DEPARTMENT OF MEDICAL ELECTRONICS AND ENGINEERING

Vision

To be a leading force in the field of medical electronics in understanding medical equipment for health care.

Mission

- To impart knowledge base and skill sets in the field of medical electronics.
- Inculcate managerial and entrepreneurial skills to work in multidisciplinary environment.
- To provide a best learning ambience for academics & research leading to global competence.
- To analyze and design latest life saving technologies to solve societal problems.

Program Educational Objectives

PEO 1: To impart fundamental knowledge in science and technology to perform challenging roles in new trends of medical electronics.

PEO2: To develop professional attitude, good communication skill and to work in multidisciplinary teams with strong ethical, spiritual background.

PEO3: To excel in the field of research and innovation there by contributing to the evolving technology.

Program Specific Outcomes (PSOs)

PSO 1: Investigate, Implement and demonstrate various applications of analog and digital electronic subsystems in designing and building biomedical instrumentation systems.

PSO 2: Specify, architect and prototype health-care solutions by applying signal and medical image processing techniques on modern hardware and software platforms

PSO 3: Design, develop and verify processes, algorithms and computer programs for medical purposes

Program Outcomes:

Engineering Graduates will be able to:

- **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **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.
- **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.
- **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.
- **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.
- **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.
- **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.
- **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **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.
- **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.
- **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.

SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)
CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION FOR BE DEGREE COURSE
(Effective from the academic year 2021-22)

Department of Medical Electronics
III SEMESTER B.E.

			(Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Eng. & Tech.- Jan. 2018)					Examination			
SI No.	Course Code		Course Title	Teaching dept.	Board of Exam.	L-T-P	Credits	CIE	SEE	Total Marks	Exam Hours
01	BS	MA3TH1	Integral Transform and Numerical Methods	MA	MA	4-0-0	4	50	50	100	3
02	PC	ML3TH2	Oops with C++	ML	ML	3-0-0	3	50	50	100	3
03	PC	ML3TH3	Human Anatomy and Physiology	ML	ML	3-0-0	3	50	50	100	3
04	PC	ML3TH4	Biomedical Instrumentation	ML	ML	3-0-0	3	50	50	100	3
05	PC	ML3TH5	Analog and Digital Electronic Circuits	ML	ML	3-0-0	3	50	50	100	3
06	ES/ MA	ML3TH6/ MA3DP6	Biosensors and Measurements/ DIP Mathematics	ML/ MA	ML/ MA	3-0-0	3	50	50	100	3
07	PC	ML3LB1	Biomedical Instrumentation Lab	ML	ML	0-0-3	1.5	50	50	100	3
08	PC	ML3LB2	Analog and Digital Electronics circuits Lab	ML	ML	0-0-3	1.5	50	50	100	3
09	PC	ML3LB3	Oops with C++ Lab	ML	ML	0-0-3	1.5	50	50	100	3
10	HS	SK3DP1	Skill Development-I	HS	HS	1-0-0	1	50	-	50	-
Total							24.5	500	450	950	-
	CIE-Continuous Internal Evaluation, SEE-Semester End Examination										

Note: **MA3DP6: DIP Mathematics for Lateral Entry students only.**
There is no SEE for Skill Development-I course.
However, all the students should maintain a minimum 85% of attendance and 40% of CIE to get pass in the subject.

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CHOICE BASED CREDIT SYSTEM (CBCS)
SCHEME OF TEACHING AND EXAMINATION FOR BE DEGREE COURSE
(Effective from the academic year 2021-22)

Department of Medical Electronics
IV SEMESTER B.E.

	(Subjects and Syllabus as per AICTE-Model Curriculum for UG Course in Eng. & Tech.- Jan. 2018)							Examination			
SI No	***Course and Course Code***		***Course Title***	***Teaching dept.***	***Board of Exam.***	L-T-P	***Credits***	***CIE***	***SEE***	***Total Marks***	***Exam Hrs.***
01	BS	MA4ES1	Probability and Complex Analysis	MA	MA	3-0-0	3	50	50	100	3
02	PC	ML4TH2	Signals and Systems	ML	ML	3-0-0	3	50	50	100	3
03	PC	ML4TH3	Circuit Theory and Analysis	ML	ML	3-0-0	3	50	50	100	3
04	PC	ML4TH4	Physiological Control System	ML	ML	3-0-0	3	50	50	100	3
05	PC	ML4TH5	Linear Integrated Circuits	ML	ML	3-0-0	3	50	50	100	3
06	PC	ML4TH6	Microcontroller	ML	ML	3-0-0	3	50	50	100	3
07	PC	ML4LB1	Microcontroller Lab	ML	ML	0-0-3	1.5	50	50	100	3
08	PC	ML4LB2	Sensors and Measurements Lab	ML	ML	0-0-3	1.5	50	50	100	3
09	PC	ML4LB3	Signals and Control System Lab	ML	ML	0-0-3	1.5	50	50	100	3
10	HS	SK4DP2	Skill Development-II	HS	HS	1-0-0	1	50	-	50	-
Total							23.5	500	450	850	-
	CIE-Continuous Internal Evaluation, SEE-Semester End Examination										

Note: **MA4**1: Engineering mathematics-IV is not common for all Branches (Syllabus is based on Department request).**
There is no SEE for Skill Development-II course. However, all the students should maintain a minimum 85% of attendance and 40% of CIE to get pass in the subject.

* *	*Old Code*	*New Code*
CSE and ISE	*18CS401*	*MA4CS1*
EE,EC,ETC AND ML	*18ES401*	*MA4ES1*
ME,CVL, IEM	*18MA401*	*MA4ME1*

Sri Siddhartha Institute of Technology, Tumkur

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Department of Medical Electronics

Syllabus for the Academic Year 2021-22

Subject Name: Integral Transforms and Numerical Techniques **Semester: III**

Subject Code: MA3TH1 **L-T-P-C: 4-0-0-4**

Course Objectives:

	Course Objectives
1	Introduce the concept of Laplace Transform and problems on periodic function.
2	Introduce the concept of Fourier series and problems arising up in engineering problems.
3	Introduce the concept of Fourier transform and Z-transform.
4	To develop the proficiency in Numerical techniques and solving Ordinary Differential Equations arising in engineering applications.

