**

1. Know the role and importance of Cardiac Assist Devices.
2. Know the importance of rehabilitation and related aspects Learn the role of Visual Aids
3. Know the role and importance of Visual Aids devices
4. Know the role and importance of Hearing And Speech Aids devices
5. Know the role and importance of Rehabilitation Medicine and Advocacy

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC14.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDC14.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC14.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC14.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC14.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

9

**UNIT I**

**CARDIAC ASSIST DEVICES**

Synchronous counter pulsation, assisted through respiration right ventricular by-pass pump, left ventricular bypass pump, open chest and closed chest type, Principle and problems --Intra Aortic balloon pumping, Veno Arterial Pumping, Prosthetic Cardio Valves, Biomaterials for purposes, its characteristics and testing.

**UNIT II**

**PROSTHETIC AND ORTHOTIC DEVICES**

Hand and Arm replacement – Different Types of Models, Externally Powered Limb Prosthesis, Feedback in Orthotic System, Functional Electrical Stimulation, Sensory Assist Devices, Materials for Prosthetic and Orthotic devices.

**UNIT III**

**VISUAL AIDS**

Ultra sonic and laser canes, Intra ocular lens, Braille Reader, Tactile devices for visually Challenged, Text voice converter, Screen readers.

**UNIT IV**

**HEARING AND SPEECH AIDS**

Audiograms, types of deafness - conductive and nervous, hearing aids- Types, constructional and functional characteristics. Cochlear implants- Need, constructional details, speech trainer.

**UNIT V**

**REHABILITATION MEDICINE AND ADVOCACY**

Physiological aspects of Function recovery, Psychological aspects of Rehabilitation therapy, Legal aspect available in choosing the device and provision available in education, job and in day-to-day life.

**REFERENCE BOOK**

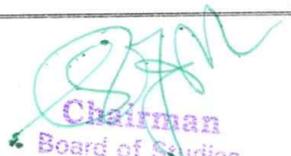
Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Joseph D.Bronzino	The Biomedical Engineering Handbook, Third Edition	Three Volume Set, CRC Press	2006
2.	Levine S.N.(Ed.),	Advances in Biomedical Engineering and Medical Physics Vol:1,2 & 4,	Inter University Publications, New York, Edition	1968

  
**Chairman**  
**Board of Studies**  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

3.	Kolff W.J	Artificial Organs	John Wiley and Sons, New York, Edition	1979
4.	Andreas.F. Von racum,	Hand book of Bio material Evaluation	Mc.Millan Publishers	1980
5.	Albert M.Cook and Webster.J.G	Therapeutic Medical Devices	Prentice Hall Inc., New Jersey	1992

**WEB REFERENCE(s)**

1. [https://www.tnhp.com/sites/default/files/file-library/resources/provider-manuals/cshcn/2021/2021-04-apr/28\\_Ortho\\_Prosth\\_Dvcs.pdf](https://www.tnhp.com/sites/default/files/file-library/resources/provider-manuals/cshcn/2021/2021-04-apr/28_Ortho_Prosth_Dvcs.pdf)
2. [http://www.oandplibrary.org/op/pdf/1977\\_02.pdf](http://www.oandplibrary.org/op/pdf/1977_02.pdf)
3. <https://study.com/academy/lesson/prosthetic-devices-function-use-examples.html>
4. <https://www.uofmhealth.org/conditions-treatments/rehabilitation/orthotics-and-prosthetics>
5. <https://www.aopa.org.au/careers/what-are-orthoses-and-protheses>



**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

19MDC15

**ELECTRICAL SAFETY & QUALITY ASSURANCE**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

1. To provide electrical protection and maintenance in working environment.
2. To ensure the electrical safety.
3. To learn about Safety Aspects in Medical Imaging systems
4. To study about the Standards and Regulations Background of electrical safety device
5. To gain the knowledge of Diagnostic Medical Devices Directives

**COURSE OUTCOMES**

1. The purpose of this course is to help students to develop knowledge and insight into the procedures
2. Knowledge used in quality control and assurance activities as well as safety measures to be followed in hospitals.
3. Electrical safety and different standards Testing and verification of medical devices.
4. Safety & precautions Safety aspects in electro surgical systems
5. Guidelines on medical devices with the knowledge of Diagnostic Medical Devices Directives

Course Outcomes	Program Outcomes												PSOs		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
19MDC15.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
19MDC15.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDC15.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDC15.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDC15.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

**UNIT I**

**CLASSIFICATION OF DEVICE**

9

Classification of Device: Device classes, types in medical field

**PATIENT SAFETY:**

Electric shock hazards, Leakage currents, macro shock, micro shock hazards and preventions, safety codes and analyzer. Safety & precautions Safety aspects in electro surgical systems

**UNIT II**

**SAFETY ASPECTS IN MEDICAL IMAGING SYSTEMS**

9

Biological effects of ionizing radiation- Determinants of biological effects, Short term & long term effects Ultrasound bio-effects, Radio biology of nuclear medicine, biological effects of magnetic field Laser safety- fundamentals, safety consideration of lasers.

**UNIT III**

**DEFINITION**

9

Defining the device, The product definition process, Overview of quality function deployment, The QFD process, The business proposals Reliability: Types of Reliability, Optimizing reliability, Reliability's effects on medical devices. Concept of Failure: Various methods of CAPA Safety and Risk Management: Personnel safety and hygiene, Medical device safety and risk management, The role of each participant/stakeholder, Shared responsibility for medical device safety and performance. Electrical safety and different standards Testing and verification of medical devices.

**UNIT IV**

**STANDARDS AND REGULATIONS BACKGROUND**

9

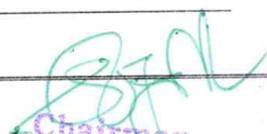
Standards: Voluntary and mandatory standards, Standards development process, Conformity assessment with standards, National and international standards systems, Identification of standards, Current trends in the use of standards in medical device regulations. The ISO 9000 Series of Standards.

**UNIT V**

**THE MEDICAL DEVICES DIRECTIVES**

9

Definition of a medical device, The Medical Devices Directives process, Choosing the appropriate directive, Identifying the applicable essential requirements, Identification of corresponding harmonized standards, Essential requirements, Classification of the device based on conformity, Medical Devices Directives, Active Implantable Medical Devices Directives. In-vitro Diagnostic Medical Devices Directives. NABH, NABL, JCI, AERB, WHO guidelines on medical devices.

  
**Chairman**  
**Board of Studies**  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous),  
 Rasipuram, Namakkal Dist - 637 408.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Richard Fries	Reliable Design of Medical Devices	Second Edition by, CRC Press	2006.
2.	Richard C Fries, CRC Press	Medical Device Quality Assurance and Regulatory Compliance	CRC Press	1998.
3.	Michael Cheng	Medical device regulations: global overview and guiding principles	World Health Organization	Latest Edition
4.	Gábor Czitán, Attila Gutassy, Ralf Wilde	Product Safety in the European Union	TÜV Rheinland Akadémia	2008.

**WEB REFERENCE(s)**

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1121134/>
2. <https://www.ncbi.nlm.nih.gov/books/NBK2686>. [https://www.bnl.gov/nsls2/project/PDR/4-ESHQ\\_Ch\\_1\\_Intro\\_QA.pdf](https://www.bnl.gov/nsls2/project/PDR/4-ESHQ_Ch_1_Intro_QA.pdf)
3. <https://www.americares.org/globalassets/publications/comm/misc/hws/hwsi-guide-standards-0413.pdf>
4. <http://fobi.us/wp-content/uploads/2018/05/Medical-Equipment-QA-Program.pdf>
5. <https://www.qualityindicators.ahrq.gov/>

  
**Chairman**  
 Board of Studies

Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

19MDC17

MEDICAL SIGNAL PROCESSING

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

1. To study about the adaptive filters and their analysis.
2. To discuss the Data Compression Techniques.
3. To study about the Cardio-logical Signal Processing.
4. To learn about the Neurological signal processing.
5. To study about the sleeping modes of EEG.

**COURSE OUTCOMES**

1. Choose an filter for the ECG analysis.
2. Write the types of algorithm for data compression.
3. Idea about processing the ECG signal and their estimations.
4. Study about EEG and their parameters.
5. Study about the sleeping modes of EEG.

Course Outcomes	Program Outcomes												PSOs		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	PS03
19MDC17.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDC17.CG2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC17.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC17.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC17.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

**UNIT I**

**ADAPTIVE FILTERS**

9

Introduction, Principle of an adaptive filter, the steepest descent algorithm, adaptive noise canceller, cancellation of interference in electrocardiography, applications of adaptive filters. Canceling Donor heart Adaptive filters, high frequency noise in ECG, motion artifact in ECG, cancellation of ECG signal from the electrical activity of the chest muscles, cancellation of high frequency noise in Electro-surgery.

**UNIT II**

**DATA COMPRESSION TECHNIQUES**

9

Introduction, Loss and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, FAN coding techniques.

**UNIT III**

**CARDIO-LOGICAL SIGNAL PROCESSING**

9

Introduction, ECG Parameters and their estimations: ECG QRS Detection techniques, estimation of R-R interval, estimation of ST segment inclination, Rhythm analysis, arrhythmia analysis monitoring, and long term continuous ECG recording.

**UNIT IV**

**NEUROLOGICAL SIGNAL PROCESSING**

9

Introduction, Linear prediction theory, the Autoregressive (AR) method, Recursive estimation of AR parameters, Spectral error measure, Adaptive segmentation, EEG Transient detection and elimination in epileptic patients and its overall performance.

**UNIT V**

**SLEEP EEG**

9

Introduction, Data acquisition and classification of sleep stages, The Markov model and Markov chains, Dynamics of sleep-wake transitions, Hypnogram model parameters, Event history analysis for modeling sleep.

