

IV SEMESTER

B.E. Medical Electronics (ML) Choice Based Credit System (CBCS) Semester - III			
ENGINEERING MATHEMATICS-IV (Common to All Branches)			
Subject Code	: 15MAT41		IA Marks : 20
Number of Lecture Hours/Week	: 04		Exam Marks : 80
Total Number of Lecture Hours	: 50		Exam Hours : 03
Credits - 4			
Course Objectives: This course will enable the students to			
Revised Bloom's Taxonomy Levels: L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing, L5 – Evaluating, and L6 - Creating			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1		10 Hours	
Module -2		10 Hours	
Module -3		10 Hours	

Module -4	10 Hours	
Module -5	10 Hours	
Course Outcomes: After studying this course, students will able to:		
Graduate Attributes (as per NBA)		
Question Paper Pattern: <ul style="list-style-type: none"> • The question paper will have TEN questions. • Each full question carry 16 marks • There will be TWO full questions (with maximum of FOUR sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer FIVE full questions, selecting ONE full question from each module. 		
Text Books:		
Reference Books:		

IV SEMESTER

B.E. Electronics and Instrumentation Engineering (EI) Choice Based Credit System (CBCS) Semester – IV

SIGNAL CONDITIONING AND DATA ACQUISITION CIRCUITS (Common to EI, BM & ML) [Revised]

Subject Code	: 15 EI/BM/ML42		IA Marks	: 20
Number of Lecture Hours/Week	: 04		Exam Marks	: 80
Total Number of Lecture Hours	: 50		Exam Hours	: 03
Credits – 4				
<p>Course Objectives: This course will enable the students to</p> <ul style="list-style-type: none"> • Define and describe Op Amp, basic concepts, characteristics and specifications • Gain knowledge about Linear and nonlinear applications op-amp. • Design and develop circuits like, amplifiers, filters, Timers to meet industrial requirements. • Get a firm grasp of basic principles of op-amp. 				
<p>Revised Bloom's Taxonomy Levels: L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing, L5 – Evaluating, and L6 – Creating</p>				
Modules			Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
<p>Module -1 Introduction to Operational Amplifiers: Introduction, Block schematic of an Op-amp, Power supply connections, Characteristics of an Ideal OP-AMP, Inverting Amplifier, Non-inverting Amplifier, Voltage follower, Differential Amplifier, CMRR. (Relevant problems).</p> <p>Operational Amplifier Characteristics: DC characteristics – Input bias current, Input offset current, Input offset voltage, Total output offset voltage, Thermal drift. AC characteristics – Frequency response, Slew rate, PSRR.</p> <p>Basic op-amp applications – Scale changer/Inverter. Summing amplifier: Inverting summing amplifier, Non-inverting Summing amplifier, Subtractor, Instrumentation Amplifier. (Relevant problems).</p>			10 Hours	L1,L2, L3,L4
<p>Module -2 Operational Amplifier Applications: V – I and I – V converter, Op-amp circuit using diodes, sample and hold circuit, Differentiator and Integrator.</p> <p>Comparator and waveforms generator: Comparator, Regenerative comparator (Schmitt Trigger), Astable mutivibrator, Monostable</p>			10 Hours	L1,L2, L3,L4

multivibrator and Triangular waveform generator. Phase shift oscillator, Wien bridge oscillator. (Relevant problems).		
Module -3 Voltage Regulators: Introduction, Series Op-amp regulator, IC voltage regulators, 723 general purpose regulators, switching regulator. Active filters: First and Second order LPF, First and Second orders HPF, Band Pass Filters, Band Reject filters. (Design examples).	10 Hours	L1,L2, L3,L4
Module -4 555 Timer: Description of Functional Diagram, Monostable operation, Applications of Monostable Multivibrator: Frequency Divider & Pulse Width Modulation. Astable operation, Applications of Astable Multivibrator: FSK Generator and Pulse Position Modulation. Phase Locked Loops: Basic Principles, Analog phase Detector/comparator, Voltage controlled oscillator. PLL applications: Frequency Multiplication/Division, Frequency translation, FM demodulation.	10 Hours	L2,L3,L4, L5, L6
Module -5 Data Acquisition Systems: Types of instrumentation systems, Components of analog data acquisition system, Digital data acquisition system, Use of recorders in digital systems, Digital recording systems. Data Converters: Digital to Analog Converters: Basic DAC techniques, Weighted Resistor DAC, R – 2R Ladder DAC, DAC 0800 (Data sheet: Features and description only). Analog to Digital Converters: Functional diagram of ADC, Flash ADC, Counter type ADC, Successive approximation ADC, Dual slope ADC. ADC 0809 (Data sheet: Features, specifications and description only), DAC/ADC specifications.	10 Hours	L2, L3,L4, L5, L6
Course Outcomes: After studying this course, students will able to: <ol style="list-style-type: none"> 1. Understand the basic principles and operation of op-amp. 2. Design and develop circuits to meet the practical applications 3. Implement and integrate the op-amp circuits in electronic gadgets. 		
Graduate Attributes (as per NBA) <ul style="list-style-type: none"> • Engineering knowledge • Problem analysis • Design & development of solutions • Investigation of Complex Problem 		
Question Paper Pattern: <ul style="list-style-type: none"> • The question paper will have TEN questions. 		

