GNANAMANI COLLEGE OF TECHNOLOGY

Department of Biomedical Engineering

Course Outcomes (COs)

(*Academic Year:* **2021-2022)**

Regulation: **2017**

Year/Sem	Course	Course Outcomes	
I/I	HS8151-Communicative English	C101.1	Understand articles of a general kind in magazines and newspapers.
		C101.2	Take part effectively in informal conversations; introduce themselves and their friends and express opinions in English.
		C101.3	Develop conversations and short talks in English.
		C101.4	Create short essay of a general kind, personal letters and emails in English.
		C101.5	Classify the tenses forms for better understanding.
I/I	MA8151-Engineering Mathematics-I	C102.1	Summarize the Basic Explanation of limit function, continuity and derivatives.
		C102.2	Apply differentiation rules in Euler's theorem, Jacobians and total derivatives.
		C102.3	Solve integration of rational functions and irrational functions using the definite and indefinite integrals
		C102.4	Examine the change of order of integration in Cartesian and polar coordinates.
		C102.5	Solve the higher order linear differential equation with constant co efficient.
I/I	PH8151- Engineering Physics	C103.1	Outline the properties of materials and its applications.
		C103.2	Develop knowledge on concepts of waves and optical devices
		C103.3	Explain the thermal conductivity of materials
		C103.4	Utilize the basic concepts of quantum theory in electron microscopes.
		C103.5	Outline the properties of materials audits applications

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I/I	**CY8151- Engineering Chemistry**	C104.1	Identify the hardness of water and suitable methods to soften.
		C104.2	Explain the concepts of adsorption, catalysis of various substances and its applications.
		C104.3	Illustrate the phase transitions of various component system and alloys.
		C104.4	Analyze the combustion mechanisms of various fuels.
		C104.5	Explain different energy sources and storage devices.
I/I	**GE8151- Problem Solving and Python Programming**	C105.1	Develop algorithmic solutions to simple computational problems
		C105.2	Summarize data from/to files in Python Programs.
		C105.3	Develop Python programs with conditionals and loops.
		C105.4	Define a Python program into functions.
		C105.5	Build compound data using Python lists, tuples, dictionaries.
I/I	**GE8151- Engineering Graphics**	C106.1	Construct the conic sections, special curves and free hand sketching
		C106.2	Develop projection of points, lines and plane surfaces
		C106.3	Construct the projection of solids with various conditions
		C106.4	Design the section of solids and develop the surface
		C106.5	Construct isometric view and perspective view of solids

Year/Sem	Course	Course Outcomes	
I/I	**GE8161- Problem Solving and Python Programming Laboratory**	C107.1	Test and debug the simple python programs
		C107.2	Develop the python programs with conditionals and loopings
		C107.3	Develop the python programs step-wise by defining functions anf calling them
		C107.4	Build Python list, tuples, dictionaries for representing compound data
		C107.5	Build the data from/to files in python
I/I	**BS8161-Physics and Chemistry Laboratory**	C108.1	Examine the rigidity and young's modulus of the materials.
		C108.2	Experiment with thermal conductivity of material.
		C108.3	Determine the compressibility of liquid and wavelength of a spectrum.
		C108.4	Analyze the water quality parameter.
		C108.5	Measure the pH and conductance of a given sample.
I/II	**HS8251-Technical English**	C109.1	Explain technical texts and illustrate area-specific texts effortlessly.
		C109.2	Illustrate charts in their area of specialization successfully.
		C109.3	Explain and describe process in varies formal and informal contexts.
		C109.4	Develop reports, winning job applications and analytical essay.
		C109.5	Build technical presentations and prepare minutes of a meeting effectively.

