ADHIYAMAAN COLLEGE OF ENGINEERING

[An Autonomous Institution Affiliated to Anna University, Chennai]

[Accredited by NAAC]

Dr.M.G.R NAGAR, HOSUR, KRISHNAGIRI (DT) – 635 130, TAMILNADU, INDIA

REGULATIONS 2022

CHOICE BASED CREDIT SYSTEM

B.E- BIOMEDICAL ENGINEERING

Vision

To produce competent and creative biomedical engineers who anticipate change, communicate and work with others effectively in a globally connected society.

Mission

M1: To pursue excellence in Biomedical Engineering by integrating engineering and medicine through education, research and innovation.

M2: To facilitate the students by introducing technologies for uplifting the society with global standards.

M3: To nurture students' skill and leadership qualities by inculcating ethical values.

The Programme defines Programme Educational Objectives, Programme Outcomes and Programme Specific Outcomes as follows:

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 Our graduates will excel in healthcare sectors and/or higher education with the instilling profound knowledge in mathematical, scientific and engineering concepts.

PEO 2 Our graduates will be able to analyze healthcare challenges, design and development of diagnostic, therapeutic strategies with global standards, economically feasible for the welfare of society.

PEO 3 Our graduates will emerge with professionalism, ethical and social responsibilities, communication skills, team spirit and leadership as a holistic personality with life long learning attitude.

2. Program Outcomes (POs)

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 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.

PO 3: Design/development of 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.

PO 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.

PO 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.

PO 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.

PO 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.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 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

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and 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.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

3. PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: An ability to apply advanced technology for measurement and interpretation of data acquired from biological system dealing the problems associated with the interaction between living and non-living materials and systems.

PSO2: An ability to use software tools, mathematics, science and engineering for precise diagnosis and therapeutic applications.

PSO3: An ability to build and expand their undergraduate foundations by engaging in learning opportunities throughout their careers.

4. MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVE WITH PROGRAMME OUTCOMES

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
I	3	3		1								2	2	2	1
II			3	3	3	3	3				3		3	3	
III						3	3	3	3	3	1	3	1		3

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CHOICE BASED CREDIT SYSTEM

B.E- BIOMEDICAL ENGINEERING

CURRICULA FOR SEMESTER I TO VIII

SEMESTER I

S.No	Course Code	Course Title	Category	L	T	P	C
1	122IP001	Induction Programme					
THEORY							
2	122ENI01	Professional English-I*	HSMC/EEC	2	0	2	3
3	122MAT02	Matrices and Calculus	BS	3	1	0	4
4	122PHT03	Engineering Physics	BS	2	0	0	2
5	122CYT04	Engineering Chemistry	BS	2	0	0	2
6	122PPT05	Python Programming	ES	3	0	0	3
7	122CMT06	Basic Civil and Mechanical Engineering	ES	3	0	0	3
8	112HST07	Heritage of Tamils	HS	1	0	0	1
PRACTICALS							
9	122PHP08	Engineering Physics Laboratory	BS	0	0	2	1
10	122PPP09	Python Programming Laboratory	ES	0	0	2	1
	TOTAL			16	1	6	19

NOTE:

***((Theory+Lab) – Embedded / Integrated)**

SEMESTER II

S.No	Course Code	Course Title	Category	L	T	P	C
THEORY							
1	222ENI01	Professional English-II*	HSMC/EEC	2	0	2	3
2	222MAT02	Probability and Statistics	BS	3	1	0	4
3	222EST03	Environmental Sciences and Sustainability	BS	2	0	0	2
4	222EGT04	Engineering Graphics	ES	2	0	4	4
5	222BMT05	Medical Physics	PC	2	0	0	2
6	222EEI06	Basic Electrical and Electronics Engineering*	PC	3	0	2	4
7	222HST07	Tamils and Technology	HS	1	0	0	1
PRACTICALS							
8	222CYP08	Engineering Chemistry Laboratory	BS	0	0	2	1
9	222EPP09	Engineering Practice Laboratory	ES	0	0	2	1
		TOTAL		15	1	12	21

NOTE: *((Theory+Lab) – Embedded / Integrated)

SEMESTER III

S. No.	Course Code	Course Name	Category	L	T	P	C
THEORY							
1	322MAT01	Transforms and Partial Differential Equations	BS	3	1	0	4
2	322BMT02	Biochemistry	PC	3	0	0	3
3	322BMI03	Human Anatomy and Physiology *	PC	3	0	2	4
4	322BMT04	Signals and Systems for Biomedical Engineering	PC	3	0	0	3
5	322BMT05	Communication Engineering	PC	3	0	0	3
6	322BMT06	Fundamentals of Data Structures in C	ES	3	0	0	3
PRACTICALS							
7	322BMP07	Biochemistry Laboratory	PC	0	0	2	1
8	322BMP08	Fundamentals of Data Structures in C Laboratory	ES	0	0	2	1
9	322GEV01	Professional Development Programme (100% Internal Assessment)	EEC	0	0	2	1
	Total			**18**	**0**	**8**	**22**

