DEPARTMENT OF BIOMEDICAL ENGINEERING

COURSE OUTCOMES

YEAR / SEM: I / II BM3251 -BIOSCIENCES FOR MEDICAL ENGINEERS

No.	Course Outcomes
C101.1	Explain about the physiological buffers in living systems and Clinical application of Electrolytes and radioisotopes.
C101.2	Recall the classification, properties and structure of carbohydrates, lipids, amino acids and protein.
C101.3	Illustrate the functional aspect of living organism and classification of tumors.
C101.4	Discuss about the various pathologic condition and bleeding disorders.
C101.5	Recall about the structure of microorganism and Identify the types of microscope.

YEAR / SEM: I / II BE3251 - Basic Electrical and Electronics Engineering

No.	Course Outcomes
C102.1	Solve the simple electric circuit parameters using Nodal Analysis and Mesh analysis
C102.2	Understand the basic concepts of measuring instruments, electrical machineries and its applications.
C102.3	Explain the properties and operation of semiconductor devices like Diode and construction the characteristics of BJT and JFET .
C102.4	Simplify Boolean expression using K-Map techniques and examine various Combinational circuits using logic gates
C102.5	Analyze the various types of electrical loads, power rating of electrical machineries and energy efficient equipment.

YEAR / SEM: I / II BM3252 MEDICAL PHYSICS

No.	Course Outcomes
C103.1	Discuss about the properties of electromagnetic radiations and its application in medical field.
C103.2	Analyze the decay series, understand various methods of production of radio isotopes and explain the application of radionuclide used in medicine.
C103.3	Interpret the characteristics of artificially produced isotopes, interaction of radiation with matter
C103.4	Illustrate the somatic effects of radiation, genetic effects of radiation
C103.5	Explain the basic principles and characteristics of sound and its application in medicine

YEAR / SEM: I / II BM3271-BIOSCIENCES LABORATORY

No.	Course Outcomes
C104.1	Understand the Biochemistry laboratory functional components
C104.2	Understand the basics principle of preparation of buffers.
C104.3	Have a sound knowledge of qualitative test of different bimolecular.
C104.4	Understand the basics knowledge of Biochemical parameter and their interpretation in Blood sample
C104.5	Have a sound knowledge of separation technology of proteins and amino acids.

YEAR / SEM: II /III BM3353 FUNDAMENTALS OF ELECTRONIC DEVICS AND CIRCUITS

No.	Course Outcomes
C201.1	Interpret working principle and application of various active and passive electronic components like resistors, capacitors, inductors, diodes and transistors.
C201.2	Quantify the specification and characteristics of BJT in different configuration.
C201.3	Relate the construction and characteristics of JFET and its families.
C201.4	Examine the characteristics and applications of special devices like Schotty barrier diode Gallium Arsenide device, LASER diode, LDR
C201.5	Analyze the characteristics Power and Display devices.

YEAR / SEM: II /III BM3301 Sensors and Measurements

No.	Course Outcomes
C20.1	Analyze various electrical parameters of transducer with different methods of measuring techniques.
C202.2	Explain about the characteristics of different transducers
C202.3	Analyze and chose appropriate light sensors for measurement of physical phenomenon.

C202.4	Explain about the use AC and DC bridges for relevant parameter measurement.
C202.5	Utilize Multimeter, CRO and different types of recorders for appropriate measurement.

YEAR / SEM: II /III BM3352 ELECTRIC CIRCUIT ANALYSIS

No.	Course Outcomes
C203.1	Analyse and design ac/dc circuits.
C203.2	Solve the circuit theorems in real time.
C203.3	Evaluate ac/dc circuits
C203.4	Analyse the electrical circuits
C203.5	Develop and understand ac/dc circuits.

YEAR / SEM: II /III/BM3351 ANATOMY AND HUMAN PHYSIOLOGY

No.	Course Outcomes
C204.1	Define the basic terminologies and identify the functions cells, tissues and organs.
C204.2	Outline the physiology of f cardiovascular, respiratory systems
C204.3	Illustrate the relationship and interaction between the various organ systems.
C204.4	Outline the physiology of digestive, excretory and other organ systems
C204.5	Analyze the functions of hormones with physiological process and physiology of vision, hearing, smell and taste.