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I/II	MA8251-Engineering Mathematics-II	C110.1	Apply matrix algebra techniques for practical applications.
		C110.2	Explain the Gradient, divergence and curl of a vector point function and related identities.
		C110.3	Apply the line, surface and volume integrals in gauss, stokes and greens theorem.
		C110.4	Analyze the function and conformal mappings using complex integration.
		C110.5	Solve the differential equation with constant co-efficient using Laplace transform.
I/II	PH8253-Physics for Electronics Engineering	C111.1	Acquire knowledge on quantum electronics theories and energy band structure.
		C111.2	Distinguish the various types of semiconductor and various devices.
		C111.3	Develop knowledge on magnetic and dielectric property of materials.
		C111.4	Identify the function of optical materials for optoelectronics.
		C111.5	Understanding the quantum structure and application in spintronics and carbon electronics.
I/II	BM8251 - Engineering Mechanics for Biomedical Engineers	C112.1	Explain the concept of basic and statics for particles.
		C112.2	Understand the concept of equilibrium of rigid bodies.
		C112.3	Analyze the basic mechanics of solids.
		C112.4	Analyze the basics of mechanics of fluids.
		C112.5	Applying fundamental concept of dynamics of particles.

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I/II	BM8201-Fundamentals of Biochemistry	C113.1	Explain the concept of biochemistry.
		C113.2	Discuss the brief concept of carbohydrates.
		C113.3	Elaborate the concept of lipids.
		C113.4	Detail note on nucleic acid and proteins.
		C113.5	Illustrate the concept of enzyme and its clinical applications.
I/II	EC8251-Circuit Analysis	C114.1	Evaluate the basic circuits analysis and network topology.
		C114.2	Evaluate the AC and DC circuits.
		C114.3	Analyze the electrical circuits and its resonance.
		C114.4	Enumerate the concept of transient analysis.
		C114.5	Discuss the concept of two port networking.
I/II	GE8261-Engineering Practices Laboratory	C115.1	Analyze and construct the electrical wiring
		C115.2	Analyze the different Electrical quantities with measuring equipments
		C115.3	Apply the concept of electronic components and design logic circuits under study state.
		C115.4	Design and generate the clock signal.
		C115.5	Apply the concept of soldering and design the rectifiers.

Year/Sem	Course		Course Outcomes
I/II	BM8211-Bio Chemistry Laboratory	C116.1	Understand the biochemistry laboratory functional components.
		C116.2	Understand the basics principles of preparation of buffers.
		C116.3	Have a sound knowledge of qualitative test of different, biomolecules.
		C116.4	Understand the basics knowledge of Biochemical parameter and their interpretation in Blood sample.
		C116.5	Have a sound knowledge of separation technology of proteins and amino acids.
II/III	C201 - Linear Algebra and Partial Differential Equations	C201.1	Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
		C201.2	Distinguish accurate and efficient use of advanced algebraic techniques.
		C201.3	Develop their mastery by solving non – trivial problems related to the concept and by proving simple theorems about the statements proven by the text.
		C201.4	Solve first, second order homogeneous and non homogeneous partial differential equations.
		C201.5	Determine Fourier series to solve one dimensional wave and one and two dimensional heat equations.
II/III	C202 - Signals and Systems	C202.1	Classify the various types of continuous and discrete signals and systems.
		C202.2	Analyze continuous time signals using Fourier series, Laplace and Fourier transform
		C202.3	Design continuous time LTI systems using Fourier and Laplace transform.
		C202.4	Analyze discrete time signal using z-transform and DTFT.
		C202.5	Design discrete time LTI systems using z-transform and DTFT.

Year/Sem	Course		Course Outcomes
II/III	C230 - Anatomy and Human Physiology	C203.1	Summarize the level of organization of the human body & its application in basic.
		C203.2	understand the muscles, bones and joints of the various regions & its application of human body.
		C203.3	Explain the cardiac vascular and the lymphatic system of the body & its application of interconnect.
		C203.4	Illustrate the topographical and functional anatomy of the neurons and reflex mechanism
		C203.5	understand the topographical and functional anatomy of the limbs in digestive and urinary system.
II/III	C204 - Sensors and Measurements	C204.1	Analyze various electrical parameters with accuracy, precision, resolution
		C204.2	Select appropriate passive or active transducers for measurement of physical phenomenon.
		C204.3	Understand and select appropriate light sensors for measurement of physical phenomenon.
		C204.4	Employ AC and DC bridges for relevant parameter measurement
		C204.5	Employ Multimeter, CRO and different types of recorders for appropriate measurement
II/III	C205 - Electron Devices and Circuits	C205.1	Interpret the structure and characteristics of PN Junction Devices.
		C205.2	Analyze the performance characteristics of transistors and thyristors.
		C205.3	Modeling of small signal amplifiers and to analyze the high frequency signals.
		C205.4	Explore the characteristics of amplifier gain and frequency response.
		C205.5	Design and analysis of feedback amplifiers and oscillators.

