

**REVISED DIPLOMA CURRICULUM OF
MEDICAL ELECTRONICS
(PART-II)**

**For the State of Meghalaya
(2024-25)**



National Institute of Technical Teachers' Training & Research
Block – FC, Sector – III, Salt Lake City, Kolkata – 700 106

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Programme Name: Medical Electronics

SEMESTER – III

SL No	Category of Course	Code No	Course Title	Study Scheme			Evaluation Scheme								Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory			Practical					
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assignment	Attendance		Sessional	Viva voce		
1	Programme Core	MELPC 201	Electrical & Electronics Measurement	ES104	3	0	0	60	20	15	5	-	-	-	100	3
2		MELPC 203	Electrical & Electronics Circuit -I	ES104	2	1	0	60	20	15	5	-	-	-	100	3
3		MELPC 205	Human Biology-I		2	0	0	60	20	15	5	-	-	-	100	2
4		MELPC 207	Digital Fundamentals	ES110	2	0	0	60	20	15	5	-	-	-	100	2
5		MELPC 209	Principle of Analog communication		3	0	0	60	20	15	5	-	-	-	100	3
6		MELPC 211	Electrical & Electronics Measurement lab	ES104	0	0	2	-	-	-	-	40	40	20	100	1
7		MELPC 213	Electrical & Electronics Circuit –I Lab	ES104	0	0	2	-	-	-	-	40	40	20	100	1
8		MELPC 215	Human Biology-I Lab		0	0	2	-	-	-	-	40	40	20	100	1
9		MELPC 217	Digital fundamental Lab	ES110	0	0	2	0	0	0	0	40	40	20	100	1
10	Internship	I-201	Internship-I		0	0	4	-	-	-	-	40	40	20	100	2
TOTAL					12	1	12	300	100	75	25	200	200	100	1000	19

Programme Name: Medical Electronics

SEMESTER – IV

SL No	Category of Course	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credits
				Pre-requisite	Contact Hours/ week			Theory			Practical					
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assign- ment	Attenda- nce		Sessional	Viva voce		
1	Program core course	MELPC 202	Electrical & Electronics Circuit-II	MELPC203	2	1	0	60	20	15	5	-			-	-
2		MELPC 204	Microprocessor & Microcontroller	MELPC207	3	0	0	60	20	15	5	-	-	-	100	3
3		MELPC 206	Human Biology -II	MELPC205	2	0	0	60	20	15	5	-	-	-	100	2
4		MELPC 208	Basic Medical electronics-I	MELPC 203	3	0	0	60	20	15	5	-	-	-	100	3
5		MELPC 210	Electrical & Electronics Circuit-II Lab	MELPC 213	0	0	2	-	-	-	-	40	40	20	100	1
6		MELPC 212	Microprocessor & Microcontroller Lab	MELPC 217	0	0	2	-	-	-	-	40	40	20	100	1
7		MELPC 214	Human Biology-II lab	MELPC 215	0	0	2	-	-	-	-	40	40	20	100	1
8		MELPC 216	Basic Medical Electronics –ILab	MELPC 215, MELPC 213	0	0	2	-	-	-	-	40	40	20	100	1
9	Open Elective	MELOE 202	Open Elective - I													
			A. Programming in C++& MATLAB		0	1	4	-	-	-	-	40	40	20		
			B. Renewable Energy Technologies		3	0	0	60	20	15	5	-	-	-	100	3
			C. Disaster Management													
10	Minor project	PR202	Minor project		0	0	4	-	-	-	-	40	40	20	100	2
11	Mandatory Course	AU202	Essence of Indian Knowledge and tradition		2	0	0	0	0	0	0	0	0	0	0	0
Total					15	1/2	12/16	240/300	80/100	60/75	20/25	240/200	240/200	120/100	1000	20

SEMESTER - III

ELECTRICAL & ELECTRONICS MEASUREMENT

L	T	P	Total Marks : 100	Course Code No: MELPC201
3	0	0		Theory
Total Contact Hours				End Term : 60
Lecture : 45 Hrs				Progressive Assessment : 40
Pre Requisite : ES104				
Credit : 3				

RATIONALE:

Knowledge and skills of Electrical and Electronics Instruments and measurement by these instruments form the most vital component of not only the Electrical and Electronics Engineering disciplines but also for any other disciplines these days. Performances of any Electrical and Electronics circuits depend on the functioning of the devices. Measurement of the parameters of the devices are therefore, essential and as such adequate knowledge of the functional and operational principles of electrical and electronics instruments including the measurement techniques their troubleshooting, calibration are basic requirements of study.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Comprehend the basic of electrical measurement.
- Prepare the specifications of required measurement of parameters for a specific application.
- Apply AC and DC bridges for measurement of electrical parameters like resistance, inductance, and capacitance.
- Explain the basics of Display devices.
- Comprehend the principles of operation and applications of video scanning.