YEAR / SEM: II /III/ BM3361 FUNDAMENTALS OF ELECTRONIC DEVICES AND CIRCUITS LABORATORY

No.	Course Outcomes
C205.1	Conduct experiments and analyze VI characteristics of various diodes.
C205.2	determine the input & output characteristics of BJT
C205.3	Conduct experiment and test voltage regulation characteristics using Zener diode voltage regulator circuit.
C205.4	Analyze the load current for the given circuit using Superposition, Thevenin's, and Norton's and Reciprocity theorems

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C205.5	Design and test RLC series and parallel circuits to compute the resonant frequency and bandwidth by plotting the frequency response

YEAR / SEM: II /III/ BM3311 SENSORS AND MEASUREMENT LABORATORY

No.	Course Outcomes
C206.1	Design and understand characteristics and calibration of various transducers.
C206.2	Design and test system for detection of signals.
C206.3	Select proper transducer for various applications.
C206.4	Conduct experiments and analyze various read out and display devices.
C206.5	Design a measurement system for various applications.

YEAR / SEM: II /IV/BM3402ANALOG AND DIGITAL INTEGRATED CIRCUITS

No.	Course Outcomes
C207.1	Characterize and analyse the analog linear circuits and develop linear IC based Systems.
C207.2	Apply the concept of ADC and DAC in real time systems and Phase Locked Loop with applications.
C207.3	Understand the Boolean algebra concepts and apply it to digital systems.
C207.4	Develop digital logic circuits and apply it to solve real time problems..
C207.5	Enumerate the design procedures for synchronous and asynchronous sequential circuits

YEAR / SEM: II /IV/BM3451 BIO CONTROL SYSTEMS

No.	Course Outcomes
C208.1	Understand the need for mathematical modeling of various systems, representation of systems in block diagrams and signal flow graphs and are introduced to biological control systems
C208.2	Analyze the time response of various systems and evaluate the static steady state error.
C208.3	Determine the the concept of system stability and plot root locus of the stability analysis
C208.4	Analyze the frequency response characteristics of various systems using different charts
C208.5	Comprehend the application aspects of time and frequency response analysis in physiological control systems.

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YEAR / SEM: II /IV/BM3401 SIGNAL PROCESSING

No.	Course Outcomes
C210.1	Analyse the classification of the continuous time and discrete time signals and systems.
C210.2	Represent the signals in both continuous time and discrete time
C210.3	Illustrate and explain DFT for the analysis of digital signals & systems
C210.4	design IIR filter and apply the concept to process real world signals.
C210.5	design FIR filter and apply the concept to process real world signals

YEAR / SEM: II /IV/BM3491BIOMEDICAL INSTRUMENTATION

No.	Course Outcomes
C211.1	Differentiate different bio potentials and its propagations.
C211.2	Illustrate different electrode placement for various physiological recordings
C211.3	Design bio amplifier for various physiological recordings
C211.4	Explain various technique for non-electrical physiogical measurements
C211.5	Demonstrate different biochemical measurement techniques.

YEAR / SEM: II /IV/BM3411 BIOMEDICAL INSTRUMENTATION LAB

No.	Course Outcomes
C212.1	Design preamplifiers and amplifiers for various bio signal recordings.
C212.2	Measure various non-electrical parameters using suitable sensors/transducers

C212.3	Application of MUX and DEMUX in Bio signal processing
C212.4	Design and analyse the characteristics of isolation amplifier
C212.5	Design PCB layout for any bio amplifier.

YEAR / SEM: II /IV/BM3412ANALOG AND DIGITAL INTEGRATED CIRCUITS LAB

No.	Course Outcomes
C216.1	Design and implement the combinational circuits using logic gates.
C216.2	Conduct experiments and verify the results using opamp.
C216.3	Design and test sequential circuit using logic gates.
C16.4	Generate different waveforms and analyse their characteristics.
C216.5	Simulate and analyse circuits using ICs

YEAR / SEM: III /V/BM8501 BIO CONTROL SYSTEMS

No.	Course Outcomes
C301.1	Apply principles of mathematical modeling in understanding the various biological systems.
C301.2	Analyze various systems in time domain response and understand the concept of system stability.
C301.3	Plot gain and phase margin and also evaluate frequency response.
C301.4	Understand the concept of modeling basic physiological system
C301.5	Interpret the physiological system modeling for biomedical applications.