- Each full question carry 16 marks
- There will be TWO full questions (with maximum of FOUR sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. “Linear Integrated Circuits”, D. Roy Choudhury and Shail B. Jain, 4th edition, Reprint 2010, New Age International. (Module -1,2,3,4 & 5)
2. “Op - Amps and Linear Integrated Circuits”, Ramakant A. Gayakwad, 4th edition, PHI (Module-3)
3. “A course in Electrical & Electronic Measurements & Instrumentation”, A K Sawhney, Dhanpat Rai Publications, 19th edition, 2011.(Module-5)

Reference Books:

1. “Operational Amplifiers and Linear Integrated Circuits”, Robert. F. Coughlin & Fred. F. Driscoll, PHI/Pearson, 2006
2. “Op - Amps and Linear Integrated Circuits”, James M. Fiore, Thomson Learning, 2001
3. “Design with Operational Amplifiers and Analog Integrated Circuits”, Sergio Franco, TMH, 3e, 2005

B.E. Medical Electronics (ML) Choice Based Credit System (CBCS) Semester - III				
EMBEDDED CONTROLLERS (Common to EI, BM & ML)				
Subject Code	: 15 EI/BM/ML 43		IA Marks	: 20
Number of Lecture Hours/Week	: 04		Exam Marks	: 80
total number of lecture hours	: 50		exam hours	: 03
Credits - 4				
Course Objectives: This course enables students to understand: <ul style="list-style-type: none"> Basics of Microprocessor and Microcontroller 8051 Microcontroller architecture and Pin description 8051 Addressing modes and instruction set Programming of on-chip peripherals in 8051 Design and develop applications using 8051 Assembly language and C program. MSP 430 Microcontroller architecture On-chip peripherals and program using Assembly language and C. 				
Revised Bloom's Taxonomy Levels: L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing, L5 – Evaluating, and L6 - Creating				
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level	
Module -1 Microprocessor and Microcontrollers: Introduction: Microprocessor and Microcontroller, Microprocessor survey, RISC and CISC, CPU Architecture, Harvard and Von-Neumann, CPU Architecture. 8051 Microcontroller Architecture. Pin functions organizations Input/ Output pins, ports and circuits. Internal and External memory Architecture. 8051 Reg. banks and stack, 8051 flag bits and PSW Register. Special function Registers. Timer /Counter, Serial data input/ output, Interrupts, program counter and ROM space in the 8051.		10 Hours	L1,L2	
Module -2 Addressing modes directives instruction set of 8051 Microcontroller. Immediate and Register addressing modes. Accessing memory using various addressing modes. Bit addressing for I/o and RAM 8051 data types and directives. Jump Loop and CALL Instructions Arithmetic and Logic Instructions and programming I/o port programming. Assembly Language programs using various Instructions.		10 Hours	L1,L2	