UNIT	**Description**	**Hours**
UNIT I	**Numerical solution of ordinary differential equations of first order and first degree**: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order, Milne's and Adams-Bashforth Predictor and Corrector methods (No derivation of formulae) problems. **Numerical Integration:** Simpson's $1/3^{rd}$, $3/8^{th}$ rule, Weddle's rule, (without proof), problems.	**10**
UNIT II	**Laplace Transforms:** Definition, Laplace transforms of elementary functions.(Statement only).Derivations: Laplace transform of t^n, Laplace transform of division by t, Laplace transformof $\int_0^t f(t)dt$.Laplace transforms of Periodic function (Statement only) and problems on square wave, saw-tooth wave, triangular wave, full and half wave rectified form,Unit step functions - problems.	**10**
UNT III	**Inverse Laplace transforms:**Definition, properties, evaluation using different methods. Convolution theorem (without proof), evaluation of $L^{-1}\{F(s)\}$ using convolution theorem. Application to solve ordinary linear differential equations by Laplace transforms method.	**10**
UNIT IV	**Fourier Series:** Periodic function, Dirichlet's conditions. Fourier series of even and odd functions. Fourier series of periodic functions with period 2π and with arbitrary period $2l$. Applications to Engineering problems: Fourier series for Periodic square wave, Half wave rectified form, Full wave rectified form, Saw-tooth wave with graphical representation. Half range Fourier series,	**12**

	Practical harmonic analysis.	
UNIT V	**Fourier Transforms:** Infinite Fourier transforms. Fourier Sine and Cosine transforms. Inverse Fourier transforms, and simple problems. **Z-Transforms:** Basic definitions of Z-transform, Standard Z-transforms, Damping rule, Shifting rule, Initial value and Final value theorems(without proof), problems, Inverse Z-transform, problems. Applications-solutions of difference equations using Z-transforms.	**10**

Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Higher Engineering Mathematics	B.S.Grewal	43rd Edition KhannaPublications, 2015. ISBN:9788174091956
2	Higher Engineering Mathematics	B.V.Ramana	1st Edition, Tata McGraw-Hill,2006. ISBN:9780070634190

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Advanced Engineering Mathematics	E.Kreyszig	10th EditionJonWiley&Sons, 2015. ISBN:9780470913611
2	Higher Engineering Mathematics	H.K.Das and Er.RajnishVerma	1st Edition,Chandpublishing, 2011. ISBN:9788121938907

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Syllabus for the Academic Year 2021-22

Subject Name: OOPS with C++ and its Applications in Medicine **Semester: III**

Subject Code: ML3TH2 **L-T-P-C: 3-0-0-3**

Course Objectives:

Sl. No.	Course Objectives
1.	Understand the difference between top-down and bottom-up approach.
2.	Learn writing inline functions for efficiency and performance and the syntax and semantics of the C++ programming language.
3	Learn the design of C++ classes for code reuse and to implement copy constructors and class member functions.
4.	Learn the use of overload functions and operators in C++ and to use inheritance and virtual functions implementation and use of exception handling in C++ programs.

Unit	Course content	Teaching hrs
Unit I	**Introduction:** Oops paradigm, difference between pop and oop, basics concepts of oops, benefits of oops, applications of c++, a simple C++ program, C++ statements, structure of C++ program, data types, operators in C++, variable, expressions and their types, implicit conversion, precedence of an operator, control structures.	**08**
Unit II	**Functions and Classes**: passing arguments, returning values, reference arguments, overloaded functions, inline functions, introduction to class, class specification, defining member functions, nesting member functions, array within a class, static data members and member functions, friend functions, returning objects, constructors and destructors, applications in the medical field.	**08**
Unit III	**Operator Overloading, Pointers, Virtual Functions and Polymorphism:** introduction, definition, overloading unary operators, overloading binary operators, rules to overload operators, type conversions, pointers: array, strings, functions, objects, this pointer, virtual functions, rules for virtual functions, use friend functions to overload operators, applications in the medical field.	**09**
Unit IV	**Inheritance:** Introduction, definition, types of inheritance: single, multiple, multilevel, hybrid, hierarchical, member accessible specifiers, making private member inheritable, virtual base class, constructors in derived classes, applications in the medical field.	**07**
Unit V	**Streams and I/O Operations and Files:** C++ streams and classes, unformatted I/O operations, formatted I/O operations, classes for file stream operations, opening and closing files, detecting end of file, sequential input and output operations, exception handling basics	**07**

	and mechanism, throwing, catching and rethrowing mechanism.	

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Differentiate between structure-oriented programming and object-oriented programming and use object-oriented programming language like C++ and associated libraries to develop object-oriented programs for handling different types of data.
CO2	Identify, analyze and apply the concepts of classes, Objects and other advanced OOPs concepts like inheritance, data abstraction, encapsulation, operator overloading, functions, polymorphism.
CO3	Implement the algorithms using standard libraries and templates and exception handling to manage data.
CO4	Implement, analyze, demonstrate, document and present the concepts as application to healthcare implemented in groups or individual.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Object Oriented Programming with C++	E Balaguruswamy	TMH, 3rd edition 2020

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Object Oriented Programming in C++	Robert Lafore	Golgotia Publications Pvt. Ltd. 4th edition, 2008
2.	The complete reference C	Herbert shieldt	Tata McGraw Hill Publication, 4th edition, 2013

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Department of Medical Electronics

Syllabus for the Academic Year 2021-22

Subject Name: Human Anatomy and Physiology **Semester: III**

Subject Code: ML3TH3 **L-T-P-C: 3-0-0-3**

Course Objectives:

Sl. No.	Course Objectives
1.	Provides students the relationship between anatomy and physiology.
2.	Describes the cells, its types and different functions.
3.	Understand the blood and its compositions.
4.	Describes the different organs of the body and its functions.