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 406.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	D.C.Reddy	Biomedical Signal Processing- principles and techniques	Tata McGraw-Hill	2005
2.	Rangaraj. M. Rangayyan	Biomedical Signal Analysis	IEEE Press	2001
3.	Willis J.Tompkis	Biomedical Digital Signal Processing	PHI	Latest Edition
4.	Akay.M	Biomedical Signal Processing	Academic: Press	1994

**WEB REFERENCE(s)**

1. <https://ocw.mit.edu/courses/health-sciences-and-technology/hst-582j-biomedical-signal-and-image-processing-spring-2007/lecture-notes/>
2. <https://lecturenotes.in/subject/46/biomedical-signal-processing>
3. <https://nptel.ac.in/courses/108/105/108105101/>
4. <https://ocw.mit.edu/courses/health-sciences-and-technology/hst-582j-biomedical-signal-and-image-processing-spring-2007/lecture-notes/>
5. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.485.9364&rep=rep1&type=pdf>



**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

19MDC18

DIGITAL ELECTRONICS

L T P C  
3 0 2 4

**COURSE OBJECTIVES**

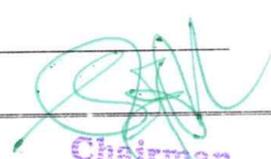
1. To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
2. To outline the formal procedures for the analysis and design of combinational circuits
3. To outline the formal procedures for the analysis and design of sequential circuits
4. To illustrate the concept of synchronous and asynchronous sequential circuits
5. To introduce the concept of Different Logic Families and programmable logic devices.

**COURSE OUTCOMES**

1. Apply Boolean algebra, Karnaugh map and Tabulation method for simplification of Boolean expressions
2. Design combinational logic circuits for various applications
3. Design shift registers, Modulo-N asynchronous and synchronous counters
4. Design and analyze state machines for the given specifications
5. Discuss different logic families and Implement digital circuit in programmable logic devices

Course Outcomes	Program Outcomes												PSOs		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
19MDC18.CO1	X	X	X	X	X	-	-	-	-	-	-	X	X	X	X
19MDC18.CO2	X	X	X	X	X	-	-	-	X	-	-	X	X	X	X
19MDC18.CO3	X	X	X	X	X	-	-	-	X	-	-	X	X	X	X
19MDC18.CO4	X	X	X	X	X	-	-	-	X	-	-	X	X	X	X
19MDC18.CO5	X	X	X	X	X	-	-	-	X	-	-	X	X	X	X

- UNIT I BASIC CONCEPTS OF DIGITAL SYSTEMS 9**  
 Review of Number systems, Number Representation, Boolean algebra, Boolean postulates and laws - De-Morgan's Theorem - Principle of Duality, Simplification using Boolean algebra, Canonical forms - Sum of product and Product of sum - Minimization using Karnaugh map and Tabulation method.
- UNIT II COMBINATIONAL CIRCUITS 9**  
 Realization of combinational logic using gates , Design of combinational circuits : Adder , Subtractor, Parallel adder Subtractor, Carry look ahead adder, Magnitude Comparator, Parity generator and checker, Encoder, Decoder, Multiplexer, Demultiplexer - Function realization using Multiplexer, Decoder - Code converters.
- UNIT III SEQUENTIAL CIRCUITS 9**  
 Flip-flops - SR, JK, D and T- Master-Slave – Triggering - Characteristic table and equation – Application table – Asynchronous and synchronous counters - Shift registers - Types – Universal shift registers – Ring counter – Johnson Counters- Serial adder / Subtractor.
- UNIT IV SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS 9**  
 Mealy and Moore models – State diagram - State table – State minimization – State assignment - Excitation table - Design of Synchronous sequential circuits: Counters and Sequence generators- Circuit implementation - Asynchronous sequential circuits - Hazards and Races, Hazard free combinational circuits
- UNIT V LOGIC FAMILIES AND PROGRAMMABLE DEVICES 9**  
 Introduction to Logic families – TTL & CMOS Logic and their characteristics – Tristate gates - Programmable Logic Devices – Programmable LogicArray (PLA) - Programmable Array Logic (PAL) ,Field Programmable Gate Arrays (FPGA) – Implementation of combinational logic circuits using PLA,PAL

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Morris Mano M. and Michael D. Ciletti	Digital Design	Pearson Education	V Edition, 2013.
2.	Donald D.Givone,	Digital Principles and Design	Tata Mc-Graw Hill Publishing company limited, New Delhi	2002
3.	Thomas L. Floyd	Digital Fundamentals	Pearson Education Inc	10th Edition, 2011
4.	Charles H. Roth Jr,	Fundamentals of Logic Design	Jaico Publishing House	Fifth Edition-, Mumbai, 2003
5.	Leach D, Malvino A P & Saha	Digital Principles and Applications	Tata McGraw-Hill Publishing Company	8th Edition, , 2014

**WEB REFERENCE(s)**

1. [www.nptel.ac.in/courses/117105080/7](http://www.nptel.ac.in/courses/117105080/7)
2. [www.nptel.ac.in/video.php?subjectId=117105080](http://www.nptel.ac.in/video.php?subjectId=117105080)
3. [www.nptelvideos.in/2012/12/digital-systems-design.html](http://www.nptelvideos.in/2012/12/digital-systems-design.html)
4. [www.allaboutcircuits.com](http://www.allaboutcircuits.com)
5. [www.electronicsforu.com](http://www.electronicsforu.com)



**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

19MDC19

LOGIC CIRCUITS FOR CLINICAL LABORATORY

L T P C  
0 2 0 1

LIST OF EXPERIMENTS

1. Inverting, Non inverting and Differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Schmitt Trigger using op-amp.
5. Phase shift and Wien bridge oscillators using op-amp.
6. Astable and monostable multivibrators using NE555 Timer.
7. Mini Projects

19MDC20

MEDICAL SIGNAL PROCESSING LABORATORY

L T P C  
0 2 0 1

LIST OF EXPERIMENTS

1. Generation of sequences (functional & random) & correlation
2. Linear and Circular Convolutions
3. Spectrum Analysis using DFT filter design

DSP Processor Based Implementation

4. Study of architecture of Digital Signal Processor
5. Convolution
6. FFT Implementation
7. Waveform generation
8. Implementation of Filter Design
9. Mini Project

19MDC21

MEDICAL EXPERT SYSTEMS LABORATORY

L T P C  
0 2 0 1

LIST OF EXPERIMENTS

Study of Medical Expert systems

1. MYCIN
2. PUFF
3. Fuzzy diagnostic systems
4. Neural network based Expert systems
5. Support vector Machine – Expert systems

Development of Medical Expert systems

6. Hospital Management
7. Respiratory disorder
8. Fetal Monitoring System
9. Heart rater variability monitoring
10. Monitoring in Diabetes Milletes



Chairman  
Board of Studies  
Department of Medical Electronics  
Muthayammal Engineering College (Autonomous)  
Resipuram, Namakkal Dist - 637 408.

19MDC22

**PATHOLOGY AND MICROBIOLOGY  
LABOTATORY**

**L T P C**  
0 2 0 1

**LIST OF EXPERIMENTS**

1. Urine physical and chemical examination (protein, reducing substances, ketones, bilirubin and blood)
2. Study of parts of compound microscope
3. Histopathological slides of benign and malignant tumours.
4. Manual paraffin tissue processing and section cutting (demonstration)
5. Cryo processing of tissue and cryosectioning (demonstration)
6. Basic staining – Hematoxylin and eosin staining.
7. Special stains – cresyl fast Blue (CFV)- Trichrome – oil red O – PAS
8. Capsule stain
9. Simple stain.
10. Gram stain.
11. AFB stain.

19MDC23

**BIOMEDICAL SENSORS AND MEASUREMENTS  
LABOTATORY**

**L T P C**  
0 2 0 1

**LIST OF EXPERIMENTS**

1. Real Time data Acquisition and Analysis of the following physiological parameters ECGs (EKGs), EMGs, and EEGs
2. Measurement of Blood Pressure using Sphygmomanometer & Digital meter.
3. Recording of Electromyogram/ nerve conduction velocity.
4. The Galvanic Skin Response Amplifier
5. Study of lung and cardiovascular models
6. Bridge Amplifier: Testing of various transducers including commonly available i)force, ii)pressure, and iii)displacement transducers, iv)temperature probes, v)light meters,
7. Study and usage of Automatic defibrillators.
8. Measurement of pH of a given solution using pH meter.
9. Determination of solution concentration using Colorimeter/Spectrophotometer.

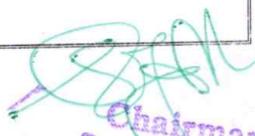
19MDC24

**MEDICAL IMAGE PROCESSING LABOTATORY**

**L T P C**  
0 2 0 1

**LIST OF EXPERIMENTS**

1. Color image segmentation algorithm development
2. wavelet/vector quantization compression
3. Deformable templates applied to skin tumor border finding
4. Helicopter image enhancement
5. High-speed film image enhancement
6. Computer vision for skin tumor image evaluation
7. New border images
8. **Mini Project (Select One):**  
Take a hand written document, Perform preprocessing and try to segment into characters  
Take an image, design fuzzy rules for content based image retrieval.  
Take an image, design a neural network for content based image retrieval.

  
**Chairman**  
Board of Studies  
Department of Medical Electronics  
Muthayammal Engineering College (Autonomous)  
Rasipuram, Namakkal Dist - 637 406

19MDC25

**ANALOG ELECTRONICS**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

1. Design and construct amplifiers
2. Construct JFET and MOSFET amplifiers
3. Study rectifiers and power supplies
4. Learn about feedback amplifiers
5. Learn about oscillators

**COURSE OUTCOMES**

1. To learn about Design and construct amplifiers
2. To Construct JFET and MOSFET amplifiers
3. To Study rectifiers and power supplies
4. To Learn about feedback amplifiers
5. To Learn about oscillators

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDC25.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDC25.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC25.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC25.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDC25.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

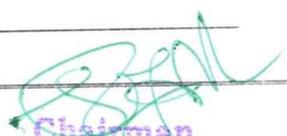
**UNIT I** **BJT AMPLIFIERS** **9**  
 CE, CB and CC amplifiers - Method of drawing small-signal equivalent circuit- Analysis of transistor amplifier Configurations-current and voltage gain, input and output impedance -Differential amplifiers- CMRR- Darlington Amplifier- Bootstrap technique - Multistage amplifiers -Cascaded stages - Cascode Amplifier. Large signal Amplifiers – Class A, Class B and Class C Power Amplifiers

**UNIT II** **JFET AND MOSFET AMPLIFIERS** **9**  
 Small signal analysis of JFET amplifiers- Small signal Analysis of MOSFET and JFET, Common source amplifier, Voltage swing limitations, Small signal analysis of MOSFET and JFET Source follower and Common Gate amplifiers, - BiCMOS,Cascode amplifier.