<p>Module -3 8051 programming in C and interfacing. Data types and time delay in 8051 C, I/o programming, Logic operation, data conversion programs, accessing Code ROM Space, data serialization. 8051 interfacing to LCD and key board, DAC, stepper motor, DC Motor, Parallel and serial ADC. Elevator.</p>	<p>10 Hours</p>	<p>L2,L3,L4</p>
<p>Module -4 Timer/ Counter, Serial communication and Interrupts in 8051. Programming 8051 timer/ counter, programming timer 0 and 1 in 8051 C, Basics of serial communication, 8051 connections to RS-232. 8051 serial port programming in assembly and C. 8051 Interrupts, Programming Timer Interrupts, External hardware Interrupts and serial communication Interrupts. Interrupts priority & Interrupt programming in C.</p>	<p>10 Hours</p>	<p>L2,L3,L4,L5</p>
<p>Module -5 Introduction to Advanced Microcontrollers. Salient Features of Advanced Microcontrollers. MSP430F2013 Architecture and pin functions, Memory, Clock Generator, CPU Registers, Addressing modes, Instruction set and emulated Instruction set. Development Environment. Aspects of C for embedded system, Introduction to MSP 430 starter kit, parallel ports.</p>	<p>10 Hours</p>	<p>L1,L2,L3</p>
<p>Course Outcomes:After studying this course , Student will be able to:</p> <ul style="list-style-type: none"> • Learn architecture of 8051 and MSP 430. • Learn programming skills using Assembly language and C • Design and interfacing of microcontroller based embedded systems. • Build projects 		
<p>Graduate Attributes (as per NBA)</p> <ul style="list-style-type: none"> • Engineering Knowledge • Problem Analysis • Design and Development of solutions • Modern Tool usage 		
<p>Question Paper Pattern:</p> <ul style="list-style-type: none"> • The question paper will have TEN questions. • Each full question carry 16 marks • There will be TWO full questions (with maximum of FOUR sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer FIVE full questions, selecting ONE full question from each module. 		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. “The 8051 Microcontroller and Embedded systems-using assembly and C”, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinaly,PHI,2006/pearson,2006 2. “MSP430 Microcontroller Basics” John H. Davis, , Elsevier 2010. 3. “Embedded Systems Design using the TI MSP430 series”, Cris Nagy, Newnes, Elsevier. 		

Reference Books:

1. “The 8051 Microcontroller architecture. Programming and applications”, Kenneth J Alyala Thomson learning 2005.
2. “The 8051 Microcontroller: Hardware, Software and Applications” V. Udhayashankara and MallikarjunaSwamy ,TMH., 2009.

B.E. Medical Electronics (ML)
Choice Based Credit System (CBCS)
Semester - IV

SIGNALS AND SYSTEMS

Subject Code	: 15ML44		IA Marks	: 20
Number of Lecture Hours/Week	: 04		Exam Marks	: 80
Total Number of Lecture Hours	: 50		Exam Hours	: 03

Credits - 4

Course Objectives: This course will enable the students

- Coverage of continuous and discrete-time signals and systems, their properties and representations and methods that is necessary for the analysis of continuous and discrete-time signals and systems. Knowledge of time-domain representation and analysis concepts as they relate to difference equations, impulse response and convolution, etc.
- Knowledge of frequency-domain representation and analysis concepts using Fourier analysis tools, Z-transform.
- Concepts of the sampling process.
- Mathematical and computational skills needed in application areas like communication, signal processing and control, which will be taught in other courses.

Revised Bloom's Taxonomy Levels: L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing, L5 – Evaluating, and L6 - Creating

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT)Level
Module -1 Introduction: Definitions of a signal and a system, classification of signals, basic operations on signals, elementary signals, Systems viewed as interconnections of operations, properties of systems. Introduction to physiological signals.	10 Hours	L1, L2, L3
Module -2 Time-domain representations for LTI systems: Convolution, Impulse response representation, Convolution Sum and Convolution Integral. Properties of impulse response representation, Differential and difference equation representations, Block diagram representations. The above concepts can be implemented by using Matlab.	10 Hours	L1, L2, L3, L4
Module -3 Fourier representation of signals: Introduction, Discrete time, continuous time Fourier series Continuous Fourier transforms (derivations of transforms and properties are excluded). Discrete Fourier transforms (derivations of transforms and properties are excluded) and their properties. The above concepts can be implemented by using Matlab.	10 Hours	L1, L2, L3, L4