Unit	Course content	Teaching hrs
Unit I	**Introduction**: homeostasis, tissue, cartilage: 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.	**08**
Unit II	**Cardiovascular System:** 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, 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.	**08**
Unit III	**Respiratory System:** 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 capacities.	**07**
Unit IV	**Nervous System**: 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.	**08**

Unit V	**Digestive System**: Introduction, Organs of the digestive system-mouth: tongue, teeth, salivary glands, 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 and liver.	**08**

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Identify and explain the structural and functional anatomy of the different types of tissues.
CO2	Analyze the generation and transmission of action potential within the cells.
CO3	Know the functions and blood supply to various parts of the body.
CO4	Identify the factors affecting performance of the vital systems.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Anatomy and Physiology in Health and Illness .	Ross and Wilson	International Publication, 12th edition, 2018.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Human Anatomy and Physiology for Pharmacy	Dr A K Jain	Arya Publication, 3rd edition, 2017
2	Introduction to the Human Body, The Essentials of Anatomy and Physiology	Tortora G.J. and Derrickson B.,	Wiley, USA, 2011, ISBN 0470598921.

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Department of Medical Electronics

Syllabus for the Academic Year 2021-22

Subject Name: Biomedical Instrumentation **Semester: III**

Subject Code: ML3TH4 **L-T-P-C: 3-0-0**-3

Course Objectives:

Sl. No.	Course Objectives
1.	Interpret technical aspects of medicine.
2.	Comprehend different bio signals and their measurement.
3.	Study the principles of various diagnostic and therapeutic equipment's.
4.	Distinguish the sub systems used in a typical man-machine system.

Unit	Course content	Teaching hrs
Unit I	**Introduction to Biomedical Instrumentation:** Introduction to the man instrument system, components of the man instrument system, Physiological systems of the body, problems encountered in measuring living systems, sources of electric potentials: Resting and action potentials, propagation of action potentials, the bioelectric potentials.	**08**
Unit II	**The Cardiovascular system:** The heart and cardiovascular system, the heart, electrocardiograph, blood pressure and its measurements, characteristics of blood flow, measurements of blood flow and cardiac output, Plethysmography, heart sounds and its measurements.	**08**
Unit III	**Other Bio-electric signals & systems:** Electro-oculogram(EOG), Electro-encephalogram(EEG), Electro-myogram (EMG), Electro retinogram(ERG) Recording Electrodes: Electrode tissue interference polarization, Skin contact impedance , Silver-Silver chloride electrodes for ECG, Electrodes for EEG, EMG, Electrical conductivity of electrode jellies & creams, microelectrodes.	**08**
Unit IV	**Measurements respiratory system:** The physiology of the Respiratory system test & instrument for the Mechanics of breathing. Gas exchange & distribution, respiratory therapy equipments.	**08**
Unit V	**Cardiac Pace Maker & Patient Safety:** Need for Cardiac Pacemaker, external pacemaker, implantable pace maker, types of implantable pacemakers. Patient Safety: Electric shock hazards, leakage currents, safety codes & analyzer, Biomedical telemetry, single channel telemetry, multi-patient telemetry, Implantable telemetry & telemedicine.	**07**

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Understand the need for engineering skills in medical applications
CO2	Understand the need & advantages of Sources of Bio-Electric potentials, Transducers, Biosensors and its type.
CO3	Record and analyze biological parameters like EEG, EMG and ECG.
CO4	Foster the knowledge on Cardiac Pace Maker and patient safety measures.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Biomedical Instrumentation & Measurements.	Cromwell etal	2e, PHI/Pearson Education, 2009
2	Principles of Applied Biomedical Instrumentation.	Geddes and Baker	3e, John Wiley, 1989

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Biomedical Instrumentation Technology and Applications	R. S Khandpur	McGraw-Hill, 3rd e, 2014.
2	Biomedical Instrumentation	M Armugam	Anuradha Publications, 2nd edition. 1994.
3	Fundamentals of biomedical instrumentation	Dr. O N Pandey	Katson Books, 2012.
4	Biomedical Instrumentation Systems	Shakthi Chatterji	Delmar Cengage Learning, 2014.

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Department of Medical Electronics

Syllabus for the Academic Year 2021-22

Subject Name: Analog and Digital Electronic Circuits **Semester: III**

Subject Code: ML3TH5 **L-T-P-C: 3-0-0-3**

Course Objectives:

Sl. No.	Course Objectives
1.	To design and analyze amplifiers.
2.	To explain various logic families.
3.	To explain combinational and sequential circuits with its applications.

Unit	Course content	Teaching hrs
Unit I	**Diodes and Transistors:** Types of diodes, Application in various contexts, comparison of different transistor configuration (CE, CB, CC), Design of RC Coupled amplifier, characteristics parameters and impedance measurement.	**08**
Unit II	**Transistor Amplifiers:** Design of CC Amplifier (Emitter follower), Darlington emitter follower, Power amplifier and types, multistage amplifier, feedback amplifiers, types-positive and negative feedback, advantages.	**08**
Unit III	**Introduction to digital logic families:** Digital IC Terminology, The TTL Logic Family, TTL loading and Fan out, MOS Technology, Digital MOSFET circuits, Complementary MOS Logic, Tristate (Three-State) Logic outputs, ECL digital logic family, Comparative study of data sheets of TTL and CMOS circuits for NAND gates.	**08**
Unit IV	**Combinational Logic circuits:** Introduction to simplification of Logic circuits, Parallel adder, BCD adder, decoders, encoders, multiplexers, de-multiplexers, comparators, Applications of combinational logic circuits	**07**
Unit V	**Sequential Logic Circuits**: Introduction to NAND and NOR Latch, S-R Flip-Flop, J-K Flip-Flop, J-K Master slave Flip-flop, D Flip-Flop, T Flip-Flop, Shift registers, Asynchronous and synchronous counters, Up/Down Counters and presetable Counters, applications of counters.	**08**

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Apply the basic knowledge of transistor and diode to design various transistor amplifiers.
CO2	Understand the concept of feedback, power and cascading effect in respect to multistage transistor amplifiers.
CO3	Interpret various characteristics of digital logic families.

CO4	Analysis the performance of decoders, encoders, multiplexers, demultiplexers and code converters and apply the knowledge of flip-flops in designing synchronous and asynchronous counters.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Digital Systems Principles and Applications	Ronald J Tocci, Neal S Widmer Gregory L. Moss	Printice hall 12th Edition, 2018 .
2	Electronic Devices and Circuit Theory	Robert L. Boylested and Louis Nashelsky	Pearson Education. 11th Edition, 2015.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Electronic Devices and Circuits	David A. Bell	PHI, 5th Edition, 2010
2	Digital Logic – Application and Design	John M Yarbrough	Thomson Brooks/Cole 7thEdition, 2012

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Syllabus for the Academic Year 2021-22

Subject Name: Biosensors and Measurements **Semester: III**

Subject Code: ML3TH6 **L-T-P-C: 3-0-0-3**

Course Objectives:

Sl. No.	Course Objectives
1.	Define and understand accuracy and precision, types of errors, statistical and probability analysis.
2.	Learn and understand the concepts of oscilloscopes and signal generators, their types and functions.
3.	Understand the working of different types of transducers.
4.	Know the different types of biosensors and its applications.