**UNIT III** **RECTIFIERS AND POWER SUPPLIES** **9**  
 Rectifiers - Half-wave, full-wave and bridge rectifiers – Rectifiers with filters- C, L, and CLC filters Voltage regulators - Zener diode regulator- regulator with current limiting, Over voltage protection, Switched mode power supply (SMPS).

**UNIT IV** **FEEDBACK AMPLIFIERS** **9**  
 General Feedback Structure – Properties of negative feedback – Basic Feedback Topologies –Feedback amplifiers – Series – Shunt, Series – Series, Shunt – Shunt and Shunt – Series Feedback – Determining the Loop Gain – Stability Problem.

**UNIT V** **OSCILLATORS** **9**  
 Classification, Barkhausen Criterion - Mechanism for start of oscillation and stabilization of amplitude, General form of an Oscillator, Analysis of LC oscillators - Hartley, Colpitts,Clapp, Tuned collector oscillators, RC oscillators - phase shift –Wienbridge - Twin-T Oscillators, Frequency range of RC and LC Oscillators, Quartz Crystal Construction, Electrical equivalent circuit of Crystal, Miller and Pierce Crystal Oscillators, frequency stability of oscillators.

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Donald .A. Neamen	Electronic Circuit Analysis and Design	Tata Mc Graw Hill	2nd Edition, 2009
2.	Robert L. Boylestad and Louis Nasheresky	Electronic Devices and Circuit Theory	Pearson Education / PHI	10th Edition 2008
3.	Adel .S. Sedra, Kenneth C. Smith	Micro Electronic Circuits	Oxford University Press	6th Edition, 2010
4.	Behzad Razavi	Design of Analog CMOS Integrated Circuits	Tata Mc Graw Hill,	2007
5.	Paul Gray, Hurst, Lewis, Meyer	Analysis and Design of Analog Integrated Circuits	John Willey & Sons	4th Edition 2005

**WEB REFERENCE(s)**

1. [www.nptel.ac.in/courses/117101106/7](http://www.nptel.ac.in/courses/117101106/7)
2. [www.nptel.ac.in/courses/117101106/9](http://www.nptel.ac.in/courses/117101106/9)
3. [www.nptel.ac.in/courses/117101106/8](http://www.nptel.ac.in/courses/117101106/8)
4. [www.nptel.ac.in/courses/117106088/1](http://www.nptel.ac.in/courses/117106088/1)
5. [www.nptel.ac.in/courses/117106088/14](http://www.nptel.ac.in/courses/117106088/14)

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayamma Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

19MDC26

**ANALOG ELECTRONICS LABOTATORY**

L	T	P	C
0	2	0	1

**LIST OF EXPERIMENTS**

1. Frequency Response of CE amplifier 2.
2. Frequency Response of CS amplifier
3. Frequency response of feedback amplifier circuit-current series
4. Frequency response of feedback amplifier circuit- voltage shunt
5. Transistor based design of RC phase Shift Oscillator circuit
6. Transistor based design of Wein Bridge Oscillator circuit
7. Power Supply circuit - Half wave rectifier and Full wave rectifier with simple capacitor filter
8. Mini Project

19MDC27

**MICROPROCESSOR AND MICROCONTROLLER LABORATORY**

L	T	P	C
0	2	0	1

**LIST OF EXPERIMENTS**

1. Addition, subtraction, multiplication, division using 8086 processor
2. Sorting of numbers in ascending order using 8086 processor
3. Sorting of numbers in descending order using 8086 processor
4. Palindrome and Fibonacci series using 8086 processor
5. Sorting of even numbers in an array using 8086 processor
6. Finding the largest and smallest number in an array using 8086 processor
7. Addition of two numbers using 8051 processor
8. Subtraction of two numbers using 8051 processor
9. Multiplication of two numbers using 8051 processor
10. Sorting of numbers in ascending order using 8051 processor
11. Sorting of numbers in descending order using 8051 processor
12. Palindrome and fibonacci series using 8051 processor
13. Sorting of even numbers in an array using 8051 processor
14. Basic programs using ARM controller

19MDE01

**ADVANCED BIO ANALYTICAL & THERAPEUTIC TECHNOLOGY**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

- To study about the microscopy
- To learn about the hybrid techniques and types of chromatography
- To study about the special techniques in advanced bio analytical.
- To learn the radiation therapy and radiation safety.
- To analysis about the basics of respiratory aids

**COURSE OUTCOMES**

- Idea about the imaging techniques in microscopy.
- Types of techniques in advanced bio analytical.
- Know about the types of special techniques.
- Knowledge about the types of respiratory aids.
- Know about the radiation & safety of radiation.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDE01.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDE01.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE01.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE01.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE01.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

**ADVANCED IMAGING TECHNIQUES IN MICROSCOPY**

9

**UNIT I**

Live cell imaging, Confocal microscopy and sample preparation for fluorescence microscopy - High content/throughput screening - Basics of SEM & Specimen preparation for SEM - Basics of TEM & Specimen preparation for TEM. Advanced EM techniques: Electron tomography and Serial block face imaging using SEM - CryoEM - Methods to study interactions: FRET, FCCS and BiFC - Atomic Force Microscopy - Dynamics methods: photo-bleaching and activation - STED - Structured Illumination Microscopy - Multi-photon microscopy and In vivo imaging.

**UNIT-II**

**ANALYTICAL HYBRID TECHNIQUES**

9

Gas chromatography with mass spectrometric detection (GC-MS), liquid chromatography with mass spectrometric detection (LC-MS), inductively coupled plasma with mass spectrometric detection (ICP-MS). Metal analysis by ICP-MS; Analysis of data: HPLC chromatograms, including trouble shooting - how to achieve good separation on HPLC; GC-MS data; LC-MS spectra

**UNIT III**

**ANALYTICAL SPECIAL TECHNIQUES**

9

Flow Cytometer: Introduction to flow cytometry- Fluorochromes and fluorescence - Experimental design and fluorescence quantitation Compensation and gating - Normalization - Comparing Univariate Cell Distributions - Probability Binning - Readings on flow cytometry data analysis. isoelectric focusing and 2-Dimensional polyacrylamide gel electrophoresis and their uses in protein research. Protein crystallization; Theory and methods.

**UNIT IV**

**RESPIRATORY AIDS**

9

korotkoff's method measurement of respiratory rate: Impedance Pneumography. OXIMETERS: Principle, pulse oximeter, Ventilator- Need, Types, Intermittent positive pressure, breathing apparatus operating sequence, electronic IPPB unit with monitoring for all respiratory parameters, Humidifier, Nebulizer, Aspirator.

**UNIT V**

**RADIATION THERAPY AND RADIATION SAFETY**

9

Effects of ionising radiation, Radiation therapy - Cobalt Cesium therapy, linear accelerator, betatron, cyclotron, brachy-therapy, Radiation protection in medicine- radiation protection principles.

  
**Chairman**  
**Board of Studies**  
**Department of Medical Electronics**  
**Muthayammal Engineering College**  
**Rasipuram, Namakkal Dist. - 641 002, T.N.**

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Skoog, D.A., Crouch, S.R., and Holler, F.J	Principles of Instrumental Analysis	6th edition, Brooks/Cole, USA	2006
2.	R.S.Khandpur	Hand book of Biomedical Instrumentation	Tata McGraw Hill, NewDelhi	1998
3.	Albert M.Cook and Webster.J.G	Therapeutic Medical Devices	Prentice Hall Inc., New Jersey	1982
4.	Leslie Cromwell, Fred. J. Weibel, Erich.A.Pferffer	Biomedical Instrumentation and Measurements	Prentice Hall India, NewDelhi	2001
5.	Rangaraj.M.Rangayyan	Biomedical Signal Analysis-A Case Study Approach	IEEE Press-John Wiley&Sons Inc, New York	2002

**WEB REFERENCE(s)**

1. <https://analytika.pharmaceuticalconferences.com/events-list/advance-bio-analytical-techniques>
2. <https://onlinelibrary.wiley.com/doi/book/10.1109/9780470544204>
3. [http://www.biomedicahelp.altervista.org/SecondoAnno/StatisticaSegnali/Segnali/Segnali\\_BiomedicalSignalAnalysisBook\\_Libro.pdf](http://www.biomedicahelp.altervista.org/SecondoAnno/StatisticaSegnali/Segnali/Segnali_BiomedicalSignalAnalysisBook_Libro.pdf)
4. <https://people.ucalgary.ca/~ranga/enel563/Lectures1stEdCh1-2-3.pdf>
5. [http://www.naweb.iaea.org/nahu/DMRP/documents/slides/Chapter\\_16\\_Radiation\\_protection\\_and\\_safety.pdf](http://www.naweb.iaea.org/nahu/DMRP/documents/slides/Chapter_16_Radiation_protection_and_safety.pdf)



**Chairman**  
**Board of Studies**  
**Department of Medical Electronics**  
**Muthusammal Engineering College**  
**Rasipuram, Namakkal Dist**

19MDE02

**TISSUE ENGINEERING**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

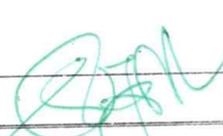
1. Expose to Tissue Engineering
2. Understand the Cell cycle and differentiation
3. Be familiar with stem cells.
4. Understand different synthetic and biomaterials

**COURSE OUTCOMES**

1. Explain the components of Tissue Engineering
2. Use appropriate materials in tissue engineering
3. Apply Tissue Engineering in different fields
4. Understand different synthetic and biomaterials
5. Understand the Cell cycle and differentiation

Course Outcomes	Program Outcomes												PSOs		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	PS03
19MDE02.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDE02.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE02.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE02.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE02.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

- UNIT I** **FUNDAMENTALS OF TISSUE ENGINEERING** 9  
 Tissue exchange and tissue development - Objectives of tissue engineering - Laboratory set up for tissue engineering. Cell cycle and differentiation - cell adhesion - cell adhesion molecules - cell migration - cell aggregation and tissue equivalent.
- UNIT II** **STEM CELLS** 9  
 Definition of stem cells – types of stem cells – differentiation, dedifferentiation maturation, proliferation, pluripotency and immortalization. Sources of stem cells: haematopoietic – fetal - cord blood – placenta - bone marrow - primordial germ cells - cancer stem cells - induced pluripotent stem cells.
- UNIT III** **COMPONENTS OF TISSUE ENGINEERING** 9  
 Cell and Drug delivery systems - Transplantation – Implantation - Synthetic components – nanotechnology in tissue engineering – Imaging methods: SEM, TEM, Fluorescent and Confocal microscopy.
- UNIT IV** **MATERIALS IN TISSUE ENGINEERING** 9  
 Biological materials – degradable and non degradable – extra cellular matrix – decellularization - Polymers: synthetic and natural – cell interaction with polymers – applications of polymer.
- UNIT V** **APPLICATION OF TISSUE ENGINEERING** 9  
 Replacement Engineering: Artificial organs – cartilage, skin blood, pancreas, kidney and liver. Regenerative engineering: Nerve regeneration – cardiac tissue regeneration – muscle regeneration.