Module -4 Applications of Fourier representations: Introduction, Frequency response of LTI systems, Fourier transforms representation of periodic signals, Fourier transform representation of discrete time signals. Synthesis of a physiological signal using Fourier series and Fourier transform.	10 Hours	L1, L2, L3, L4
Module -5 Z-Transform: Introduction, properties of ROC, properties of Z-Transform, inversion of Z-transform, transform analysis of LTI Systems, transfer function, stability and causality, unilateral Z- Transform and its application to solve difference equations. Analysis of Physiological signals using ZT.	10 Hours	L1, L2, L3, L4
Course Outcomes: After studying this course, students will able to: <ol style="list-style-type: none"> 1. Characterize and analyze the properties of CT and DT signals and systems 2. Analyze CT and DT systems in Time domain using convolution and differential equation 3. Represent CT and DT systems in the Frequency domain using Fourier analysis tools like CTFS, CTFT, DTFS and DTFT. 4. Conceptualize the effects of sampling a CT signal and analyze CT and DT systems using Z Transforms 		
Graduate Attributes (as per NBA) <ul style="list-style-type: none"> • Engineering Knowledge • Problem Analysis • Design / development of solutions • Interpretation of data 		
Question Paper Pattern: <ul style="list-style-type: none"> • The question paper will have TEN questions. • Each full question carry 16 marks • There will be TWO full questions (with maximum of FOUR sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer FIVE full questions, selecting ONE full question from each module. 		
Text Books: <ol style="list-style-type: none"> 1. Simon Haykin and Barry Van Veen “Signals and Systems”, John Wiley & Sons, 2nd edition, 2012 2. Suresh R. Devasahayam, Signals and systems in biomedical engineering, Plenum Publishers, 2000. 		
Reference Books: <ol style="list-style-type: none"> 1. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, “Signals and Systems” Pearson Education \ Asia / PHI, 3rd edition, 1997. Indian Reprint 2011 2. H. P Hsu, R. Ranjan, “Signals and Systems”, Scham’s outlines, TMH, 2011 3. B. P. Lathi, “Linear Systems and Signals”, Oxford University Press, 2010 4. Ganesh Rao and Satish Tunga, “Signals and Systems”, Sanguine Technical Publishers, 2012. 		

B.E. Medical Electronics (ML)
Choice Based Credit System (CBCS)
Semester - IV

BIOMEDICAL INSTRUMENTATION

Subject Code	: 15ML45		IA Marks	: 20
Number of Lecture Hours/Week	: 04		Exam Marks	: 80
Total Number of Lecture Hours	: 50		Exam Hours	: 03

Credits - 4

Course Objectives:

- To understand the generalized structure of biomedical instrumentation and its development process.
- To study the concepts behind the origin of electricity in human beings.
- To analyze the working principles of electrodes and their applications in biomedical engineering concepts.
- To apply different concepts to design of bio-potential amplifiers for various healthcare applications.
- To study the non-electrical & sensory measurements in human body and their importance in clinical diagnostics

Revised Bloom's Taxonomy Levels: L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing, L5 – Evaluating, and L6 - Creating

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
<p>Module -1 Introduction to biomedical instrumentation: Biometrics, introduction to the man-instrument system, components of man-instrument system, medical instrumentation development process, problems encountered in measuring a living system. Sources of bioelectric potentials: Resting and action potentials, propagation of action potentials, the bioelectric potentials.</p>	10 Hours	L1, L2,
<p>Module -2 Bio Potential Electrodes: Origin of bio potential and its Propagation, Electrode theory, Electrode-electrolyte interface, electrode-skin interface, half-cell potential, electrode impedance, polarization effects of electrode-nonpolarizable electrodes, Types of electrodes, electrolysis & arcing, Stimulating electrodes, capacitive electrodes, electrode-tissue interaction, internal electrodes, electrodes on a subject, tissue response to electrolytes, skin abrasion</p>	10 Hours	L1, L2,
<p>Module -3 Measurement of Non-Electrical Parameter: Temperature, Respiration rate and pulse rate measurement. Blood pressure: indirect methods-auscultatory method, oscillometric method, direct methods: electronic manometer, pressure amplifiers-systolic, diastolic, mean detector. Behavioral & sensory measurements: Instruments for testing motor responses, Instrumentation for sensory measurements, Bio-feedback instrumentation</p>	10 Hours	L1, L2, L3, L4