YEAR / SEM: III /V/BM8502 BIOMEDICAL INSTRUMENTATION

No.	Course Outcomes
C302.1	Explain the acquisition of various bio signals using various types of Electrodes.
C302.2	Record and analyze various physiological signals

C302.3	Design bio-amplifiers to analyze and interpret data.
C302.4	Classify various cardiac function measurements
C302.5	Use bio-amplifiers in medical applications.

YEAR / SEM: III /V/OML552 MICROSCOPY

No.	Course Outcomes
C303.1	Illustrate the physics behind the microscopy
C303.2	Describe the principle, construction and working of light microscopy.
C303.3	Explain the significance of electron microscopy.
C303.4	Demonstrate the important of sample preparation technique.
C303.5	Identify the appropriate spectroscopy technique for chemical analysis.

YEAR / SEM: III /V/BM8511 BIOMEDICAL INSTRUMENTATION LAB

No.	Course Outcomes
C304.1	Design preamplifiers and amplifiers for various bio signal recordings.
C304.2	Measure various non-electrical parameters using suitable sensors/transducers
C304.3	Application of MUX and DEMUX in Bio signal processing
C304.4	Design and analyse the characteristics of isolation amplifier
C304.5	Design PCB layout for any bio amplifier.

YEAR / SEM: III /VI/BM8601 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT- I

No.	Course Outcomes
C305.1	Explain the working of all basic cardiac equipment and maintenance and trouble shooting.
C305.2	Analyse various neurological disorders recording of all basic neurological equipment's.

C305.3	Discuss the various EMG waveforms and the equipment's related to EMG.
C305.4	Illustrate about measurements of parameters related to respiratory system.
C305.5	Describe the measurement techniques of sensory responses.

YEAR / SEM: III /VI/BM8651 BIOMECHANICS

No.	Course Outcomes
C306.1	Apply the principles of mechanics in medical application
C306.2	Apply knowledge of biomechanics to analyze the properties of biofluid, hard and soft tissues and identify the appropriate model to demonstrate mechanical behavior.
C306.3	Apply knowledge of biomechanics to analyze the properties hard and soft tissues and identify the appropriate model to demonstrate mechanical behavior.
C306.4	Analyze the biomechanics of different human joints and also forces for various static and dynamic human activities.
C306.5	Demonstrate a detailed understanding of the design requirements of computational mathematical modeling applied in biomechanics.

YEAR / SEM: III /VI/MD8091 HOSPITAL MANAGEMENT

No.	Course Outcomes
C307.1	Classify hospitals, different units and their functions in hospital.
C307.2	Explain the role of human resource management concepts in hospital
C307.3	Demonstrate knowledge of strategic planning and decision making in the healthcare.
C307.4	Implement information system for effective and improved healthcare delivery.
C307.5	Apply skills for improving safety and the quality of care in hospital.

YEAR / SEM: III /VI/BM8074 BIOSIGNAL PROCESSING

No.	Course Outcomes
C308.1	Interpret different types of biomedical signals and identify their spectral components.
C308.2	Design different filters on biomedical signals and judge filter performance
C308.3	Identify physiological interferences and artifacts affecting ECG signal.
C308.4	Analyze power and correlation spectra of EEG signal.
C308.5	Program the signal processing algorithm to classify biomedical signals.

YEAR / SEM: III /VI/BM8611 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT LABORATORY

No.	Course Outcomes
C309.1	Demonstrate the basic principle of working, mode of operation and various advancements.
C309.2	Make measurement, analyse and interpret the results for clinical purposes.
C309.3	Choose appropriate instruments for specific application and accurate measurement
C309.4	Examine the electrical safety measurements
C309.5	Analyze the different bio signals using suitable tools.

YEAR / SEM: III /VI/ BM8612 MINI PROJECT

No.	Course Outcomes
C310.1	Formulate a real world problem, identify the requirement and develop the design solutions.
C310.2	Express the technical ideas, strategies and methodologies.
C310.3	Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
C310.4	Test and validate through conformance of the developed prototype and analysis the cost effectiveness
C310.5	Prepare report and present the oral demonstrations.