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II/III	C206 - Pathalogy and Microbiology	C206.1	Analyze structural and functional aspects of living organisms of tissue regeneration and degradation
		C206.2	Discuss the importance of living organism..
		C206.3	Interpret morphological features and the diseases caused by bacteria, fungi and viruses.
		C206.4	Explain the functions of microscope.
		C206.5	Describe the various methods involved in treating the pathological diseases and importance of public health.
II/III	C207 - Pathalogy and Microbiology Laboratory	C207.1	Perform practical experiments on tissue processing, Cryo processing, staining Processes
		C207.2	Use Compound microscope
		C207.3	Practice on chemical examinations, Cryo processing, Histopathological examinations
		C207.4	Learn about immunization and their preparation and its importance.
		C207.5	Learn how "clonal selection" allows for the expansion of a limited number of antigen-recognizing lymphocytes in response to an specific antigenic stimulus.
II/III	C208 - Devices and Circuits Laboratory	C208.1	Interpret the characteristics of PN junction, Zener diodes& regulators.
		C208.2	Demonstrate the characteristics of common emitter and base transistor configuration.
		C208.3	Demonstrate the characteristics of common emitter and base transistor configuration.
		C208.4	Analyze the frequency response in AC circuits
		C208.5	Verify Thevinin & Norton theorem KVL & KCL, and Super Position Theorems

Year/Sem	Course	Course Outcomes	
II/III	**C209 - Human Physiology Laboratory**	C209.1	Demonstrate the process and procedure for collection of blood samples
		C209.2	Categorize blood group using forward and reverse method.
		C209.3	Test for bleeding and clotting time in the given sample.
		C209.4	Estimatehemoglobin, ESR,PCV,MCH, MCV and MCHC
		C209.5	Estimate total and differential count of RBC,WBC.
II/IV	**C210 - Probability and Statistics**	C210.1	Acquire skills in handling situation involving more than one random variables and function of random variables.
		C210.2	Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
		C210.3	Apply the concept of testing of hypothesis for small and large samples in real life problems.
		C210.4	Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
		C210.5	Apply X,R,P,C and np charts in quality control.
II/IV	**C211 - Medical Physics**	C211 .1	Explain about non-ionizing radiation, interaction with tissue of human and its effects.
		C211 .2	Define and compare intensities of sensory stimuli
		C211 .3	Infer the basics of radioactivity & radioactive nuclides
		C211 .4	Describe the various interactions of radiations with matter and its clinical significance
		C211 .5	Use the basic radiation quantities and its units

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II/IV	C212 - Basics of Electrical Engineering	C212.1	Design simple electrical circuits and understand the configuration of circuits with sources and variable loads.
		C212.2	Get knowledge on electrical machines and on its efficient operating principle.
		C212.3	Infer the significance of measuring electrical instruments of energy, voltage
		C212.4	Analyze existing power distribution and hence apply technology in electrical applications. With electrical safety and load protection.
		C212.5	Understand the working of different current, voltage and power measuring devices with classic and stand alone.
II/IV	C213 - Linear Integrated Circuits	C213.1	Explain the performance characteristics of operational amplifier.
		C213.2	Design linear and non-linear applications of operational amplifiers.
		C213.3	Discuss the applications using analog multiplier and PLL.
		C213.4	Explain ADC and DAC using OP-AMP.
		C213.5	Generate Waveforms using OP-AMP circuits and Analyze special function IC's.
II/IV	C214 - Fundamentals of Data Structures in C	C214.1	Understand the features of C
		C214.2	Understand the basic concepts of functions, structure of C
		C214.3	Implement linear and non linear data structure operations using C
		C214.4	Suggest appropriate linear/non linear data structure for any given data set
		C214.5	Apply hashing concept and sorting algorithm for a given problem