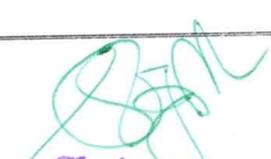
  
**Chairman**  
**Board of Studies**  
**Department of Medical Electronics**  
**Muthayammal Engineering College (Autonomous)**  
**Rasipuram, Namakkal Dist. - 637 002**

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	CS Potten,	Stem cells .(Unit I &II).	Elsevier	1997
2.	W.Mark Saltzman	Tissue Engineering – Engineering principles for design of replacement organs and tissue (Units I,III,IV&V)	Oxford University Press Inc New York	2004
3.	Gray E. Wnek, Gray L Browlin	Encyclopedia of Biomaterials and Biomedical Engineering	Marcel Dekker Inc New York	2004
4.	R. Lanza,J. Gearhart et al(Eds),	Essential of Stem Cell Biology	Elsevier Academic press	2006
5.	R.Lanza,I.Weissman, J. Thomson, and R. Pedersen	Handbook of Stem Cells”, Two Volume, Volume 12: Volume 1.Embryonic Stem Cells Volume 2.Adult & Fetal Stem Cells	Academic Press.	2004

**WEB REFERENCE(s)**

1. [ocw.mit.edu](http://ocw.mit.edu) > Courses > Health Sciences and Technology MIT Open Course War <http://ocw.mit.edu>
2. <https://nptel.ac.in/courses/102/106/102106036/>
3. [https://ocw.mit.edu/courses/mechanical-engineering/2-782j-design-of-medical-devices-and-implants-spring-2006/lecture-notes/ch5\\_tel.pdf](https://ocw.mit.edu/courses/mechanical-engineering/2-782j-design-of-medical-devices-and-implants-spring-2006/lecture-notes/ch5_tel.pdf)
4. <https://www.biologydiscussion.com/biotechnology/tissue-engineering/tissue-engineering-4-aspects-with-diagram/10577>
5. <https://www.nibib.nih.gov/science-education/science-topics/tissue-engineering-and-regenerative-medicine>

  
Chairman  
Board of Studies

19MDE03

MEDICAL SCIENCE

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

1. To identify the various function and basics of tissues, cartilage propagation of action potential
2. To identify the functional component and basics of Nervous system.
3. To identify and understand complete cardiovascular system from blood vessel to parts of heart and also know about function of all parts of digestive system.
4. To identify the function of all the parts of respiratory system
5. To identify the importance function of skeletal system and various types of joints.

**COURSE OUTCOMES**

1. Essentials of structural and functional anatomy of the human body
2. Anatomy and physiology of various nervous system
3. Anatomy and physiology of various cardiovascular system,
4. Anatomy and physiology of digestive system
5. Anatomy and physiology of respiratory system

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDE03.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDE03.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE03.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE01.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE03.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

**UNIT I INTRODUCTION: HOMEOSTASIS, TISSUE, CARTILAGE 9**

The internal environment and homeostasis, movement of substances within the body, body fluids, action potential, propagation of action potential. Epithelial tissue- simple epithelium, stratified epithelium, connective tissue- cells of connective tissue, loose connective tissue, Adipose tissue, Dense connective tissue, Lymphoid tissue, Cartilage- Hyaline cartilage, Fibrocartilage, Elastic cartilage.

**UNIT II NERVOUS SYSTEM 9**

Neurons: Properties of neurons, Cell bodies, Axon and Dendrites, Types of nerves, Synapse and neurotransmitters, neuromuscular junction. Central nervous system: neuroglia, meninges, ventricles of the brain and CSF. Brain: Cerebrum, functions of cerebrum, functional areas of the cerebrum. Brainstem: Cerebellum, Spinal cord- grey matter, white matter, motor nerve tracts, spinal nerves: nerve roots, plexuses, cranial nerves. Autonomic nervous system - functions and effects.

**UNIT III CARDIO VASCULAR SYSTEM 9**

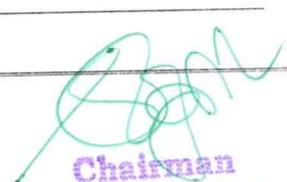
Introduction, Blood vessels- Arteries and Arterioles, Veins and Venules, capillaries and sinusoids, control of blood vessel diameter, blood supply- internal respiration, cell nutrition. Heart- position, structure pericardium, myocardium, endocardium, interior of the heart, flow of blood through the heart, blood supply to heart, Conducting system of the heart, factors affecting heart rate, the Cardiac cycle, cardiac output, blood pressure, control of blood pressure, pulse and factors affecting the pulse rate. Circulation of the blood pulmonary circulation, systemic circulation, aorta, circulation of blood to head and neck, circulation of blood to upper limb, portal circulation.

**UNIT IV DIGESTIVE SYSTEM 9**

Introduction, Organs of the digestive system- mouth: tongue, teeth, salivary glands, pharynx, oesophagus, stomach, gastric juice and functions of stomach- small intestine: structure, chemical digestion in small intestine, large intestine: structure, functions of the large intestine, rectum and anal canal. Pancreas, Liver

**UNIT V RESPIRATORY SYSTEM 9**

Introduction, Nose and Nasal cavity- position, structure and functions, pharynx, position, structure, functions. Larynx: position, structure and functions. Trachea, bronchi, bronchioles and alveoli, lungs- position, associated structure, pleura and pleural cavity. Respiration- muscles of respiration cycle of respiration, variables affecting respiration, lung volumes and capacity.

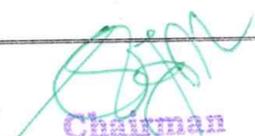
  
**Chairman**  
**Board of Studies**  
**Department of Medical Electronics**  
**Muthayyamsai Engineering College (Autonomous)**  
**Madhavur, Annamalai Dist - 637 403.**

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Elaine.N. Marieb,	Essential of Human Anatomy and Physiology	Pearson Education New Delhi.,	Eight edition,, 2007.
2.	Gillian Pocock, Christopher D. Richards	The Human Body An introduction for Biomedical and Health Sciences	Oxford University Press, USA	2009
3.	William F.Ganong	Review of Medical Physiology	Mc Graw Hill New Delhi	22nd edition
4.	Eldra Pearl Solomon	Introduction to Human Anatomy and Physiology	W.B. Saunders Company	2003
5.	Arthur C.Guyton	Text book of Medical Physiology	11 th Edition, Elsevier Saunders,	11th Edition, 2006

**WEB REFERENCE(S)**

1. <https://ourstudycircle.in/upscpdf/medical-science-optional-books-notes-pdf/>
2. <https://www.mediconotes.com/>
3. [https://www.ncad.ie/files/download/BMS\\_handbook\\_14-15.pdf](https://www.ncad.ie/files/download/BMS_handbook_14-15.pdf)
4. <https://www.docsity.com/en/study-notes/medicine-and-pharma/medical-sciences/>
5. <https://www.iqvia.com/-/media/library/white-papers/medical-science-liaisons.pdf>

  
**Chairman**  
**Board of Studies**  
**Department of Medical Electronics**  
**Muthayammal Engineering College (Autonomous)**  
**Ravipuram, Namakkal Dist - 637 403**

19MDE04

**BIOMATERIALS & CHARACTERIZATION**

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

1. To learn characteristics and classification of Biomaterials.
2. To study about the characteristics of thermal & mechanical properties of polymer & plastics.
3. To understand the characteristics of ceramic, carbon biomaterials.
4. To learn polymeric materials and its combinations that could be used as a tissue replacement implants
5. Understand the concept of biocompatibility and the methods for biomaterials testing

**COURSE OUTCOMES**

1. Know the basic knowledge of biomaterials.
2. Identify significant gap required to overcome challenges and further development in metallic and ceramic materials
3. Identify significant gap required to overcome challenges and further development in polymeric materials
4. Create combinations of materials that could be used as a tissue replacement implant.
5. Understand the testing standards applied for biomaterials

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDE04.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
19MDE04.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE04.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE04.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE04.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

<b>UNIT I</b>	<b>INTRODUCTION TO BIO-MATERIALS</b>	<b>9</b>
Definition and classification of bio-materials, mechanical properties, visco elasticity, biomaterial performance, body response to implants, wound healing, blood compatibility, Nano scale phenomena		
<b>UNIT II</b>	<b>POLYMER AND PLASTICS</b>	<b>9</b>
Classification, thermal properties, factors influencing polymer properties. Polymer compatibility, polymer degradation, restorable polymers, tissue adhesives, dialysis membrane, sutures. . MECHANICAL PROPERTIES AND TESTS: For elasticity, plasticity, and elasticity, dislocation deformation and fracture.		
<b>UNIT III</b>	<b>METALLIC AND CERAMIC BIOMATERIALS</b>	<b>9</b>
Properties and use to titanium alloys stainless steel, cobalt based alloys degradable ceramics.		
<b>UNIT IV</b>	<b>CARBON AND POLYMERIC BIOMATERIALS</b>	<b>9</b>
Carbon, polythene, polypropylene, silicones rubber, acrylic implants, hydrogels. DENTAL		
<b>UNIT V</b>	<b>IMPLANTS</b>	<b>9</b>
Alveolar bone replacements. Orthopedic implants-types of orthopedic function devices, permanent joint replacements, hip joints, bone cement, Biological testing of biomaterials.		