Unit	Course content	Teaching hrs
Unit I	**Measurement and Error:** Static characteristics, error measurements, types of static errors, error sources, measurement error combinations, basics of statistical analysis. (Text 1:1.1,1.2,1.3,1.4,1.5,1.6,1.7,1.8). **Ammeters**: DC Ammeter, multirange ammeter, Ayrton shunt or universal shunt, requirements of shunt, extending ammeter ranges, RF ammeter (thermocouple), limitation of thermocouple. (Text 1:3.1,3.2,3.3,3.4,3.5,3.6,3.7) **Digital voltmeters:** Introduction, RAMP technique, Dual Slope integrating type DVM, integrating type DVM, principles of ADC, successive approximations ADC, resolution and sensitivity of digital meters, general specifications of DVM. (Text 1:5.1,5.2,5.3,5.4,5.5,5.6,5.8,5.9,5.10)	**08**
Unit II	**Oscilloscopes:** Introduction, Basic principles, block diagram of oscilloscope, Typical CRT connections, Dual beam and dual trace oscilloscope, sampling and storage oscilloscopes, measurement of frequency by Lissajous method, electronic switch. Digital storage oscilloscopes. (Text: 7.1, 7.2, 7.4, 7.14, 7.15, 7.16, 7.17, 7.18, 7.20, 7.32) **Signal Generators:** Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and square wave generator, Function generator, Square and Pulse generators (Text: 8.1, 8.2, 8.3, 8.5, 8.6. 8.7, 8.8, 8.9)	**08**
Unit III	**Transducers:** Introduction, electrical transducer, selecting a transducer, resistive transducer, strain gauges: bounded, unbounded, types of strain gauges, thermometer, thermistor, inductive	**09**

	transducer, capacitive transducer, pressure inductive transducer, LVDT, piezo electric transducer, photo electric transducer. (Text 1: 13.2, 13.3, 13.4, 13.6, 13.7, 13.8, 13.9, 13.11, 13.12, 13.13, 13.14, 13.15, 13.16).	
Unit IV	**Measurements of Resistance, inductance and capacitances:** Introduction, Wheatstone's bridge, kelvin's bridge, AC bridges, capacitance comparison bridge, inductance comparison bridge, schering's bridge, Maxwell's bridge, Wein's bridge, Wagner's earth connection. (Text 1:11.1,11.2,11.3,11.8,11.9,11.11,11.14,11.15) **Data Acquisition System (DAS):** Introduction, objective of DAS, signal conditioning of inputs, single channel DAS, multi-channel DAS, computer-based DAS. (Text 17.1, 17.2, 17.3, 17.4, 17.5, 17.6).	**07**
Unit V	**Biosensors:** Introduction, types: electrochemical biosensors, amperometric biosensors, potentiometric sensors, conductometric sensors, optical biosensors, piezoelectric biosensors, calorimetric biosensors, applications: clinical diagnostics, environmental monitoring, defense industries, food and water safety. (Text book 2: 1.1, 5.1, 5.2.1, 5.3, 5.4, 5.5).	**07**

Course Outcomes:

Sl. No.	
CO1	Measure various electrical parameters with accuracy, precision, resolution and interpret various types of errors and their statistical analysis.
CO2	Enhance their knowledge on the working principles of different oscilloscopes and signal generators and their functions.
CO3	Choose different types of transducers, data acquisition system and bridges required to build the different circuits.
CO4	Choose the required sensor for various biomedical applications.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Electronic Instrumentation	H. S. Kalsi	McGraw Hill, 2nd Edition., 2012

2	Biosensors: Fundamentals and Applications	Bansi Dhar Malhotra and Chandra Mouli Pandey	Smithers Rapra Technology Ltd, 2015

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Sensors and Transducers	D Patranabis	PHI publications, 2nd edition, 2018.
2	Electronics and Electrical Measurements	A. K. Sawhney	Dhanpat Rai &Sons, 2015
3	Biosensor	Elizabeth A. H. Hall	Prentice Hall, 2010

Sri Siddhartha Institute of Technology, Tumkur

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Department of Medical Electronics

Syllabus for the Academic Year 2021-22

Subject Name: Biomedical Instrumentation Lab **Semester: III**

Subject Code: ML3LB1 **L-T-P-C: 0-0-3-1.5**

Course Objectives:

Sl. No.	Course Objectives
1.	Interpret technical aspects of medicine.
2.	Comprehend different bio signals and their measurement.
3.	Study the principles of various diagnostic and therapeutic equipment's.

Sl no.	Course Contents
1	Determining the characteristics of the following amplifiers using op-amps (a) Inverting amplifier (b) Non-Inverting Amplifier (c) Differential Amplifier (d) Isolation Amplifier (e) Instrumentation Amplifier
2	To Analyze Active 1^{st}& 2^{nd} order filters for the given cutoff frequency. (i)Low pass Filter (ii) High Pass Filter (iii)Band Pass Filter (iv)Band Stop Filter
3	To Obtain &observe various Bioelectric signals on DSO or BiokitPhysiograph module kit. (i)Electrocardiograph (ii) Electro-oculograph (iii)Electromyograph (iv)Electroencephalograph
4	Study Experiments: (i) Spectrophotometer (ii) Ultrasound Scanner (iii)X-Ray machines (iv)MRI Scanner & CT-Scanner

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Reminisce the basics of measurements and the generic sensors used.
CO2	Accent the determination of characteristics of sensors used to measure various variables
CO3	Illustrate the usage of various sensors for signal acquisition.
CO4	Implement linear ICs for signal amplification.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Biomedical Instrumentation & Measurements	Cromwell etal	PHI/Pearson Education, 2nd Ed., 2011
2	Principles of Applied Biomedical Instrumentation	Geddes and Baker	John Wiley, 3rd Ed., 2008

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Biomedical Instrumentation Technology and Applications	R. S. Khandpur	McGraw-Hill, 2nd Ed., 2018
2	Biomedical Instrumentation	M Armugam	Anuradha Publications, 2nd edition. 1994.
3	Fundamentals of biomedical instrumentation	Dr. O N Pandey	Katson Books, 2009
4	Biomedical Instrumentation Systems	Shakthi Chatterji	Delmar Cangage Learning, 2014

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Syllabus for the Academic Year 2021-22

Subject Name: Analog and Digital Electronics Lab **Semester: III**

Subject Code: ML3LB2 **L-T-P-C: 0-0-3-1.5**

Course Objectives:

Sl. No.	Course Objectives
1.	To design and analyse amplifiers.
2.	To design and analyse oscillators.
3.	To verify logical gates.