NOTE: *((Theory+Lab) – Embedded / Integrated)

SEMESTER IV

S.No.	Course Code	Course Name	Category	L	T	P	C
THEORY							
1	422PRT01	Random Processes and Linear Algebra	BS	3	1	0	4
2	422BMI02	Sensors and Measurements*	PC	3	0	2	4
3	422BMT03	Pathology and Microbiology	PC	3	0	0	3
4	422BMT04	Analog Integrated Circuits	PC	3	0	0	3
5	422BMT05	Digital Logic Design	PC	3	0	0	3
6	422BMT06	Biomaterials and Biomechanics	PC	3	0	0	3
7	422BMAXX	Audit Course	AC	1	0	0	0
	PRACTICAL						
8	422BMP07	Pathology and Microbiology Laboratory	PC	0	0	2	1
9	422BMP08	Integrated Circuits Laboratory	PC	0	0	2	1
10	422GEV02	Math Solver Software	EEC	0	0	2	1
	Total			**19**	**1**	**4**	**22**

NOTE: *((Theory+Lab) – Embedded / Integrated)

SEMESTER V

S.No.	Course Code	Course Name	Category	L	T	P	C
THEORY							
1	522BMT01	Biomedical Instrumentation	PC	3	0	0	3
2	522BMI02	Microcontroller and Embedded System Design *$	PC	3	0	2	4
3	522BMT03	Bio Control Systems	PC	3	0	0	3
4	522BMT04	Digital Signal Processing and Biomedical Applications	PC	3	0	0	3
5	522BMEXX	Professional Elective – I	PE	3	0	0	3
6	522XXOXX	Open Elective – I	OE	3	0	0	3
7	522MCTXX	Mandatory Course-I	MC	2	0	0	0
PRACTICAL							
8	522BMP07	Biomedical Instrumentation Lab	PC	0	0	2	1
9	522BMP08	Digital Signal Processing Lab	PC	0	0	2	1
10	522BMP09	Internship**	EEC	0	0	4	2
11	522BMVXX	Value Added Course	VAC	1	0	0	1
	Total			**19**	**0**	**6**	**23**

SEMESTER VI

S. No.	Course Code	Course Name	Category	L	T	P	C
THEORY							
1	622BMT01	Diagnostic and Therapeutic Equipment	PC	3	0	0	3
2	622BMT02	Radiological Equipment	PC	3	0	0	3
3	622BMI03	Augmented Reality and Virtual Reality in Healthcare	PC	3	0	2	4
4	622BMEXX	Professional Elective – II	PE	3	0	0	3
5	622BAOXX	Management Elective	ME	3	0	0	3
6	622XXOXX	Open Elective -II	OE	3	0	0	3
7	622MCTXX	Mandatory Course-II	MC	2	0	0	0
PRACTICAL							
8	622BMP07	Diagnostic and Therapeutic Equipment Lab	PC	0	0	2	1
9	622BMP08	Hospital Training $	EEC	0	0	2	1
10	622BMP09	Interpersonal Skills/Listening & Speaking	EEC	0	0	2	1
	Total			**19**	**0**	**6**	**22**

NOTE: *((Theory+Lab) – Embedded / Integrated)

$ Course oriented with MoU

SEMESTER VII

S. No.	Course Code	Course Name	Category	L	T	P	C
THEORY							
1	722BMT01	Medical Image Processing	PC	3	0	0	3
2	722BMT02	Rehabilitation Engineering	PC	3	0	0	3
3	722BMT03	Medical Safety and Standards	PC	3	0	0	3
4	722BMEXX	Professional Elective – III	PE	3	0	0	3
5	722BMEXX	Professional Elective – IV	PE	3	0	0	3
6	722XXOXX	Open Elective-III	OE	3	0	0	3
PRACTICAL							
7	722BMP07	Digital Image Processing Lab	PC	0	0	2	1
8	722BMP08	Mini Project	EEC	0	0	4	2
	Total			**18**	**0**	**6**	**21**

SEMESTER VIII

S. No.	Course Code	Course Name	Category	L	T	P	C
THEORY							
1	822BMEXX	Professional Elective – V	PE	3	0	0	3
2	822BMEXX	Professional Elective – VI	PE	3	0	0	3
PRACTICAL							
3	822BMP04	Project Work	EEC	0	0	18	9
	Total			**6**	**0**	**18**	**15**