Module -4 Bio Amplifier: Basic Amplifier configurations, Basic requirements-example of typical Electrocardiograph, Problems frequently encountered with bio-amplifiers, transient protection, common-mode and other interference reduction circuits, right leg driven ECG amplifier, Isolation amplifiers-transformer and optical isolation, Isolated DC amplifier and AC carrier amplifier. Chopper amplifiers	10 Hours	L1, L2, L3, L4
Module -5 Amplifiers for other Biopotential Signals, Example of Biopotential Pre-amplifier, Other Biopotential Signal Processors concepts –Integrators, Filters, Comparators, Modulators, Demodulators	10 Hours	L1, L2, L3, L4
Course Outcomes: After studying this course, students will able to: <ul style="list-style-type: none"> • Explain the sources of Bio Potentials. • Apply electronic concepts for design of amplifiers and filter for acquisition of physiological signals. • Analyze different parameters applicable in development of instrumentation for healthcare applications. 		
Graduate Attributes (as per NBA) <ul style="list-style-type: none"> • Engineering Knowledge • Problem Analysis • Design / development of solutions • Interpretation of data 		
Question Paper Pattern: <ul style="list-style-type: none"> • The question paper will have TEN questions. • Each full question carry 16 marks • There will be TWO full questions (with maximum of FOUR sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer FIVE full questions, selecting ONE full question from each module. 		
Text Books: <ol style="list-style-type: none"> 1. John G. Webster “Medical Instrumentation Application and Design”, John Wiley, New York, 2004. 2. Geddes and Baker “Principles of Applied Biomedical Instrumentation”, John Wiley, 3rd Edition, 1989. 3. Joseph J. Carr and John M. Brown “Introduction to Biomedical Equipment Technology “, Prentice Hall, 1998 		
Reference Books: <ol style="list-style-type: none"> 1. R. S. Khandpur, “Handbook of Biomedical Instrumentation “ 2nd Edition, Tata McGraw Hill, 2003 2. Cromwell “Biomedical Instrumentation and Measurements”, l et al., 2nd Edition, PHI, 1990. 		

B.E. Medical Electronics (ML)
Choice Based Credit System (CBCS)
Semester - IV

SCIENTIFIC AND ANALYTICAL INSTRUMENTATION
(Common to EI, BM & ML)

Subject Code	: 15 EI/BM/ML 46		IA Marks	: 20
Number of Lecture Hours/ Week	: 04		Exam Marks	: 80
Total Number of Lecture Hours	: 50		Exam Hours	: 03

Credits - 4

Course Objectives:

- To introduce the basic concept of qualitative and quantitative analysis of a given sample.
- To Impart various spectroscopic techniques and its instrumentation.
- To Impart the concept of separation science and its application.
- To impart methods of Industrial analyzers and its application.

Revised Bloom's Taxonomy Levels: L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing, L5 – Evaluating, and L6 - Creating

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT)Level
<p>Module -1 An introduction to instrumental methods: Terms associated with Chemical analysis, Classification of instrumental techniques, A review of important consideration in analytical methods, Basic functions of instrumentation, Nature of EM radiation, EM spectrum. Atomic energy levels, Molecular electronic energy levels, vibrational energy levels, Fundamental Levels of photometry, IR Spectroscopy: Basic Components of IR Spectrophotometers, Fourier Transform IR Spectroscopy</p>	10 Hours	L1, L2
<p>Module -2 UV and visible Spectrometers –instrumentation : Radiation Sources, Wavelength selection, Detector, Readout modules, Instruments for absorption photometry</p>	10 Hours	L1, L2
<p>Module -3 Flame emission and atomic absorption spectroscopy: Introduction, Instrumentation for flame spectrometric methods, Flame emission spectrometry, atomic absorption spectrometry, Atomic fluorescence spectrometry, Interferences associated with Flames & furnaces, applications, comparison of FES and AAS</p>	10 Hours	L1, L2
<p>Module -4</p>	10 Hours	L1, L2, L3