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II/IV	C215 - Digital Electronics	C215 .1	Explain the various ecosystem and biodiversity.
		C215 .2	Outline the environmental pollution, related problems and control methods.
		C215 .3	Summarize the natural resources and the effects of its over-exploitation.
		C215 .4	Interpret social issues and sustainable development.
		C215 .5	Illustrate population, environmental health issues and application of Information Technology.
II/IV	C216 - Fundamentals of Data Structures in C Laboratory	C216.1	Design and Implement the basic data structures using C
		C216.2	Apply linear and non-linear data structures in problem solving for string , pointers and dynamic memory allocations
		C216.3	Design and Implement functions and recursive functions for stack and queues in C
		C216.4	Design and Implement the tree traversals using C
		C216.5	Choose appropriate sorting algorithm for an application and implement it in a modularized way
II/IV	C217 - Integrated Circuits Laboratory	C217.1	Design oscillators and amplifiers using operational amplifiers.
		C217.2	Design filters using Opamp and perform experiment on frequency response.
		C217.3	Analyse the working of PLL and use PLL as frequency multiplier
		C217.4	Design DC power supply using ICs.
		C217.5	Acquire knowledge in using SPICE

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III/V	C301 - Analog and Digital Communications	C301 .1	Explain the different Analog Modulation Techniques and sources of noise.
		C301 .2	Explain the different Analog Modulation Techniques and sources of noise.
		C301 .3	Examine the spectral characteristics of digital modulation techniques
		C301 .4	Examine and correct the errors introduced in the channel using Source and error control coding schemes.
		C301 .5	Discuss about Multiple access techniques and Multiuser Radio.
III/V	C302 - Biocontrol Systems	C302.1	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
		C302.2	Analyze the time response of various systems and discuss the concept of system stability
		C302.3	Analyze the frequency response characteristics of various systems using different charts
		C302.4	Understand the concept of modeling basic physiological systems
		C302.5	Comprehend the application aspects of time and frequency response analysis in physiological control systems
III/V	C303 - Biomedical Instrumentation	C303.1	Differentiate different bio potentials and its propagations
		C303.2	Illustrate different electrode placement for various physiological recordings
		C303.3	Design bio amplifier for various physiological Recordings
		C303.4	Explain various technique for non-electrical physiological measurements
		C303.5	Demonstrate different biochemical measurement Techniques

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III/V	C304 - Discrete Time Signal Processing	C304 .1	Analyze the signals and systems using continuous-discrete time signal
		C304 .2	Apply z-transform and inverse Z transform and Analyze discrete time systems
		C304 .3	Apply the various transformation techniques and the computation of Discrete Fourier Transform
		C304 .4	Analyze and construct the filters for digital implementation.
		C304 .5	Infer the different types of digital signal processor & quantization effects.
III/V	C305 - Medical Optics	C305.1	Demonstrate knowledge of the fundamentals of optical properties of tissues
		C305.2	Analyze the components of instrumentation in Medical Photonics and Configurations
		C305.3	Describe surgical applications of lasers.
		C305.4	Describe photonics and its diagnostic applications
		C305.5	Investigate emerging techniques in medical optics
III/V	C306 - Microscopy	C306.1	Understand the physics behind the microscopy
		C306.2	Describe the principle, construction and working of light microscopy
		C306.3	Appreciate about electron microscopy
		C306.4	Understand the importance of sample preparation technique
		C306.5	Identify the appropriate microscopy technique for chemical analysis

Year/Sem	Course		Course Outcomes
III/V	**C307 - Digital Signal Processing Laboratory**	C307 .1	Experiment with sequence generation, correlations, convolution and spectrum analysis using DET
		C307 .2	Design FIR and IIR filters with known specifications
		C307 .3	Apply adaptive filtering in equalization for various application of DSP
		C307 .4	Demonstrate DSP processors and explain its operations and addressing modes
		C307 .5	Build FIR and IIR filters and analyze finite word length effect on DSP processors
III/V	**C308 - Biomedical Instrumentation Laboratory**	C308.1	Design and construct bio-amplifiers form medical instrumentation
		C308.2	Design an amplifier circuit to detect physiological signals like ECG,EEG,EMG and EOG
		C308.3	Design of multiplexer and demultiplexer to transmit bio signals.
		C308.4	Measurement of biochemical signals using biosensors like photo transducer, pH meter
		C308.5	Analyze the characteristics of bio amplifier using PCB simulation tool.
III/V	**C309 - Interpersonal Skills / Listening & Speaking**	C309.1	Listen and Respond to everyday topics with reasonable accuracy
		C309.2	Introduce themselves and their friends and Take part effectively in informal conversations in English.
		C309.3	Develop conversations and short talks in English.
		C309.4	Make effective presentations and Participate in GD.
		C309.5	Participate confidently and appropriately in conversations both formal and informal.