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Hench L.L. Ethridge E.C.	Biomaterials, An interfacial Approach	Academic Press,	1982
2.	John G. Webster, Bols	Encyclopedia of Medical Devices and Instruments. I-IV		
3.	Bronzins J.D	The Biomedical Engineering Hand book	CRC Press	1995

**WEB REFERENCE(s)**

1. [https://brainmaster.com/software/pubs/brain/The\\_Biomedical\\_Engineering\\_Handbook\\_.pdf](https://brainmaster.com/software/pubs/brain/The_Biomedical_Engineering_Handbook_.pdf)
2. <https://onlinelibrary.wiley.com/doi/abs/10.1002/jbm.820190515>
3. <https://theeye.eu/public/Books/BioMed/Encyclopedia%20of%20Medical%20Devices%20and%20Instrumentation%20e%20Vol%201%20All-Bra%20%28Wiley%202006%29.pdf>
4. [http://www.unhas.ac.id/tahir/BAHAN-KULIAH/BIO-MEDICAL/NEW/HANBOOK/13\\_Bioceramics.pdf](http://www.unhas.ac.id/tahir/BAHAN-KULIAH/BIO-MEDICAL/NEW/HANBOOK/13_Bioceramics.pdf)
5. [https://2019.febscongress.org/abstract\\_preview.aspx?idAbstractEnc=4424170094098093094094424170](https://2019.febscongress.org/abstract_preview.aspx?idAbstractEnc=4424170094098093094094424170)

**Chairman**  
Board of Studies

Department of Medical Electronics  
Muthayemmal Engineering College (Autonomous)  
Rasipuram, Namakkal Dist - 637 408.

19MDE05

**PHYSIOLOGICAL MODELING**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

1. To understand and appreciate the value and application of Physiological models and Vital organs.
2. To model dynamically varying physiological system
3. To understand methods and techniques for analysis and synthesis of dynamic models
4. To develop differential equations to describe the dynamic models, simulate and visualize,
5. To analysis the dynamic responses of physiological models using software.

**COURSE OUTCOMES**

1. Explain application of Physiological models.
2. Model dynamically varying physiological system
3. Discuss methods and techniques to analyze and synthesis dynamic models
4. Develop differential equations to describe the dynamic models, simulate and visualize
5. Implement physiological models using software to get dynamic responses

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDE05.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDE05.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE05.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE05.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE05.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

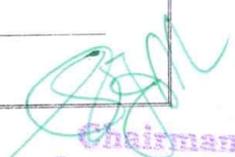
**UNIT I APPROACHES TO MODELING 9**  
The technique of mathematical modeling, classification of models, characteristics of models. Purpose of physiological modeling and signal analysis, linearization of nonlinear models. Time invariant and time varying systems for physiological modeling.

**UNIT II NONPARAMETRIC MODELING 9**  
Volterra models. Wiener models. Efficient volterra kernel estimation Analysis of estimation errors. Parametric modeling: Basic parametric model forms and Estimation procedures. Volterra kernels of nonlinear differential equations. Discrete-time volterra kernels of NARMAX models. From Volterra kernel measurements to Parametric models. Equivalence between continuous and Discrete -parametric models

**UNIT III EQUIVALENT CIRCUIT MODEL 9**  
Electromotive, resistive and capacitive properties of cell membrane, change in membrane potential with distance, voltage clamp experiment and Hodgkin and Huxley's model of action potential, the voltage dependent membrane constant and simulation of the model, model for strength-duration curve, model of the whole neuron. Huxley model of isotonic muscle contraction, modeling of EMG, motor unit firing: amplitude measurement, motor unit & frequency analysis.

**UNIT IV PHYSIOLOGICAL MODELING 9**  
Electrical analog of blood vessels, model of systematic blood flow, model of coronary circulation, transfer of solutes between physiological compartments by fluid flow, counter current model of urine formation, model of Henle's loop, and Linearized model of the immune response: Germ, Plasma cell, Antibody, system equation and stability criteria.

**UNIT V ELECTRICAL CIRCUIT MODEL OF OXYGENATION 9**  
A model of immune response to disease - Modeling of multi input/multi output systems: The Two-input case. Applications of two-input modeling to physiological systems. The Multi input case spatio temporal and spectro temporal modeling. Applications of Multi-input modeling to physiological systems

  
**Chairman**  
**Board of Studies**  
**Department of Medical Electronics**  
**Muthayammal Engineering College (Autonomous)**  
**Rasipuram, Namakkal Dist - 637 002**

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Michel C Khoo	Physiological Control Systems - Analysis, simulation and estimation	Prentice Hall of India	2001
2.	David T. Westwick, Robert E. Kearney	Identification of Nonlinear Physiological Systems	Wiley-IEEE Press	2003
3.	Endarle, Blanchard & Bronzino	Introduction to Biomedical Engg	Academic press	2012
4.	Suresh.R.Devasahayam	Signals & Systems in Biomedical Engineering	Kluwer Academic/Plenum Publishers.	2007
5.	V.Z. Marmarelis	Advanced methods of physiological modeling	Plenum Press	2008

**WEB REFERENCE(s)**

1. [https://en.wikibooks.org/wiki/Biomedical\\_Engineering\\_Theory\\_And\\_Practice/Physiological\\_Modeling\\_and\\_Simulation](https://en.wikibooks.org/wiki/Biomedical_Engineering_Theory_And_Practice/Physiological_Modeling_and_Simulation)
2. [https://www.researchgate.net/publication/262185321\\_Physiological\\_Systems\\_Modeling\\_Simulation\\_and\\_Control](https://www.researchgate.net/publication/262185321_Physiological_Systems_Modeling_Simulation_and_Control).
3. <https://nsec.lab.uconn.edu/home/courses-2/bme-3100-physiological-modeling/>.
4. <https://indico.egeu.eu/indico/event/1222/session/22/contribution/34/material/slides/0.pdf>.
5. <https://epubs.siam.org/doi/pdf/10.1137/1.9780898718287.ch8>



**Chairman**  
**Board of Studies**  
**Department of Medical Electronics**  
**Muthayammal Engineering College (Autonomous)**  
**Rasipuram, Namakkal Dist - 637 408.**

19MDE06

**BRAIN COMPUTER INTERFACE AND APPLICATIONS**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

1. To apply the knowledge of mathematics science and engineering fundamentals to understand the Brain Organization, Anatomy, and Function.
2. To analyze and study the Signal Processing for BCI's
3. To develop the basic understanding in Building a BCI
4. To study about the human devices
5. To learn about the real-time Medical Applications.

**COURSE OUTCOMES**

1. Equips the students with the knowledge of Brain Organization, Anatomy, and Function.
2. Analyze and process the brain signals for artifact reduction.
3. Understand types of BCI, in the Neurosciences domain.
4. Understand the principles and its applications in the Neurosciences domain.
5. Ability to have the ideas of human assist device with Medical Applications

Course Outcomes	Program Outcomes												PSOs		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
19MDE06.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
19MDE06.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE06.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE06.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE06.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

9

**UNIT I**

**BASIC NEUROSCIENCES**

Basic Neuroscience: Neurons, Action Potentials or Spikes, Dendrites and Axons, Synapses, Spike Generation, Adapting the Connections: Synaptic Plasticity – LTP, LTD, STDP, Short-Term Facilitation and Depression, Brain Organization, Anatomy, and Function. Recording Signals from the Brain: Invasive Techniques & Noninvasive Techniques. Stimulating the Brain - Neurochip.

**UNIT II**

**SIGNAL PROCESSING FOR BCI'S**

9

Time Domain Analysis: Hjorth Parameters, Fractal Dimension, Autoregressive (AR) Modeling, Bayesian Filtering, Kalman Filtering, Particle Filtering, Spatial Filtering: Bipolar, Laplacian, and Common Average Referencing, Principal Component Analysis (PCA), Independent Component Analysis (ICA), Common Spatial Patterns (CSP) Thresholding, Band-Stop and Notch Filtering,

**UNIT III**

**BUILDING A BCI**

Major Types of BCIs. Brain Responses Useful for Building BCIs, Conditioned Responses, Population Activity, Imagined Motor and Cognitive Activity, Stimulus-Evoked Activity. Invasive BCIs: Two Major Paradigms in Invasive Brain-Computer Interfacing: BCIs Based on Operant Conditioning, BCIs Based on Population Decoding.

**UNIT IV**

**INVASIVE BCIS IN HUMANS**

Cursor and Robotic Control Using a Multi electrode Array Implant, Cognitive BCIs in Humans, Long-Term Use of Invasive BCIs, Long-Term BCI Use and Formation of a Stable Cortical Representation, Long-Term Use of a Human BCI Implant ECoG BCIs in Humans, BCIs Based on Peripheral Nerve Signals, Nerve-Based BCIs, Targeted Muscle Innervation (TMR). Sensory Restoration, Restoring Sight: Cortical and Retinal Implants, Motor Restoration, Deep Brain Stimulation (DBS), Sensory Augmentation.