Course content	
1	Design and verification of frequency response of RC coupled amplifier.
2	Design and analysis of Emitter follower circuit.
3	Design and analysis of Darlington & Bootstrapped Darlington circuit.
4	Design and verification of characteristics of negative feedback amplifier.
5	Design and verification of Hartely and Colpitts oscillator.
6	Design and verification of crystal and RC phase shift oscillators.
7	Verification of encoder and decoder.
8	Implementation of half adder and full adder using MUX 74153.
9	Verification of Parallel Adder Using 7483.
10	Implementation of code converters using DEMUX- 74139.
11	Implementation of 1bit and 2bit comparator using logic gates and NAND gates.
12	Implementation T and D flip-flop using JK Master slave configuration and IC 7446.
13	Implementation of MOD N Counters using ICs 7476, 7490.
14	Verification of SISO, SIPO, PIPO, PISO operation using shift register 7495.

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Design various linear and nonlinear circuits for required applications.
CO2	Demonstrate the practical skills of building circuits.
CO3	Analyse the Outputs both theoretically and practically.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Digital Systems Principles and Applications	Ronald J Tocci, Neal S Widmer Gregory L. Moss	Printice hall 12th Edition, 2018 .
2	Electronic Devices and Circuit Theory	Robert L. Boylested and Louis Nashelsky	Pearson Education. 11th Edition, 2015.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Electronic Devices and Circuits	David A. Bell	PHI, 5th Edition, 2010
2	Digital Logic – Application and Design	John M Yarbrough	Thomson Brooks/Cole 7thEdition, 2012

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Department of Medical Electronics

Syllabus for the Academic Year 2021-22

Subject Name: OOPS with C++ Lab **Semester: III**

Subject Code: ML3LB3 **L-T-P-C: 0-0-3-1.5**

Course Objectives:

Sl. No.	Course Objectives
1.	To understand the difference between top-down and bottom-up approach.
2.	To learn writing inline functions for efficiency and performance and the syntax and semantics of the C++ programming language.
3	To learn the design of C++ classes for code reuse and to implement copy constructors and class member functions.
4.	To learn the use of overload functions and operators in C++ and to use inheritance and virtual functions implementation and use of exception handling in C++ programs.

Unit	Course content	Teaching hrs
	C++ Lab: 1. Write a C++ program to calculate the sum of the series i) $1+x+x^2+x^3+...+x^n$. ii) -1+2-4+8-16+...1024. 2. Write a C++ program to sort the elements of an array using i) Selection sort ii) Bubble sort 3. Write a C++ program to accept two arrays of different lengths. Merge the two accepted arrays. 4. Write a C++ program to accept two 2-dimensional arrays and perform addition, subtraction and multiplication. 5. Write a C++ program to find the LCM and GCD of 2 given numbers using functions. 6. Write a C++ program to find the factorial of a given number using recursive function. 7. Write a C++ program to find the largest, smallest and their averages using functions.	**3 Hrs/Week**

	8. Write a C++ program to find the sum of two complex numbers using classes by overloading operator +. 9. Write a C++ program to multiply two numbers using Multiple Inheritance. 10. Write a C++ programs to display medical signals and images. 11. Write a C++ programs to add noisy data and display medical signals and images. 12. Write a C++ programs to used different types of filters on various signals and images display clear medical signals and images.	

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Identify and apply data types to implement the programs and declare variables.
CO2	Implement the concepts of functions, arrays, classes & objects.
CO3	Implement Operator Overloading and inheritance for effective programming.
CO4	Use medical data to perform operations like filtering.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Object Oriented Programming with C++	E Balaguruswamy	TMH 2020, 8th edition.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1.	Object Oriented Programming in C++	Robert Lafore	Golgotia Publications Pvt. Ltd, 4th Edition, 2008
2.	The complete reference C	Herbert shieldt	Tata McGraw Hill Publication, 4th edition.

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Syllabus for the Academic Year 2021-22

Subject Name: Probability and Complex Analysis **Semester: IV**

Subject Code: MA4ES1 **L-T-P-C: 3-0-0-3**

Course Objectives:

Sl.No	Course Objectives
1	Understand the least square method to fit a curve for the given data and evaluate the correlation coefficient and regression lines for the data.
2	To develop probability distribution of discrete and continuous random variables.
3	Study the concept of joint probability distribution and Markov chain.
4	To learn the concept on complex analysis.

UNIT	Description	Hours
I	**Statistics:** Correlation and regression- Karl Pearson's coefficient of Correlation, problems. Regression analysis- lines of regression (without proof) problems. **Curve Fitting:** Curve fitting by the method of least square- Fitting of the curves: Linear, polynomial, exponential function of the form $y=ab^x$.	**8**
II	**Probability Distributions:** Review of basic probability theory**.** Random variables (Discrete and Continuous), Probability of mass/density functions. Binomial distribution, Poisson's distribution, exponential distribution and Normal distribution (without derivations) and problems.	**7**
III	**Joint probability distribution:** Joint probability distribution for two discrete random variables, Marginal distributions, Expectation, covariance, problems. **Markov Chain:** Probability Vector, Stochastic Matrix, Regular Stochastic Matrix, definition of Markov chain, Transition Probabilities and Transition probability Matrix, Higher Transition Probabilities, stationary distribution of regular Markov chains, problems.	**8**
IV	**Complex Analysis:** Review of function of a complex variables, limits, continuity and differentiability. Analytic functions, Cauchy-Reimann equations in Cartesian and polar forms (without proof). Properties and construction of analytic functions by Milne-Thompson Method. Bilinear Transformations.	**9**

V	**Complex Integration:** Line integral of complex function, Cauchy's theorem and Cauchy's integral formula (without proof) and problems. Taylor's theorem and Laurent's theorem (Statements only), Singular points: poles, Residues and Residue theorem (Without proof), problems.	**8**

Course Outcomes

Course outcome	Descriptions
CO1	Understand the concept of statistics probability distributions and stochastic process.
CO2	Use the concept of analytic function, complex integration and Residue theorem to solve the problem in Engineering field.
CO3	Apply probability distribution and stochastic process to design and analyse in Engineering fields.
CO4	Make use of Correlation and regression analysis and complex analysis to solve the problems in Engineering fields.