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I **Bio Engineering**	**Vertical II** **Medical Device Innovation and Development**	**Vertical III** **Medical Device Application and Management (Healthcare)**	**Vertical IV** **Interfacing of Bio signals**	**Vertical V** **Information and Communication**	**Vertical VI** **Emerging trends in Healthcare**
Biosensors and Transducers	Foundation Skills in Integrated Product Development	Physiological Modelling	Biometrics	Data Communication and Networks	Artificial Intelligence and Machine Learning
Biomedical Optics and Photonics	Medical Device Design	Artificial Organs and Implants	Bio Signal Processing	Satellite Communication	Neural Networks and Deep Learning
Biomedical Nanotechnology	Troubleshooting of Medical Devices	Critical Care and Operation Theatre Equipment	Speech and Audio Signal Processing	Wireless Communication	Healthcare Analytics
Neural Engineering	Medical Device Regulation	Clinical Engineering	Brain Computer Interface and Applications	Telehealth Technology	Advancements in Healthcare Technology
Principles of Tissue Engineering	Medical Innovation and Entrepreneurship	Hospital Engineering and Management	Body Area Networks	Medical Informatics	Robotics in Medicine
Bio MEMS	Rapid Prototyping	Hospital Waste Management	Wearable Devices	IoT in Healthcare	Cyber Security

VERTICAL I - BIO ENGINEERING

Course Code	Course Name	Category	L	T	P	C
X22BME01	Biosensors and Transducers	PE	3	0	0	3
X22BME02	Biomedical Optics and Photonics	PE	3	0	0	3
X22BME03	Biomedical Nanotechnology	PE	3	0	0	3
X22BME04	Neural Engineering	PE	3	0	0	3
X22BME05	Principles of Tissue Engineering	PE	3	0	0	3
X22BME06	Bio MEMS	PE	3	0	0	3

VERTICAL II - MEDICAL DEVICE INNOVATION AND DEVELOPMENT

Course Code	Course Name	Category	L	T	P	C
X22BME07	Foundation Skills in Integrated Product Development	PE	3	0	0	3
X22BME08	Medical Device Design	PE	3	0	0	3
X22BME09	Troubleshooting of Medical Devices	PE	3	0	0	3
X22BME10	Medical Device Regulation	PE	3	0	0	3
X22BME11	Medical Innovation and Entrepreneurship	PE	3	0	0	3
X22BME12	Rapid Prototyping	PE	3	0	0	3

VERTICAL III MEDICAL DEVICE APPLICATION AND MANAGEMENT (HEALTHCARE)

Course Code	Course Name	Category	L	T	P	C
X22BME13	Physiological Modelling	PE	3	0	0	3
X22BME14	Artificial Organs and Implants	PE	3	0	0	3
X22BME15	Critical Care and Operation Theatre Equipment	PE	3	0	0	3
X22BME16	Clinical Engineering	PE	3	0	0	3
X22BME17	Hospital Engineering and Management	PE	3	0	0	3
X22BME18	Hospital Waste Management	PE	3	0	0	3

VERTICAL IV INTERFACING OF BIO SIGNALS

Course Code	Course Name	Category	L	T	P	C
X22BME19	Biometrics	PE	3	0	0	3
X22BME20	Bio Signal Processing	PE	3	0	0	3
X22BME21	Speech and Audio Signal Processing	PE	3	0	0	3
X22BME22	Brain Computer Interface and Applications	PE	3	0	0	3
X22BME23	Body Area Networks	PE	3	0	0	3
X22BME24	Wearable Devices	PE	3	0	0	3

VERTICAL V INFORMATION AND COMMUNICATION

Course Code	Course Name	Category	L	T	P	C
X22BME25	Data Communication and Networks	PE	3	0	0	3
X22BME26	Satellite Communication	PE	3	0	0	3
X22BME27	Wireless Communication	PE	3	0	0	3
X22BME28	Telehealth Technology	PE	3	0	0	3
X22BME29	Medical Informatics	PE	3	0	0	3
X22BME30	IoT in Healthcare	PE	3	0	0	3

VERTICAL VI EMERGING TRENDS IN HEALTHCARE

Course Code	Course Name	Category	L	T	P	C
X22BME31	Artificial Intelligence and Machine Learning	PE	3	0	0	3
X22BME32	Neural Networks and Deep Learning	PE	3	0	0	3
X22BME33	Healthcare Analytics	PE	3	0	0	3
X22BME34	Advancements in Healthcare Technology	PE	3	0	0	3
X22BME35	Robotics in Medicine	PE	3	0	0	3
X22BME36	Cyber Security	PE	3	0	0	3

LIST OF MANAGEMENT ELECTIVE (ME)