**UNIT V**

**MEDICAL APPLICATIONS**

Sensory Restoration, Motor Restoration, Cognitive Restoration, Rehabilitation, Restoring Communication with Menus, Cursors, and Spellers, Brain- Controlled Wheelchairs, Nonmedical Applications: Web Browsing and Navigating Virtual Worlds, Robotic Avatars, High Throughput Image Search Lie Detection and Applications in Law, Monitoring Alertness, Estimating Cognitive Load, Education and Learning, Security, Identification, and Authentication, Physical Amplification with Exoskeletons, Mnemonic and Cognitive Amplification, Brain-Controlled Art.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF
-------	-----------	-------------------	-----------	---------

*(Signature)*  
**Chairman**  
**Board of Studies**

**Department of Medical Electronics**  
**Muthayammal Engineering College (Autonomous)**  
**Rasipuram, Namakkal Dist - 637 408.**

				PUBLICATION
1.	Rajesh P. N. Rao	Brain-Computer Interfacing: An Introduction (1st Edition)	Cambridge University Press	Latest Edition
2.	Bernhard Graimann (Editor), Brendan Z. Allison (Editor), Gert Pfurtscheller (Editor)	Brain-Computer Interfaces: Revolutionizing Human-Computer Interaction	The Frontiers Collection Hardcover	Latest Edition
3.	Anton Nijholt, José Del R. Millán, Stephen Dunne	Towards Practical Brain-Computer Interfaces: Bridging the Gap from Research to Real-World Applications	Springer Science & Business Media	2012
4.	Mehmet R. Yuce, Jamil Y. Khan	Wireless Body Area Networks Technology, Implementation and Applications	Pan Stanford Publishing Pvt. Ltd Singapore.	2012
5.	Guang-Zhong Yang (Ed.),	Body Sensor Networks	Springer	2006

**WEB REFERENCE(S)**

- <https://imotions.com/blog/beginners-guide-neuroscience/>
- [http://scen.ucsd.edu/wiki/Introduction\\_To\\_Modern\\_Brain-Computer\\_Interface\\_Design](http://scen.ucsd.edu/wiki/Introduction_To_Modern_Brain-Computer_Interface_Design)
- <https://www.udemy.com/brain-computer-interface/>
- <https://towardsdatascience.com/a-beginners-guide-to-brain-computer-interface-and-convolutional-neural-networks-9f35bd4af948>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3497935/>

19MDE07

**MEDICAL OPTICS**

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

- The optical properties of the tissues and the interactions of light with tissues.
- The instrumentation and components in Medical Optics.
- The Medical Lasers and their applications
- The optical diagnostic applications
- The emerging optical diagnostic and therapeutic techniques

**COURSE OUTCOMES**

- Demonstrate knowledge of the fundamentals of optical properties of tissues
- Analyze the components of instrumentation in Medical Photonics and Configurations
- Describe surgical applications of lasers.
- Describe photonics and its diagnostic applications.
- Investigate emerging techniques in medical optics

Course Outcomes	Program Outcomes												PSOs		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	PS03
19MDE07.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDE07.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE07.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE07.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE07.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

**UNIT I**

**OPTICAL PROPERTIES OF THE TISSUES**

9

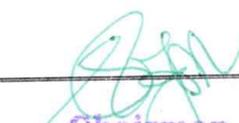
Fundamental Properties of light - Refraction, Reflection, Laws (Snell's law and Fresnel law) Scattering, Absorption, Light transport inside the tissue, Tissue properties, Laser Characteristics as applied to medicine and biology, Laser tissue Interactions – Photo chemical, Photo thermal and Photo mechanical interactions, Fluorescence, Speckles, Photo ablative processes.

**UNIT II**

**INSTRUMENTATION IN PHOTONICS**

9

Instrumentation for absorption, Scattering and emission measurements, Excitation light sources – high pressure arc lamps, LEDs, Lasers, Optical filters – Prism and Mono-chromators, Polarizer's, Optical detectors – Single Channel and Multichannel detectors, Time resolved and phase resolved detection methods, Optical fibers – Total Internal Reflection.

  
**Chairman**  
**Board of Studies**  
**Department of Medical Electronics**  
**Muthayammal Engineering College (Autonomous)**  
**Rasipuram, Namakkal Dist - 637 408.**

**UNIT III SURGICAL THERAPEUTIC APPLICATIONS OF LASERS 9**

Lasers in ophthalmology, Dermatology, Dentistry, Urology, Otolaryngology, Tissue welding and Soldering.

**UNIT IV NON THERMAL DIAGNOSTIC APPLICATIONS 9**

Optical coherence tomography, Elastography, Laser Induced Fluorescence (LIF)-Imaging, FLIM Raman Spectroscopy and Imaging, FLIM – Holographic and Speckle applications of lasers in biology and medicine.

**UNIT V DIAGNOSTIC AND THERAPEUTIC TECHNIQUES 9**

Near field imaging of biological structures, In vitro clinical diagnostics, Phototherapy, Photodynamic therapy (PDT) - Principles and mechanisms - Oncological and non-oncological applications of PDT – Bio-stimulation effect – applications - Laser Safety Procedures.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Tuan Vo Dirh	Biomedical Photonics	CRC Press	2014
2.	Paras N. Prasad	Introduction to Biophotonics	A. John Wiley and Sons, Inc. Publications	2003
3.	Markolf H.Niemz	Laser-Tissue Interaction Fundamentals and Applications	Springer	2007
4.	G.David Baxter	Therapeutic Lasers— Theory and practice	Churchill Livingstone publications	2001
5.	Leon Goldman, M.D & R.James Rockwell	Lasers in Medicine	Gordon and Breach, Science Publishers Inc	1975

**WEB REFERENCE(S)**

- <https://www.slideshare.net/ChintanMorsiya/optical-properties-71404985>
- <https://www.slideshare.net/ErFarukBinPoyen/optical-instrumentation-7-laser>
- <https://www.slideshare.net/abhaydhanorkar5/advanced-diagnostic-techniques>
- <https://www.slideshare.net/priyanka1194/thermal-imaging-and-its-applications>
- <https://www.slideshare.net/abhaydhanorkar5/advanced-diagnostic-techniques>

19MDE08

SOFT COMPUTING

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

- To provide adequate knowledge about neural networks
- To teach about the concept of fuzzy involved in various systems
- To provide adequate knowledge about genetic algorithm
- To gain knowledge on Hybrid Computing Techniques
- To provide adequate knowledge to modeling the system

**COURSE OUTCOMES**

- Describe basics of ANN and its learning algorithms
- Develop various Fuzzy Models
- Explain the terminologies associated to Genetic algorithms
- Develop a hybrid Computing Techniques
- Apply the concepts to solve real time problems

Course Outcomes	Program Outcomes												PSOs		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
19MDE08.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDE08.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE08.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

*(Signature)*  
Chairman  
Board of Studies

Department of Medical Electronics  
Muthayammal Engineering College (Autonomous)  
Rasipuram, Namakkal Dist - 637 408;

19MDE08.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE08.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

**NEURAL NETWORKS**

9

**UNIT I**

Fundamentals of Neural Networks – History- Architectures- Learning methods-XOR problem-Delta rule- derivation- Back propagation- applications- parameters in BPN- Associative memory – Hetero associative- BAM- energy function problems-applications of associative memories- ART1- ART2- applications of adaptive networks.

**UNIT II**

**BASIC CONCEPTS OF FUZZY LOGIC**

9

Introduction to fuzzy logic, Classical sets and Fuzzy sets, Fuzzy relations, Membership function: Features of membership function, Fuzzification, Methods of membership value assignments- Fuzzy rules and reasoning: Fuzzy if-then rules. Fuzzy Inference Systems (FIS): Introduction– Methods of FIS: Mamdani, Sugeno and Tsukamoto. Defuzzification: Lambda-Cuts for fuzzy sets and fuzzy relations, Defuzzification methods.

**UNIT III**

**GENETIC ALGORITHMS**

9

Fundamentals of Genetic Algorithms-Difference between Traditional Algorithms and Genetic Algorithms – creation of off springs – encoding – fitness function reproduction– Crossover- insertion& deletion- mutation- bitwise operators –applications- Multi-objective Genetic Algorithm (MOGA)- genetic algorithms in search and optimization, GA based clustering Algorithm.

**UNIT IV**

**HYBRID SOFT COMPUTING TECHNIQUES**

9

Hybrid systems – Neuro Fuzzy Modelling -Applications of Neural Networks- Pattern Recognition and classification – Neuro Genetic hybrids – fuzzy Genetic hybrids- GA based weight determination and applications- fuzzy BPN – simplified fuzzy ARTMAP. Other Soft Computing techniques: Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm Optimization (PSO).

**UNIT V**

**PROGRAMMING AND APPLICATIONS**

9

Using Neural Network toolbox – Using Fuzzy Logic toolbox- Using Genetic Algorithm & directed search toolbox Application: Printed Character Recognition, Optimization of travelling salesman problem using genetic algorithm approach. Identification and control of linear and nonlinear dynamic systems using Matlab-Neural Network toolbox

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	S.N.Sivanandam, S.N.Deepa	Principles of Soft Computing	Wiley	2nd Edition 2014
2.	Rajasekaran.S and VijayalakshmiPai.G.A	Neural Networks, Fuzzy Logic and Genetic Algorithms	PHI	2011
3.	J.S.R.Jang, C.T.Sun, E.Mizutani	Neuro – Fuzzy and Soft Computing	PHI Learning Pvt. Ltd	2012
4.	Timothy J.Ross	Fuzzy Logic with Engineering applications	John Wiley and Sons	2010
5.	Simon Haykin	Neural Networks Comprehensive Foundation	Pearson Education	Second Edition 2005

**WEB REFERENCE(s)**

1. <http://nptel.ac.in/courses/117105084/>
2. <http://nptel.ac.in/courses/108104049/13>
3. <http://nptel.ac.in/courses/106106126/15>
4. <http://nptel.ac.in/courses/108104049/27>
5. <http://www.nptelvideos.in/2012/12/neural-networks-and-applications.html>

19MDE09

**VIRTUAL REALITY**

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

1. To introduce the relevance of this course to the existing technology through demonstrations.
2. To study the case studies and applications with a futuristic vision along with socio-economic impact and issues.
3. To understand virtual reality, augmented reality and using them to build Biomedical engineering applications.
4. To know the intricacies of these platform to develop PDA applications with better optimality.
5. To learn about the application used in medical terms.