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III/VI	C310 - Microprocessors and Microcontrollers	C310 .1	Explain the architecture and addressing modes of 8086.
		C310 .2	Explain the concept of system bus structure and different modes of 8086 processor.
		C310 .3	Analyze the various I/O interfacing techniques of 8086 microprocessor.
		C310 .4	Explain the architecture and addressing modes of 8051.
		C310 .5	Analyze the various interfacing techniques and applications of 8051 microprocessor.
III/VI	C311 - Diagnostic and Therapeutic Equipment - I	C311.1	Describe the working and recording setup of all basic cardiac equipment.
		C311.2	Understand the working and recording of all basic neurological equipment's.
		C311.3	Discuss the recording of diagnostic and therapeutic equipment's related to EMG.
		C311.4	Explain about measurements of parameters related to respiratory system.
		C311.5	Describe the measurement techniques of sensory responses.
III/VI	C312 - Biomechanics	C312.1	Understand the principles of mechanics.
		C312.2	Outline the principles of biofluid dynamics.
		C312.3	Explain the fundamentals of bio-solid mechanics.
		C312.4	Apply the knowledge of joint mechanics.
		C312.5	Computational mathematical modelling applied in biomechanics.

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III/VI	C313 - Environmental Science and Engineering	C313 .1	Explain the various ecosystem and biodiversity.
		C313 .2	Outline the environmental pollution, related problems and control methods.
		C313 .3	Summarize the natural resources and the effects of its over-exploitation.
		C313 .4	Interpret social issues and sustainable development.
		C313 .5	Illustrate population, environmental health issues and application of Information Technology.
III/VI	C314 - Hospital Management	C314.1	Explain the principles of Hospital administration.
		C314.2	Identify the importance of Human resource management.
		C314.3	List various marketing research techniques.
		C314.4	Identify Information management systems and its uses.
		C314.5	Understand safety procedures followed in hospitals.
III/VI	C315 - Telehealth Technology	C315.1	Apply multimedia technologies in telemedicine.
		C315.2	Explain protocols behind encryption techniques for secure transmission of data
		C315.3	Apply coding techniques in telemedicine.
		C315.4	Apply telehealth in healthcare..
		C315.5	Apply the concept of telehealth in both diagnostic therapeutic applications

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III/VI	C316 - Microprocessors and Microcontrollers Laboratory	C316.1	Demonstrate the ALP programs in 8086.
		C316.2	Apply the Arithmetic & logical operations in 8086 microprocessor.
		C316.3	Experiment with A/D & D/A, stepper motor, traffic light Interfacing with 8086 Microprocessor.
		C316.4	Demonstrate the ALP Programs in 8051.
		C316.5	Compile the programs using MASM Software
III/VI	C317 - Diagnostic and Therapeutic Equipment Laboratory	C317.1	Measure different bioelectrical signals using various methods
		C317.2	Assess different non-electrical parameters using various methodologies.
		C317.3	Illustrate various diagnostic and therapeutic techniques
		C317.4	Examine the electrical safety measurements
		C317.5	Analyze the different bio signals using suitable tools.
II/VI	C318- Mini Project	C318.1	Identify the real world problem and develop the design solutions.
		C318.2	Reveal the technical idea, strategies and methodologies.
		C318.3	Utilize the new tools, algorithm, techniques that contribute to obtain the solution of the project.
		C318.4	Test and validate through conformance of the developed proto type and analysis the cost effectiveness.
		C318.5	Prepare report and present the oral demonstration.