Gas Chromatography : Chromatograph , Basics parts of a chromatograph, Methods of measurements of peak areas, HPLC : HPLC Instrumentation, Mobile –phase delivery system sample introduction, separation of columns, Detectors – Ultraviolet Photometers & Spectrophotometers, electro chemicals detector (amperometric detector), Differential refractometers		
Module -5 Blood analyzer: Introduction, Blood pH measurements, measurement of blood Pco ₂ , Po ₂ , A Complete blood gas analyzer. Air pollution monitoring instruments Carbon monoxide, Sulphur dioxide, Nitrogen oxides, Hydrocarbons Ozone, automated wet chemical air analysis, water pollution monitoring instruments.	10 Hours	L1, L2, L3, L4
Course Outcomes:		
<ol style="list-style-type: none"> 1. The students get well versed with the principle, construction and working of various analytical instrumentation. 2. Students get detailed information about the application of analytical techniques in medicine, Industry, etc. 		
Graduate Attributes (as per NBA)		
<ul style="list-style-type: none"> • Engineering Knowledge • Problem Analysis • Life-long Learning 		
Question Paper Pattern:		
<ul style="list-style-type: none"> • The question paper will have TEN questions. • Each full question carry 16 marks • There will be TWO full questions (with maximum of FOUR sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer FIVE full questions, selecting ONE full question from each module. 		
Text Books:		
<ol style="list-style-type: none"> 1. Instrumental Methods of Analysis, 7th edition. – 2. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, CBS Publishing & Distribution (Module 1, Module 2, Module 3, Module 4 HPLC) 2. Handbook of Instruments – R.S. Khandpur, Tata McGraw Hill (Module 1-IR Spectroscopy, Module 4, Module 5) 		
Reference Books:		
<ol style="list-style-type: none"> 1. Braun R.D., Introduction to Instrumental Analysis, Mc Graw –Hill Singapore, 2006. 2. Frank G. Kerry Industrial Gas Handbook: Gas Separation and Purification, Taylor and Francis group, 2007. 3. Principles of Instrumental Analysis 5th Edition – Douglas A. Skoog, F. James Holler, Timothy A. Niemen, Thomson Brooks/ Cole 		

B.E. Medical Electronics (ML)
Choice Based Credit System (CBCS)
Semester - IV

EMBEDDED CONTROLLERS LAB
(Common to EI, BM & ML)

Subject Code	: 15 EI/BM/ML L47		IA Marks	: 20
Number of Practical Hours/Week	: 03		Exam Marks	: 80
Total Number of Practical Hours	: 42		Exam Hours	: 03

Credits - 2

Course Objectives:

This laboratory course enables students to :

- Write 8051 Assembly language and C programs for 8051 and MSP430.
- Interface hardware modules to Microcontroller board.
- Develop applications based on Microcontroller 8051 and MSP430.

Revised Bloom's Taxonomy Levels:L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing, L5 – Evaluating, and L6 - Creating

Laboratory Experiments

Note: Software and Hardware program using KEIL software and MSP 430 IDE.

**Revised Bloom's
Taxonomy
(RBT)Level**

Software program using 8051 μ c

Simple Assembly Language;

1. Program using 8051 in Block, Move, Exchange.
2. Program in sorting, finding largest and smallest element in an array.
3. Counters ---> For Hex and BCD up/ down count.
4. Boolean and Logical Instructions. (Bit Manipulation).
5. Subroutines using CALL and RETURN instructions.
6. Code Conversions ---> ASCII to Decimal, Decimal to ASCII, BCD to ASCII
7. Programs to generate delay, programs using serial port and on chip timer/ counter.

L2, L3, L4

Software program using MSP 430 IDE

8. Assembly program using MSP 430 for data transfer, Block Move in an array.

L2, L3, L4

Hardware programming (using 8051)

9. Stepper motor Interface to 8051 Microcontroller with C Program.
10. DC Motor Interface to 8051 Microcontroller with C Program
11. DAC Interface for to generate sine wave, square wave, triangular wave, Ramp wave through 8051Microcontroller with C Program.
12. Keyboard Interfacing.
13. **ADC Interfacing**

L3, L4, L5

Course Outcomes: After the completion of this Laboratory course, students will be able to:

- Get hands-on exposure in 8051 and MSB 430 platform.
- Enhance programming skills using Assembly language and C.

- Design and interfacing of microcontroller based embedded systems.
- Build projects

Graduate Attributes (as per NBA)

- Engineering Knowledge
- Problem Analysis
- Design and Development of solutions
- Modern Tool usage
- Individual and Team work

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Students are allowed to pick one experiment from the lot.
3. Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

Reference Books:

1. "The 8051 Microcontroller and Embedded systems-using assembly and C", Muhammad AliMazidi and Janice Gillespie Mazidi and Rollin D. McKinaly, PHI,2006/pearson,2006
2. "MSP430 Microcontroller Basics" John H. Davis, Elsevier 2010.
3. "Embedded Systems Design using the TI MSP430 series", Cris Nagy, Newnes, Elsevier.
4. "The 8051 Microcontroller architecture. Programming and applications", Kenneth J Alyala Thomson learning 2005.