  
**Chairman**  
**Board of Studies**  
**Department of Medical Electronics**  
**Muthayammal Engineering College (Autonomous)**  
**Rasipuram, Namakkal Dist - 637 408.**

**COURSE OUTCOMES**

- Analyze & Design a system or process to meet given specifications with realistic engineering constraints.
- Identify problem statements and function as a member of an engineering design team.
- Utilize technical resources
- Propose technical documents and give technical oral presentations related to design mini project results.
- Application used in medical terms.

Course Outcomes	Program Outcomes												PSOs		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
19MDE09.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDE09.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE09.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE09.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE09.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

**UNIT I INTRODUCTION TO VIRTUAL REALITY 9**

Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark.

**UNIT II 3D COMPUTER GRAPHICS 9**

Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.

**UNIT III VIRTUAL ENVIRONMENT 9**

Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in betweening, free from deformation, particle system. Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

**UNIT IV VR HARDWARE AND SOFTWARE 9**

Human factors: Introduction, the eye, the ear, the somatic senses. VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. VR Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML

**UNIT V APPLICATIONS 9**

Use of Analysis Tools, Fourier transforms Power spectrum, Correlation methods, windowing & flittering. Application of VR: Medical applications-military applications-robotics applications- Advanced Real time tracking other applications- simulations, therapy.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	John Vince	Virtual Reality Systems	Pearson Education Asia	2007.
2.	Anand R	Augmented and Virtual Reality	Khanna Publishing House, Delhi	Latest Edition
3.	Adams	Visualizations of Virtual Reality	Tata McGraw Hill	2000
4.	Grigore C. Burdea, Philippe Coiffet	Virtual Reality Technology	Wiley Inter Science, 2nd Edition,	2006
5.	William R. Sherman, Alan B. Craig	Understanding Virtual Reality: Interface, Application and Design	Morgan Kaufmann	2008

**WEB REFERENCE(s)**

- <http://www.vresources.org/>
- <http://www.vrac.iastate.edu/>
- <http://www.w3.org/MarkUp/VRM>
- [http://interscience.in/IJESS\\_Vol2Iss2-3-4/71-75.pdf](http://interscience.in/IJESS_Vol2Iss2-3-4/71-75.pdf)
- <https://aabme.asme.org/categories/augmented-and-virtual-reality>

  
**Chairman**  
**Board of Studies**  
**Department of Medical Electronics**  
**Muthayammal Engineering College (Autonomous)**  
**Rasipuram, Namakkal Dist - 637 406.**

19MDE10

**WEARABLE SYSTEMS**

**L T P C**  
3 0 0 3

**COURSE OBJECTIVES**

1. To study about need for wearable systems
2. To gain knowledge about sensors in wearable systems.
3. To acquaint with signal processing and Wearability issues
4. To handle with the energy harvesting for wearable devices
5. Learn about applications of wearable systems.

**COURSE OUTCOMES**

1. Enables the need for wearable devices.
2. Know about the basic principles of sensors and with the input signal
3. Provides idea with the energy management for wearable devices.
4. Explain need of wireless health systems
5. Equips with the knowledge of application with wearable systems

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDE10.CO1	X	X	X	-	-	-	-	-	-	X	-	X	X	-	-
19MDE10.CO2	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE10.CO3	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE10.CO4	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-
19MDE10.CO5	X	X	X	-	-	X	-	-	X	X	-	X	X	-	-

**UNIT I**

**SENSORS**

9

Need for wearable systems, Sensors for wearable systems-Inertia movement sensors, Respiration activity sensor, Inductive plethysmography, Impedance plethysmography, pneumography, Wearable ground reaction force sensor, GSR, Radiant thermal sensor, Wearable motion sensors, CMOS – Based Biosensors, E-Textiles, Bio compatibility

**UNIT II**

**SIGNAL PROCESSING**

9

Wearability issues -physical shape and placement of sensor, Technical challenges - sensor design, signal acquisition, Constraint on sampling frequency for reduced energy consumption, light weight signal processing, Rejection of irrelevant information, Data mining

**UNIT III**

**ENERGY HARVESTING FOR WEARABLE DEVICES**

9

Solar cell, Vibration based, Thermal based, Human body as a heat source for power generation, Hybrid thermoelectric photovoltaic energy harvests, Thermopiles.

**UNIT IV**

**WIRELESS HEALTH SYSTEMS**

9

Need for wireless monitoring, Definition of Body area network, BAN and Healthcare, Technical Challenges- System security and reliability, BAN Architecture – Introduction, Wireless communication techniques

**UNIT V**

**APPLICATIONS OF WEARABLE SYSTEMS**

9

Medical Diagnostics, Medical Monitoring-Patients with chronic disease, Hospital patients, Elderly patients, Multi parameter monitoring, Neural recording, Gait analysis, Sports Medicine, Smart Fabrics.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Annalisa Bonfiglio, Danilo De Rossi	Wearable Monitoring Systems	Springer	2011
2.	Sandeep K.S. Gupta, Tridib Mukherjee, Krishna Kumar Venkatasubramanian	Body Area Networks Safety, Security, and Sustainability	Cambridge University Press	2013
3.	Hang, Yuan-Ting	wearable medical sensors and systems	Springer	2013
4.	Mehmet R. Yuce, Jamil Y. Khan	Wireless Body Area Networks Technology, Implementation and	Pan Stanford Publishing	2012

**Chairman**  
Board of Studies  
Department of Medical Electronics  
Muthayammal Engineering College (Autonomous)  
Rasipuram, Namakkal Dist - 637 408.

		Applications	Pvt.Ltd Singapore,	
5.	Guang-Zhong Yang(Ed.),	Body Sensor Networks	Springer	2006

**WEB REFERENCE(S)**

1. <https://www.springer.com/gp/book/9781441973832>
2. <https://ionlarqss.firebaseio.com/aa620/body-area-networks-by-sandeep-k-s-gupta-tridib-mukherjee-krishna-kumar-venkatasubramanian-b00bm4titm.pdf>
3. <https://research.monash.edu/en/publications/wireless-body-area-networks-technology-implementation-and-applications>
4. [http://www.panstanford.com/pdf/9789814241571\\_fm.pdf](http://www.panstanford.com/pdf/9789814241571_fm.pdf)
5. [http://cdn.intechopen.com/pdfs/9103/InTechWireless\\_body\\_area\\_network\\_wban\\_for\\_medical\\_applications.pdf](http://cdn.intechopen.com/pdfs/9103/InTechWireless_body_area_network_wban_for_medical_applications.pdf)

19MDE11

**INTERNET OF THINGS**

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

1. To understand Smart Objects and IoT Architectures
2. To learn about various IOT-related protocols
3. To build simple IoT Systems using Arduino and Raspberry Pi.
4. To understand data analytics and cloud in the context of IoT
5. To develop IoT infrastructure for popular applications

**COURSE OUTCOMES**

1. Explain the concept of IoT.
2. Analyze various protocols for IoT.
3. Design a PoC of an IoT system using Rasperry Pi/Arduino
4. Apply data analytics and use cloud offerings related to IoT.
5. Analyze applications of IoT in real time scenario

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDE11.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
19MDE11.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE11.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE11.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE11.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

**UNIT I**

**FUNDAMENTALS OF IoT**

9

Evolution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

**UNIT II**

**IoT PROTOCOLS**

9

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

**UNIT III**

**DESIGN AND DEVELOPMENT**

9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

**UNIT IV**

**DATA ANALYTICS AND SUPPORTING SERVICES**

9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

**UNIT V**

**CASE STUDIES/INDUSTRIAL APPLICATIONS**

9

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry	IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things	Cisco Press,	2017
2.	Maciej Kranz	Building the Internet of Things: Implement New Business Models, Disrupt	John Wiley & Sons	Latest Edition
3.	Arshdeep Bahga, Vijay Madiseti	Internet of Things – A hands-on approach	Universities Press	2015
4.	Olivier Hersent, David Boswarthick, Omar Elloumi	The Internet of Things – Key applications and Protocols	Wiley, (for Unit 2).	2012
5.	Jan Höller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand, David Boyle	From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence	Elsevier	2014

**WEB REFERENCE(s)**

- <https://www.arduino.cc/>
- [https://www.ibm.com/smarterplanet/us/en/?ca=v\\_smarterplanet](https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet)
- <https://nptel.ac.in/courses/106105166/>
- <https://nptel.ac.in/downloads/106105166/>
- [https://nptel.ac.in/noc/individual\\_course.php?id=noc19-cs31](https://nptel.ac.in/noc/individual_course.php?id=noc19-cs31)

19MDE12

**HOSPITAL WASTE MANAGEMENT**

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

- To know the basic knowledge of healthcare waste.
- To create the awareness of hazard of biomedical waste.
- To study about the hospital management and controlling of the wastages.
- To learn about the types of treatment technologies for wastes.
- To study about the professional ethics of biomedical waste handling.

**COURSE OUTCOMES**

- Handling of biomedical waste.
- Importance of the biomedical waste disposal in the society.
- Know about the types of treatment technologies for wastes.
- Learn the laws of biomedical waste handling and the Healthcare waste Management.

Course Outcomes	Program Outcomes												PSOs		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PSO1	PSO2	PSO3
19MDE12.C01	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
19MDE12.C02	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE12.C03	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE12.C04	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE12.C05	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

UNIT I

INTRODUCTION

9

*(Signature)*  
 Chairman  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

Definition of general and hazardous healthcare waste, Infectious waste, geno-toxic waste, waste sharps, categorization and composition of Biomedical waste, major and minor sources of biomedical waste, Segregation of waste, Color coding, waste handling and disposal.

**UNIT II HAZARD OF BIOMEDICAL WASTE 9**

Need for disposal of biomedical waste, Specifically Communicable diseases, Diseases epidemiology and mode of transmission of disease, Environmental pollution by biomedical waste-causes, consequences, mitigation and remedies.

**UNIT III CONTROL OF HOSPITAL ACQUIRED INFECTION 9**

Types of infection – Common Nosocomial infection and their Causative Agents– Prevention of hospital acquired infection–Role of central sterile supply department–Infection control committee –Monitoring and controller of cross infection-Staff health.