Text Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	Higher Engineering Mathematics	B.S.Grewal	43rd Edition Khanna Publications,2015. ISBN:9788174091956
2	An Introduction to Probability Theory and its Applications	W.Feller	3rdEdition,JohnWiley&Sons,Inc,2008. ISBN:9788126518050

Reference Books:

Sl No	Title	Author(s)	Edition, Publisher, Year, ISBN
1	A First Course in Probability	S.Ross	8thEdition,Pearson,2010. ISBN:9780136033134
2	Higher Engineering Mathematics	B.V. Ramana	1st Edition, Tata McGraw-Hill, 2006. ISBN:9780070634190

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Syllabus for the Academic Year 2021-22

Subject Name: Signals and Systems **Semester: IV**

Subject Code: ML4TH2 **L-T-P-C: 3-0-0-3**

Course Objectives:

Sl. No.	Course Objectives
1.	Classify the continuous time signals and systems and discrete-time signals and systems
2.	Analyze the continuous time signals using Fourier series and Fourier transforms
3.	Understand the concepts of z-transform and discrete Fourier transform.
4.	Analyze the discrete time and continues time systems.

Unit	Course content	Teaching hrs
Unit I	Introduction To Signals: Definitions of a signal, elementary signals, classification of signals and basic operations on signals. Introduction to Biomedical signals.	**08**
Unit II	Introduction to Systems: Definition of a system, properties of systems. Representations of LTI systems, Convolution sum and integral. Block Diagram Representation.	**07**
Unit III	Transforms of Continuous time signals: Fourier Transform of time domain signal and its inverse, Relationship between FT and Laplace transform (only Properties statements).	**07**
Unit IV	Transforms of discrete time signals: DTFT of time domain signals and its inverse, Z-transform and its inverse, relationship between DTFT and Z-Transform, ROC properties and properties of DTFT and Z-Transform(only statements).	**09**
Unit V	Analysis of continuous and discrete time systems: Transfer function, Impulse response, Frequency response, and differential and difference equations.	**08**

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Ability to classify signals and operations of signals.
CO2	Identify system properties and determine the response of LTI systems using convolution.
CO3	Analyze the spectral content of signals using different transforms.
CO4	Demonstrate the understanding of the relation among transfer function, frequency response and impulse response.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100%syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Signals and Systems	Simon Haykin and Barry Van Veen	John Wiley & Sons, 2009.
2	Signals and Systems	Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab	Pearson EducationAsia / PHI, 2nd edition,2007.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Signals and Systems	H.Phsu, R.Ranjan	Scham's outlines,TMH, 2018.
2	Linear Systems and Signals	B.P.Lathi.	Oxford University Press, 2015 Wileyand Sons.

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Syllabus for the Academic Year 2021-22

Subject Name: Circuit Theory And Analysis **Semester: IV**

Subject Code: ML4TH3 **L-T-P-C: 3-0-0-3**

Course Objectives:

Sl. No.	Course Objectives
1.	To introduce various circuit analysis methods.

Unit	Course content	Teaching hrs
Unit I	Basic concepts: Introduction, Network terminologies, Review of KVL & KCL, Energy sources – ideal & practical, Source Transformations, Mesh Analysis of DC & AC circuits, Nodal analysis of DC & AC circuits, Star – Delta transformations.	**08**
Unit II	Network Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem.	**08**
Unit III	Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their representation, evaluation of initial and final conditions using differential equations of circuits with AC and DC excitation.	**08**
Unit IV	Circuit Analysis using Laplace Transforms: Step response of RL, RC & RLC circuits, Circuit analysis with LT using partial fraction expansion.	**07**
Unit V	Resonance: Series resonance, resonant frequency, reactance curves, voltage & current variable with frequency, Selectivity & bandwidth, Q – factor, circuit magnification factor Selectivity with variable C & variable L Parallel resonance, resonant frequency, impedance, selectivity, bandwidth Maximum impedance conditions with C, L, & f variable, current & Q – factor.	**08**

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Recall the fundamentals of electrical circuits and simplify the given circuits.
CO2	Solve for the circuit parameters by reducing the given circuit using network theorems.
CO3	Illustrate the behavior of circuit elements and analyze the behavior of the given circuits.
CO4	Analyze the given circuits using different methods of analysis. Determine the performance parameters of the given circuits.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Basic Engineering Circuit Analysis	J. David Irwin, R. Mark Nelms	8th edition, John Wiley & Sons, 2006.
2	Network Analysis	M E Van Valkenburg	3rd Edition, 2007.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Engineering Circuit Analysis	William H.Hayt, Jr, Jack E.Kimmerly, Steven M.Durbin	6 th edition, Tata McGraw-Hill, 2002.
2	Networks and Systems	D. Roy Choudhury	New Age International, Reprint 2005.

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Department of Medical Electronics

Syllabus for the Academic Year 2021-22

Subject Name: Physiological Control System **Semester: IV**

Subject Code: ML4TH4 **L-T-P-C: 3-0-0-3**

Course Objectives:

Sl. No.	Course Objectives
1.	To study system concept and different mathematical techniques applied in analyzing any given system.
2.	Analysis of given system in time domain and frequency domain.
3.	To study the techniques of plotting the responses in both domain analysis.
4.	To apply these analysis to study the biological systems.