B.E. Medical Electronics (ML)
Choice Based Credit System (CBCS)
Semester – IV

**PHYSIOLOGIC MEASUREMENTS AND BIOMEDICAL
INSTRUMENTATION LAB**

Subject Code	: 15MLL48	IA Marks	: 20
Number of practical Hours/Week	: 03	Exam Marks	: 50
Total Number of practical Hours	:42	Exam Hours	: 03

Credits - 2

Course Objectives: This Lab course will enable the students to

- Impart the working principle of sensors and transducer
- Testing the response and plot the characteristics of different transducers
- Interpret and analyze experimental results with theoretical concepts.
- Calibrate the sensors/transducers
- Study and interpret data sheets of different transducers to select the suitable transducer for particular application and safe operation.
- Understand the basic concepts and procedure for the measurement of BP, solution concentration, pH and conductivity.

Revised Bloom's Taxonomy Levels: L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing, L5 – Evaluating, and L6 - Creating

LIST OF EXPERIMENTS	Revised Bloom's Taxonomy (RBT) Level
1. Measurement of blood pressure using sphygmomanometer and automatic digital BP instrument. Finding the systolic and diastolic values and calculate Mean Arterial Pressure (MAP)	L1, L2, L3,L4
2. Measurement of unknown concentration of given solution/ body fluid using Spectrophotometer and Colorimeter	L1, L2, L3,L4
3. (a) Measurement of pH of a given solution/body fluid using pH meter. (b) Determination of Conductivity of a given unknown solution/ body fluid using conductivity meter.	L1, L2, L3,L4
4. Record and Trace ECG signal and labeling the amplitude and time components. Calculating Heart Rate	L1, L2, L3,L4
5. Measurement of displacement using LVDT& determine its sensitivity and resolution	L1, L2, L3,L4
6. Temperature measurement using RTD, Thermistor and Thermocouple, and to find their sensitivity.	L1, L2, L3,L4
7. Temperature measurement using AD590 / LM34.	L1, L2, L3,L4
8. Characteristics of LDR, Photodiode & Phototransistor by variable illumination & variable distance.	L1, L2, L3, L4
9. Measurement of unknown resistance by Wheatstone bridge & finding the sensitivity of the bridge.	L1, L2, L3
10. Measurement of self-inductance using Maxwell's bridge.	L1, L2, L3
11. Measurement of unknown capacitance using Schering's bridge.	L1, L2, L3

12. Characteristics of Load cell and Cantilever beam using Strain gauge (Quarter, Half and Full bridge configuration)	L1, L2, L3, L4
<p>Course Outcomes: After studying this course, students will able to:</p> <ul style="list-style-type: none"> • Analyze the response and plot the characteristics of temperature measurement transducers such as RTD, Thermistor, and Thermocouple & AD590. • Analyze the response and plot the characteristics of displacement measuring transducers such as LVDT and Potentiometric transducer. • Analyze the response and plot the characteristics of strain gauge type load cell. • Analyze the response and plot the characteristics of pressure transducer. • Measure unknown values of resistance, capacitance and Inductance using different bridges. • Design , build and test the circuits for practical applications using transducers • Measure BP, solution concentration, pH, conductivity & ECG for different biomedical applications. 	
<p>Graduate Attributes (as per NBA)</p> <ul style="list-style-type: none"> • Engineering Knowledge. • Problem Analysis. • Design / development of solutions (partly) • Interpretation of data 	
<p>Conduct of Practical Examination:</p> <ol style="list-style-type: none"> 1. All laboratory experiments are to be included for practical examination. 2. Students are allowed to pick one experiment from the lot. 3. Strictly follow the instructions as printed on the cover page of answer script for breakup of marks. 4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero. 	
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Electronic Instrumentation by H. S. Kalsi, TMH, 2004 (Module-2,3 & 4) 2. Electronic Instrumentation and Measurements by David A Bell, PHI / Pearson Education 2006/ Oxford Higher Education, 2013. (Module 1& 3) 3. Measurement systems application and design by E.O. Doebline 4th Edition, TMH. 4. Instrumentation for Process Measurement by Norman. A. Anderson, 3rd Edition, CRC 5. Principle of Measurement System by John. P. Bentley, 3rd Edition, Pearson, 2007 6. Handbook of Biomedical Instrumentation- R S Khandpur, 2nd edition, Tata McGraw Hill, 2003. 	