YEAR / SEM: IV /VII/ BM8701 Diagnostic and Therapeutic Equipment -II

No.	Course Outcomes
C401.1	Discuss the various equipment used in ICU and applications of telemetry.
C401.2	Explain the types of diathermy and its applications.
C401.3	Express the basics of ultrasound and its application in medicine
C401.4	Discuss the various extracorporeal and special diagnostic devices used in hospitals
C401.5	Outline the importance of patient safety against electrical hazard

YEAR / SEM: IV /VII / EC8093 Digital Image Processing

No.	Course Outcomes
C402.1	Ability to understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms
C402.2	Explain the Operate on images using the techniques of smoothing, sharpening and enhancement.
C402.3	Ability to understand the restoration concepts and filtering techniques.
C402.4	Explain the basics of segmentation, features extraction, compression and recognition methods for color models.
C402.5	Explain the Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors

YEAR / SEM: IV /VII / BM8702 Radiological Equipments

No.	Course Outcomes
C403.1	Describe the working principle of X ray machine and its application.
C403.2	Illustrate the principle computed tomography.
C403.3	Explain the technique used for visualizing various sections of the body using magnetic resonance imaging
C403.4	Demonstrate the applications of radio nuclide imaging.
C403.5	Apply methods of radiation safety.

YEAR / SEM: IV /VII / BM8703 Rehabilitation Engineering

No.	Course Outcomes
C404.1	Apply adequate knowledge about the needs of rehabilitations and its future development.
C404.2	Explain an in depth idea about Engineering Concepts in Sensory & Motor rehabilitation.
C404.3	Apply the different types of Therapeutic Exercise Technique to benefit the society.
C404.4	Design and apply different types Hearing aids, visual aids and their application in biomedical field and hence the benefit of the society.
C404.5	Apply in-depth knowledge about different types of models of Hand and arm replacement.

YEAR / SEM: IV /VII / OCH752 Energy Technology

No.	Course Outcomes
C405.1	Explain different types of energy
C405.2	Ability to understand conventional Energy sources
C405.3	Ability to understand Non- conventional Energy sources
C405.4	Explain biomass sources and develop design parameters for equipment to be used in Chemical process industries
C405.5	Understand energy conservation in process industries

YEAR / SEM: IV /VII / CS8081 - Internet of Things

No.	Course Outcomes
C406.1	Explain the concept of IoT
C406.2	Analyze various protocols for IoT
C406.3	Design a PoC of an IoT system using Rasperry Pi/Arduino

C406.4	Apply data analytics and use cloud offerings related to IoT.
C406.5	Analyze applications of IoT in real time scenario

YEAR / SEM: IV /VII / EC8762 Digital Image Processing Laboratory

No.	Course Outcomes
C407.1	Perform enhancing operations on the image using spatial filters and frequency domain filters
C407.2	Apply transforms and analyse the characteristics of the image
C407.3	Perform segmentation operations in the images.
C407.4	Estimate the efficiency of the compression technique on the images.
C407.5	Apply image processing technique to solve real health care problems.

YEAR / SEM: IV /VII MD8751 Hospital Training

No.	Course Outcomes
C408.1	Advocate a patient-centered approach in healthcare.
C408.2	Communicate with other health professionals in a respectful and responsible manner
C408.3	Recognize the importance of inter-professional collaboration in healthcare.
C408.4	Propose a patient-centered inter-professional health improvement plan based upon the patient's perceived needs
C408.5	Use the knowledge of one's own role and those of other professions to address the healthcare needs of populations and patients served

YEAR / SEM: IV /VIII / GE8076 - Professional Ethics in Engineering

No.	Course Outcomes
C409.1	Ability to create an awareness on Human Values
C409.2	Ability to instill Moral and Social Values and Loyalty
C409.3	Explain depth knowledge on framing of the problem and determining the facts.
C409.4	Explain depth knowledge on codes of ethics.
C409.5	Analyze ethical problems in research

YEAR / SEM: IV /VIII / EC8791 EMBEDDED AND REAL TIME SYSTEMS

No.	Course Outcomes
C410.1	Describe the architecture and programming of ARM processor
C410.2	Outline the concepts of embedded systems
C410.3	Explain the basic concepts of real time operating system design
C410.4	Model real-time applications using embedded-system concepts
C410.5	Explain real time operating systems

YEAR / SEM: IV / VIII BM8811 PROJECT WORK

NO	Course Outcomes
C411.1	Identify an application or a methodology which can be developed or formulated by Applying the acquired knowledge.
C411.2	Categorize the executable project modules according to the project flow and design the modules.
C411.3	Choose efficient tools for implementing and executing the design of each module.
C411.4	Integrate all the modules and test them for efficient working through effective team work.
C411.5	Demonstrate the project, elaborate the entire tasks and compile the project report.