Unit	Course content	Teaching hrs
Unit I	Introduction: Examples of Control Systems, open loop vs Closed loop Systems, Mathematical Modelling of Linear Systems: Transfer functions, Mechanical Systems, Analogous Systems, Block diagram, Signal Flow graph. Difference between Engineering and Physiological Control System, Case study: Block diagram representation of the muscle stretch reflex.	**08**
Unit II	Time-Domain Analysis of the Control System: Step response of first order, second order systems, response specification, steady state error and error constants. Case study: Steady State Characteristics of the Muscle Stretch Reflex Model components, Regulation of Cardiac Output.	**08**
Unit III	Stability Analysis: Concept of stability, RH criterion, applications of RH criterion with limitations. Root locus technique: Introduction to root locus concepts, Construction rules, Analysis of stability by root locus plot.	**08**
Unit IV	Identification of Physiological control systems: Nonparametric and parametric identification of methods: discussion of it, Identification of closed loop systems: case studies: The starling Heart-Lung Preparation, minimal model of blood glucose regulation, respiratory control system.	**08**
Unit V	Frequency response Analysis: Bode plots, Relative stability and Frequency domain specification. Case studies; Bode plots of frequency response of the linearized lung mechanics.	**07**

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Obtain mathematical models of open loop and closed loop physical and physiological control systems.
CO2	Apply mathematical techniques to perform time response analysis of a physiological control systems.
CO3	Carry out stability analysis using different mathematical techniques on physiological systems by system identification.
CO4	Analyze physiological systems using frequency domain techniques.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Physiological control system	Michael. C.K .Khoo	PHI, 2012
2	Engineering control systems	Norman S. Nise	John WILEY & sons, 5th Ed., 2015

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Modern control Engineering	Ogata	Prentice Hall, 2016
2	Automatic Control Systems	B.C Kuo	John Wileyand Sons, 2010
3	Control Engineering	Nagrath & Gopal	New Age International Publishers, 2010

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Syllabus for the Academic Year 2021-22

Subject Name: Linear Integrated Circuits **Semester: IV**

Subject Code: ML4TH5 **L-T-P-C: 3-0-0-3**

Course Objectives:

Sl. No.	Course Objectives
1.	To understand the basic concepts of operational amplifier and its various applications.
2.	To understand the basics of PLL and its practical applications.
3.	To know about analog multipliers, analog switches and different A/D and D/A convertors.
4.	To introduce the concepts of waveform generation and introduce some special function ICs.

Unit	Course content	Teaching hrs
Unit I	**Operational Amplifier Characteristics:** Introduction, Amplifiers in closed loop configuration, DC and AC Characteristics, Frequency compensation. **Operational Amplifier Applications:** Instrumentation Amplifier, V to I and I to V converter, Op-amp circuits using Diodes – Half wave and Full wave rectifiers, peak detector, Sample and hold circuit.	**08**
Unit II	**Comparators and waveform Generators:** Introduction, comparator, Schmitt Trigger, Square wave generator using Astable Multivibrator, Monostable Multivibrator, Triangular wave generator. Sinusoidal oscillators - RC phase shift and Wien bridge oscillators.	**08**
Unit III	**Voltage Regulators and Active Filters:** Introduction, RC Active Filters, First order low pass filter, second order active filter, Higher order low pass filter, High pass active filter, All pass filter-phase shift lead and lag circuit.	**08**
Unit IV	**D-A and A-D converters**: Introduction, Analog and Digital data converter, specifications of D/A and basic DAC techniques-weighed resistor DAC, R-2R ladder DAC, A-D Converters: Specifications of A/D converter, classification of ADCs- The parallel Comparator/Flash ADC, counter type ADC, Successive Approximation Converter, single slope type ADC and Dual slope type ADC, Sigma – delta ADC.	**08**
Unit V	**Timers** : Functional block diagram of 555, Applications - Astable and Monostable multivibrators, Ramp generator. Phase locked loops: Introduction, Basic principles, phase detector/comparator, voltage controlled oscillator, PLL in frequency	**07**

	multiplication/Division.	

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Apply the knowledge of electronic engineering fundamentals to comprehend linear integrated circuits based systems.
CO2	Interpret and analyze the effects of DC and AC limitations of Operational Amplifiers.
CO3	Implement linear integrated circuits in the areas of power sourcing, signal generation and conditioning, and analog communication.
CO4	Design and develop analog sub-circuits for linear and non-linear applications. Experiment and document the test results of various applications of linear integrated circuits, working both independently and in teams.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Linear Integrated Circuits	.Salivahanan & V.S.Kanchana Bhaaskaran	Tata McGraw - Hill Publication, 2014
2	Linear Integrated circuits	D Roy Choudhury &shail B Jain	New Age Publication, 2012

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Opamps and Linear ICs	David A.Bell	Prentice-Hall Publications,2007
2	Op-Amps and Linear Integrated Circuits	Ramakanth A.Gayakwad	4th ed, PHI, 2005

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Syllabus for the Academic Year 2021-22

Subject Name: **Microcontrollers** **Semester: IV**

Subject Code: ML4TH6 **L-T-P-C: 3-0-0-3**

Course Objectives:

Sl. No.	Course Objectives
1.	To impart detailed different computer architectures and the detailed architecture of 8051.
2.	To impart detailed Addressing modes and instruction sets of 8051.
3.	To learn Internal interrupts, timers, counters.
4.	To learn External interface with devices like LCD, ADC, DAC and Stepper motor and Serial communication.

Unit	Course content	Teaching hrs
Unit I	**Microprocessors and microcontroller**: Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture. **The 8051 Architecture:** Introduction, Features of 8051, Architecture of 8051, Pin diagram of 8051, Memory organization.	**07**
Unit II	**Addressing Modes:** Introduction, Instruction syntax, Data types, Subroutines, **Instruction set:** Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. 8051 programming: Assembler directives, Assembly language programs. **8051 Ports**: Basics of I/O concepts, Port structure and Operation.	**08**
Unit III	**8051 Interrupts and Timers/counters:** Time delay calculations. Basics of interrupts, 8051 interrupt structure, 8051 timers/counters. Interfacing with external memory: memory address decoding.	**08**
Unit IV	**8051 Interfacing and Applications**: Interfacing 8051 to LCD, ADC, DAC, Stepper motor interfacing and DC motor interfacing. Programming examples in assembly language **Case Study:** ECG waveform Display/Body temperature measurement and display using sensor LM35.	**08**
Unit V	**8051 Serial Communication:** Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, 8051 Serial communication Programming in assembly language.	**08**

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Compare & differentiate different computer architectures.