Course Code	Course Name	Category	L	T	P	C
622BMM01	Principles of Management	ME	3	0	0	3
622BMM02	Engineering Economics And Financial Accounting	ME	3	0	0	3
622BMM03	Human Resource Management	ME	3	0	0	3
622BMM04	Bio Statistics	ME	3	0	0	3
622BMM05	Digital Marketing	ME	3	0	0	3
622BMM06	e-Waste Management	ME	3	0	0	3

LIST OF MANDATORY COURSES (MC)

MANDATORY COURSES-1

Course Code	Course Name	Category	L	T	P	C
522BMM01	Introduction to Women and Gender Studies	MC	3	0	0	0
522BMM02	Elements of Literature	MC	3	0	0	0
522BMM03	Sustainable Development	MC	3	0	0	0
522BMM04	Disaster Management	MC	3	0	0	0
522BMM05	Ethics and Human Values	MC	3	0	0	0

MANDATORY COURSES-1I

Course Code	Course Name	Category	L	T	P	C
622BMM01	Well Being With Traditional Practices(Yoga, Ayurveda and Siddha)	MC	3	0	0	0
622BMM02	History of Science and Technology in India	MC	3	0	0	0
622BMM03	Political and Economic Thought for Humane Society	MC	3	0	0	0
622BMM04	State, Nation Building and Politics in India	MC	3	0	0	0
622BMM05	Fundamentals of Research Methodology	MC	3	0	0	0

LIST OF AUDIT COURSES (AC)

Course Code	Course Name	Category	L	T	P	C
_22BMA01	Constitution of India	AC	3	0	0	0
_22BMA02	Medical Regulatory Standards	AC	3	0	0	0
_22BMA03	Entrepreneurship Development	AC	3	0	0	0
_22BMA04	Industrial Safety	AC	3	0	0	0
_22BMA05	IPR and Patent Design	AC	3	0	0	0

LIST OF VALUE ADDED COURSES (VAC)

Course Code	Course Name	Category	L	T	P	C
_22BMV01	MOOC Course	VAC	3	0	0	0
_22BMV02	SWAYAM / NPTEL	VAC	3	0	0	0
_22BMV03	Industrial Expertised Medical Equipment Training	VAC	3	0	0	0
_22BMV04	CCRP	VAC	3	0	0	0
_22BMV05	Bio Printing	VAC	3	0	0	0

LIST OF EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Course Code	Course Name	Category	L	T	P	C
322GEV01	Professional Development	EEC	0	0	2	1
422GEV02	Math Solver Software	EEC	0	0	2	1
522GEV03	Internship	EEC	0	0	4	2
-22GEV04	Scientific Reading and Writing	EEC	0	0	2	1
-22GEV05	Medical Coding	EEC	0	0	2	1

LIST OF OPEN ELECTIVE COURSES

Sl.No	Course Code	Course Name	Category	L	T	P	C
1	522BMT01	Biomedical Instrumentation	OE	3	0	0	3
2	722BMT01	Medical Image Processing	OE	3	0	0	3
3	722BMT02	Augmented Reality and Virtual Reality in Healthcare	OE	3	0	0	3
4	722BMT03	Medical Safety and Standards	OE	3	0	0	3
5	_22BME04	Neural Engineering	OE	3	0	0	3
6	_22BME22	Brain Computer Interface and Applications	OE	3	0	0	3
7	_22BME23	Body Area Networks	OE	3	0	0	3
8	_22BME24	Wearable Devices	OE	3	0	0	3
9	_22BME28	Telehealth Technology	OE	3	0	0	3
10	_22BME30	IoT in Healthcare	OE	3	0	0	3
11	_22BME31	Artificial Intelligence and Machine Learning	OE	3	0	0	3
12	_22BME32	Neural Networks and Deep Learning	OE	3	0	0	3
13	_22BME34	Advancements in Healthcare Technology	OE	3	0	0	3
14	_22BME35	Robotics in Medicine	OE	3	0	0	3

CREDITS (2022 REGULATION)

The credits earned through the one credit courses shall be over and above the total credit requirement prescribed in the curriculum for the award of degree.

Allocation of Credits:

Semester	I	II	III	IV	V	VI	VII	VIII
Credit	19	21	22	22	23	22	21	15
Total	165							

S.No	CATEGORY	CREDITS AS PER SEMESTER								CREDITS TOTAL
		I	II	III	IV	V	VI	VII	VIII	
1	HSMC	2	2							4
2	BS	9	7	4	4					24
3	ES	7	5	4						16
4	PC		6	14	18	15	11	10		74
5	PE					3	3	6	6	18
6	OE					3	3	3		9
7	EEC	1	1			2	2	2	9	17
8	ME						3			3
9	MC					✓	✓			
10	AC				✓					
11	VAC	1	1	1	1	1				
	Total	**19**	**21**	**22**	**22**	**23**	**22**	**21**	**15**	**165**