**UNIT IV TREATMENT TECHNOLOGIES FOR WASTES 9**

Mechanical Treatment & Chemical Disinfections, Conventional Treatment Technologies: Wet thermal technology, Incineration, Microwave Technology, Autoclave system, Hydroclave system, Electro Thermal Reactivation (ETP), Treatment Process Electron beam Technology, Plasma Pyrolysis / Gasification systems

**UNIT V LAWS OF BIOMEDICAL WASTE HANDLING 9**

Biomedical wastes ,Disposal of biomedical waste products and deep burial, Segregation, Packaging, Transportation, Storage Legislation, policies and law regarding environment on Healthcare waste Management, Biomedical waste management and handling rules 1998 and its amendment. CPCB guidelines. World Health Organization guidelines on Management of wastes from hospital wastes

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	AnantpreetSingh, SukhjitKaur	Biomedical Waste Disposal	Jaypee Publishers (P) Ltd, India	2012
2.	Sushma Sahai	Bio-Medical Waste Management	APH Publishing Corporation, India	2009
3.	Sanskriti Sharma	Hospital Waste Management and Its Monitoring	Jaypee Publishers (P) Ltd, India	2002
4.	Paul T. Williams	Waste Treatment and Disposal	John Wiley & Sons, Ltd	2005
5.				

**WEB REFERENCE(s)**

- <https://www.slideshare.net/zulfiquer732/hospital-waste-management-93579083>
- <http://www.ihatepsm.com/blog/hospital-waste-management-bio-%E2%80%9393-medical-waste-management>
- <https://www.biomedicalwastesolutions.com/medical-waste-disposal/>
- <http://www.wastemanagement.in/what-is-hospital-waste-management.html>
- <https://www.medprodisposal.com/what-is-medical-waste-medical-waste-definition-types-examples-and-more>

19MDE13

TELE HEALTH TECHNOLOGY

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

- To learn the key principles for telemedicine and health.
- To study about electronic health recorders
- To understand mobile health technology.
- To know tele-medical standards, mobile telemedicine standards.
- To know tele-medical standards, mobile telemedicine and its applications

**COURSE OUTCOMES**

- Apply multimedia technologies in telemedicine.
- Explain Protocols behind encryption techniques for secure transmission of data.
- Apply tele-health in healthcare.
- Apply mobile-health in healthcare.
- Learn tele-medical standards.

Course	Program Outcomes	PSOs
--------	------------------	------

  
**Chairman**  
 Board of Studies  
 Department of Medical Electronics  
 Muthayammal Engineering College (Autonomous)  
 Rasipuram, Namakkal Dist - 637 408.

Outcomes	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	PS03
19MDE13.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
19MDE13.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE13.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE13.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE13.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

**UNIT I INTRODUCTION 7**

Overview of Health Informatics, Healthcare Data, Information and Knowledge, Healthcare Data Analysis

**UNIT II ELECTRONIC HEALTH RECORDS 9**

Electronic Health Records, Health Information Exchange, Health Data Standards, Architectures of Information Systems, Consumer Health informatics.

**UNIT III MOBILE HEALTH 9**

Mobile Technology and mHealth, Online Medical Resources, Medical Information Retrieval, Disease Management and Disease Registries, Telemedicine, Medical Imaging Informatics, Bioinformatics, Public Health Informatics

**UNIT IV TELEMEDICAL STANDARDS 11**

Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Encryption. Protocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7, H. 320 series (Video phone based ISBN) T. 120, H.324 (Video phone based PSTN), Video Conferencing, Real-time Telemedicine integrating doctors / Hospitals, Clinical laboratory data, Radiological data, and other clinically significant biomedical data, Administration of centralized medical data, security and confidentiality of medical records and access control, Cyber laws related to telemedicine.

**UNIT V TELEMEDICAL APPLICATIONS 9**

Telemedicine access to health care services - health education and self care. Introduction to robotics surgery, telesurgery. Telecardiology, Teleoncology, Telemedicine in neurosciences, Electronic Documentation, e-health services security and interoperability., Telemedicine access to health care services – health education and self care, Business aspects - Project planning and costing, Usage of telemedicine.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Robert E. Hoyt and Ann K. Yoshihashi	Lasers and Optical Fibers in Medicine	Health Informatics: Practical Guide for Healthcare and Information Technology Professionals (Sixth Edition)	Latest Edition
2.	Phillip Olla.	Mobile Health Solutions for Biomedical Applications	Hershey, Pa. : Information Science Reference, c	2009
3.	I stepanian, Robert, Laxminarayan, Swamy, Pattichis, Constantinos	M-Health- Emerging Mobile Health Systems	Springer Publications	2006
4.	SasanAdibi	Mobile Health: A Technology Road Map	Springer Publication	Mar 2015
5.	Norris, A.C.	Essentials of Telemedicine and Telecare	Wiley	2002

**WEB REFERENCE(s)**

1. COMP107x Introduction to Mobile Application Development using Android
2. <https://www.coursera.org/course/introbiomedhlthinfo>
3. <https://trove.nla.gov.au/version/45455445>
4. <https://www.who.int/sustainable-development/health-sector/strategies/telehealth/en/>
5. [http://www.caltrc.org/telehealth/why-are-telemedicine-and-telehealth-so-important-in-our-healthcare system/](http://www.caltrc.org/telehealth/why-are-telemedicine-and-telehealth-so-important-in-our-healthcare-system/)

19MDE14

FIBER OPTICS AND LASERS IN MEDICINE

L T P C  
3 0 0 3

**COURSE OBJECTIVES**

1. Be familiar with objective property of fiber optics.
2. To study about the losses in optics.
3. To gain the knowledge in application of lasers in therapy and diagnosis.
4. Be exposed to basic of endoscopy.
5. To know about the clinical applications of fiber optic laser systems.

**COURSE OUTCOMES**

1. Able to understand the property of fiber optics
2. Apply lasers in different areas of medicine.
3. Explain the special techniques of Lasers.
4. Study about the endoscopy.
5. Study about clinical applications of fiber optic laser systems.

Course Outcomes	Program Outcomes												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19MDE14.CO1	x	x	x	-	-	-	-	-	-	x	-	x	x	-	-
19MDE14.CO2	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE14.CO3	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE14.CO4	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-
19MDE14.CO5	x	x	x	-	-	x	-	-	x	x	-	x	x	-	-

**UNIT I**

**OPTICAL FIBRES AND THEIR PROPERTIES**

9

Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics – Absorption losses – Scattering losses – Dispersion – Connectors and splicers –Fibre termination – Optical sources – Optical detectors

**UNIT II**

**LOSSES AND DISPERSION IN FIBER OPTICS**

9

Absorption, Rayleigh scatter, Fresnel Reflection, Bending losses, dispersion Graded Index fiber, Single mode fiber, cables for fiber optics, Problems occurring in connecting optical fibers, Cleaving Process, Connectors and couplers Medical Laser: Introduction, Laser physics, medical lasers, Laser safety fundamentals

**UNIT III**

**APPLICATION OF LASERS IN THERAPY AND DIAGNOSIS**

9

Introduction, laser assisted diagnosis and therapy fundamentals, Interaction of Laser beams and materials principles, Laser interaction with tissue, application of Lasers in Diagnosis and Imaging, Laser surgery and therapy, thermal interaction between laser and Tissue. Integrated laser-fiber systems and their applications, Complications in the use of Laser fiber optic system.

**UNIT IV**

**ENDOSCOPY**

9

Endoscopic imaging system fundamentals, Angioscope, Videoscopy, Fluorescence endoscopy, Endoscopic therapy, Endoscopic ultrasound imaging principles. Fiber Optic Medical Diagnosis: introduction, fundamentals, fiber optic biomedical sensor-principles, Direct-indirect Sensor principles

**UNIT V**

**CLINICAL APPLICATIONS OF FIBER OPTIC LASER SYSTEMS**

9

Fiber optic Laser system in cardiovascular disease, Fiber optic Laser system in Gastroenterology, Fiber optic Laser system in general and thoracic surgery, Fiber optic Laser system in Neurosurgery, Fiber optic Laser system in Oncology, Fiber optic Laser system in Ophthalmology, Fiber optic Laser system in Orthopedics, Fiber optic Laser system in Otolaryngology, Fiber optic Laser system in Urology, Flow chart diagrams for clinical applications of laser –fiber systems.

**REFERENCE BOOK**

Sl.No	AUTHOR(s)	TITLE OF THE BOOK	PUBLISHER	YEAR OF PUBLICATION
1.	Abraham Katzir	Lasers and Optical Fibers in Medicine	Academic press Inc	Latest Edition
2.	John Crisp	Introduction to fiber optics	Mc Graw Hill, 2nd Edition	2001
3.	G.DavidBaxterr Churchill Livingstone	Therapeutic Lasers - Theory and practice	Addison Wesley	Latest Edition

*Chairman*  
Board of Studies  
Department of Medical Electronics  
Muthayammal Engineering College (Autonomous)  
Rasipuram, Namakkal Dist - 637 408.

**WEB REFERENCE(s)**

1. [https://books.google.co.in/books/about/Lasers\\_and\\_Optical\\_Instrumentation.html](https://books.google.co.in/books/about/Lasers_and_Optical_Instrumentation.html)
2. <https://www.elsevier.com/books/lasers-and-optical...in-medicine/.../978-0-08-092397-0>
3. <https://www.lasercomponents.com/de-en/news/optical-fibers-in-medical-technology/>
4. <https://www.elsevier.com/books/lasers-and-optical-fibers-in-medicine/katzir/978-0-08-092397-0>
5. [http://www.nitttrchd.ac.in/sitenew1/app\\_sc/ppts/Optical%20Fibers/Medical%20Apps%20of%20optical%20Fibers\\_JKC.pdf](http://www.nitttrchd.ac.in/sitenew1/app_sc/ppts/Optical%20Fibers/Medical%20Apps%20of%20optical%20Fibers_JKC.pdf)



Chairman  
Board of Studies  
Department of Medical Electronics  
Muthayammal Engineering College (Autonomous)  
Rasipuram, Namakkal Dist - 687 408.