CO2	Identify the different addressing modes, Instruction set and I/O Ports of 8051. Write software programs using all the instructions.
CO3	Design interface for ADC/DAC, LCD, Stepper & DC Motor and external memory with 8051. Case study for some medical applications.
CO4	Incorporate the Timer, Interrupts and Serial Communication in developing application programs.

Question Paper Pattern:

Total 5 units of syllabus, 2 full questions from each unit (20marks each) and total 20 marks from each unit. Total 10 Questions for 100 marks, covers 100% syllabus, and student has to answer any 5 full questions (1 to1 choice). Each question carries maximum 4 subdivisions.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	The 8051 Microcontroller and Embedded Systems – using assembly and C	Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay	PHI, 2006.
2	8051 Microcontroller - Hardware, Software and Applications	V. Udayashankara and M.S. Mallikarjunaswamy	Tata McGraw-Hill, 2009.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	The 8051 Microcontroller and embedded systems	Kenneth J. Ayala and Dhananjay V.Gadre	Cenegage learning, 2012
2	Programming and customizing the 8051 Microcontroller	Predko	TMH, 2007
3	Microcontrollers- Theory and Applications	Ajay V.Deshmukh	TMH, 2005

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Subject Name: Microcontroller Lab **Semester: IV**

Subject Code: ML4LB1 **L-T-P-C: 0-0-3-1.5**

Course Objectives:

Sl. No.	Course Objectives
1.	To impart detailed different computer architectures and the detailed architecture of 8051.
2.	To impart detailed Addressing modes and instruction sets of 8051.
3.	To learn Internal interrupts, timers, counters.
4.	To learn External interface with devices like LCD, ADC, DAC and Stepper motor and Serial communication.

Course content
I. PROGRAMMING for 8051 1 Familiarisation of Addressing modes. 2 Write programs for implementing ALU for given specifications. 3 Write programs to count different events. 4 Implementation of subroutines. 5 Write programs to implement standard code convertors. 6 Programs to generate delay, Programs using serial port and on-Chip timer / counter.
II. INTERFACING: **7** Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface **8** Stepper and DC motor control interface

Course Outcomes:

Sl. No.	Course Outcomes
CO1	To write program based on 8051.
CO2	Interface typical external hardware to 8051.
CO3	Handle versatile tool: Keil IDE.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	The 8051 Microcontroller and Embedded Systems – using assembly and C	Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay	PHI, 2006.
2	8051 Microcontroller - Hardware, Software	V. Udayashankara and	Tata McGraw-Hill,

	and Applications	M.S. Mallikarjunaswamy	2009.

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	The 8051 Microcontroller and embedded systems	Kenneth J. Ayala and Dhananjay V.Gadre	Cenegage learning, 2012
2	Programming and customizing the 8051 Microcontroller	Predko	TMH, 2007
3	Microcontrollers- Theory and Applications	Ajay V.Deshmukh	TMH, 2005

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Syllabus for the Academic Year 2021-22

Subject Name: Biosensors and measurements Lab **Semester: IV**

Subject Code: ML3LB2 **L-T-P-C: 0-0-3-1.5**

Course Objectives:

Sl. No.	Course Objectives
1.	To know and demonstrate basic knowledge of electrical wiring circuits, protective devices to work in biomedical engineering field.

Sl no.	Course Contents
1	(i)Introduction to Lab components & Instruments. (ii)Hands on Soldering.
2	Analyze the following Bridge circuits & list its applications. (i) Wheat Stone Bridge (ii) Maxwells Inductance & Capacitive Bridge
3	Demonstrate pH Instrument Calibration & Determine pH of the given buffer solution.
4	Illustrate Indirect Blood Pressure measurement using (i) Analog method (ii) Digital method
5	Calculate change in Strain Guage resistance & plot its characteristics.
6	To plot characteristics of temperature transducer.
7	To plot characteristics of polarized electrodes & non polarized electrodes.
8	To plot characteristics of multi-point electrodes.
9	To test concentration of given solution using photoelectric calorimeter.
10	To study & plot characteristics of Photo Electric Transducer (LDR).

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Comply with the safety procedures.
CO2	Apply the fundamentals of electricity.
CO3	Install and test electrical system.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Electrical and Electronic Measurements and Instrumentation	A. K. Sawhney and Puneet Sawhney	Dhanpat Rai and Co. 2015

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition

1	Electronic Devices and Circuit Theory	Robert L. Boylested and Louis Nashelsky	Pearson Education,11th Edition, 2015

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Syllabus for the Academic Year 2021-22

Subject Name: Signals and Control System Lab **Semester: IV**

Subject Code: ML4LB3 **L-T-P-C: 0-0-3-1.5**

Course Objectives:

Sl. No.	Course Objectives
1.	Classify the continuous time signals and systems and discrete-time signals and systems.
2.	Analyze the continuous time signals using Fourier series and Fourier Transforms.
3.	Understand the concepts of z-transform and discrete Fourier transform.
4.	Analyze the discrete time and continues time systems.

Sl no.	Course Contents
1	Generation of Elementary signals.
2	Analysis of LTI Systems.
3	DTFT of a time domain signal.
4	Draw pole-zero plot.
5	Finding impulse response of a given difference equation.
6	Convolution of two time domain sequences.
7	Plot root locus and bode plot of the given transfer function.
8	Obtain step response of a second order system
9	Find Fourier Transform of a signal.
10	Plot Power Spectrum of a signal.

Course Outcomes:

Sl. No.	Course Outcomes
CO1	Design a suitable experimental/simulation procedure for practical investigations on signals, systems.
CO2	Implement transformation techniques to analyze signals & systems.

Text Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Signals and Systems	Simon Haykin and Barry Van Veen	John Wiley & Sons, 2001
2	Engineering control systems	Norman S. Nise	John WILEY & sons, 5th Edition, 2010

Reference Books:

SI No	Text Book title	Author	Volume and Year of Edition
1	Signals and Systems	H.Phsu,R.Ranjan,	Scham's outlines,TMH, 2006
2	Linear Systems and Signals	B.P.Lathi,	Oxford University Press, 2005 hn Wileyand Sons
3	Modern control Engineering	Ogata	Prentice Hall, 2010
4	Automatic Control Systems	B.C Kuo	John Wileyand Sons, 2010