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III/VI	**C319 - Professional Communications**	C319.1	Develop the employability, career and soft skills.
		C319.2	Develop their interview etiquette, presentation and GD skills.
		C319.3	Participate confidently in Group Discussions and Job Interviews.
		C319.4	Attend job interviews and be successful in them.
		C319.5	Develop adequate soft skills required for the workplace.
IV/VII	**C401 - Diagnostic and Therapeutic Equipment - II**	C401.1	Discuss the Various equipments used in ICU and applications of telemetry
		C401.2	Explain the types of diathermy and its applications
		C401.3	Understand the basics of ultrasound and its applications 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 hazards
IV/VII	**C402- Digital Image Processing**	C402.1	Characterize images in the transform domain
		C402.2	Configure image compression and restoration techniques in transform domain
		C402.3	Design image enhancement techniques
		C402.4	Design image compression techniques
		C402.5	Apply image segmentation methods as required by target application

Year/Sem	Course	Course Outcomes	
IV/VII	**C403 - Radiological Equipment**	C403.1	Describe the working principle of X ray machine and its applications
		C403.2	Illustrate the principle computed tomography
		C403.3	Interpret 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	Outline the methods of radiation safety
IV/VII	**C3404 - Rehabilitation Engineering**	C404.1	Gain adequate knowledge about the needs of rehabilitation and its future development
		C404.2	Have an in depth idea about engineering concepts in sensory and motor rehabilitation
		C404.3	Apply different types therapeutic exercise technique to benefit the society
		C404.4	Design and apply different types hearing aids , visual aids and their applications in biomedical field
		C404.5	Gain in depth knowledge about different types of models of hand and arm replacement
IV/VII	**C405- Robotics in Medicine**	C405.1	Understand the basics robotic systems
		C405.2	Design basic robotics system and formulate kinematics
		C405.3	Constructive inverse kinematic motion
		C405.4	planning solutions for various robotics configurations
		C405.5	Design robotic systems for medical applications

Year/Sem	Course		Course Outcomes
IV/VII	C406 - Transducer Engineering	C406.1	Understand the measurements of physical quantities and how they are converted electrical or other forms
		C406.2	Have an adequate knowledge in resistance, transducers
		C406.3	Develop the knowledge of inductance and capacitance transducer
		C406.4	Study the characteristics of transducers
		C406.5	Impart knowledge on various types of transducers
IV/VII	C3407 - Digital Image Processing Laboratory	C407.1	Perform enhancing operations on the image using spatial filters and frequency domain filters.
		C407.2	Use 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.
IV/VII	C408- Hospital Training	C408.1	Advocate the patient center approach in health care.
		C408.2	Communicate with other health professionals in a respectful and responsible manner.
		C408.3	Recognize the importance of inter-professional collaboration in health care.
		C408.4	Suggest a patient – centered inter-professional health improvement plan based upon the patients perceived needs.
		C408.5	Use the knowledge of one's own role and those of others profession to address the health care needs of patients.

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IV/VII	C409 - Embedded and Real time Systems	C409.1	Understand the concepts of Embedded systems design and analysis
		C409.2	Learn the architecture and programming of ARM processor
		C409.3	Exposed to the basic concepts of Embedded programming
		C409.4	Learn the real time operating systems
		C409.5	Model real time applications using Embedded system concepts
IV/VII	C410 - Hospital Waste Management	C410.1	Analyze various hazards accident and its control
		C410.2	Outline the difference waste disposal procedure
		C410.3	Categories different biowaste based on its properties
		C410.4	Explain different safety facilities in hospitals
		C410.5	Propose various regulations and safety norms
IV/VII	C411-Project Work	C411.1	Apply the fundamentals of mathematics, science and engineering knowledge to identify, formulate the design and investigate complex engineering problem of Biomedical engineering and applications.
		C411.2	Apply appropriate techniques and modern engineering hardware and software tools in biomedical engineering.
		C411.3	Apply reasoning informed by the contextual knowledge to asses societal, health, safety, legal and cultural issues with societal and environmental context, applying ethical principles in the field of Biomedical engineering and allied application.
		C411.4	Analyze the Function effectively as an individual and as a member or leader in diverse teams in multidisciplinary settings and make effective presentation, and communicate effectively.
		C411.5	Demonstrate the understanding of the engineering and management principles in multidisciplinary environments to engage in lifelong learning in the broadest context of technological change.