DETAILED COURSE CONTENTS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HOURS)
1. Principles of Measurement & Instrumentation	1.1 Concept 1.2 definition and methods of Measurement 1.3 Classification of instruments 1.4 static and dynamic characteristics 1.5 Unit of measurements. 1.6 Dimension 1.7 Error in measurement 1.8 Classification of errors in Measurement , accuracy and precision	4
2. Electro-Mechanical Instrument	2.1 Moving Iron Instruments 2.2 PMMC Instruments 2.3 Electrodynamometer type meter 2.4 Induction type Energy meter	15

	2.5 Frequency meter 2.6 Extension of range using Shunt Multiplier 2.7 Extension of Range of Meter using Instrument like CT and PT	
3.Measurement of R, L and C	3.1 Different methods of measuring low, medium, high resistances 3.2 Wheatstone Bridge 3.3 Measurement of inductance & capacitance with the help of AC bridges (Hays Bridge, Schering Bridge, Maxwell bridge, Anderson bridge) 3.4 LCR meter-working principle with block diagram	12
4. Display Devices	4.1 CRO, Digital Recorder 4.2 Digital Storage Oscilloscope, block diagram, theory and application 4.3 Signal sources 4.4 Function generator 4.5 Digital Multi-meter, clamp on meter, megger 4.6 Spectrum analyser	12
5. Video Test Method To describe	1.1 Scan System 1.2 Video waveform 1.3 Principles of colour 1.4 Waveform monitor 1.5 Vector scope	5

Books recommended:

1. A.K.Sawhney. “ Electrical and Electronic Measurement and Instrumentation”, DHANPAT RAI & CO Latest edition
2. Gupta J.B., “ A Course in Electronics and Electrical Measurements and Instrumentation”, S.K.Kataria & Sons
3. H.S.Kalsi, “Electronic Instrumentation’, Tata McGraw –Hill Education.
4. 4. D. Patranabis, ’ Sensors& Transducers’

ELECTRICAL & ELECTRONICS CIRCUIT-I

L	T	P	Total Marks : 100	Course Code No: MELPC203
2	1	0		Theory
Total Contact Hours :				End Term : 60
Lecture and tutorial : 45 Hrs				Progressive Assessment : 40
Pre Requisite : ES104				
Credit : 3				

RATIONALE:

Electrical Engineering cannot stand alone without the study of Electronic Devices & Circuits. The modern Electrical Equipment are mostly controlled by electronic circuits where both the circuits are mostly designed on the basis of linear and binary operation of the solid-state devices. This subject provides the facility for the study of basic knowledge of the solid-state devices and their application. Care has been taken so that the studies of the practical circuits are included in this subject rather than theoretical approach. Some problems on designing of simple electronic circuits have also been included here.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Explain the basics of Voltage and Current Sources, their interconversion and conversion of Star & Delta Connection & vice versa, concepts of Electric Circuit Network Theorems, Sinusoidal Excited Circuit, Series and Parallel Resonance
- Explain functioning of Switches, relays, Connectors and Contactors, various types of Diodes and types and special purpose diodes used for various application.
- Describe Transistors, its types, constructional details, Biasing, Applications and analyse its circuitry for Faithful Amplification.
- Explain Electromagnetic Spectrum of Light and acquire knowledge about the Opto-Electronics Semiconductor Devices.
- Discuss fundamentals of Power Electronics Devices viz. Thyristors, SCR, DIAC, TRIAC.

DETAILED COURSE CONTENTS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HOURS)
1. D.C Network Theorems	1.1 To define voltage and current source 1.2 To represent graphically the ideal current and voltage source 1.3 To represent graphically the practical voltage and current source 1.4 To describe series parallel combination and determine the equivalent resistance 1.5 to deduce the conversion formulae for Delta to Star and vice versa	6

	<p>1.6 Kirchoff's current law 1.7 Kirchoff's voltage law 1.8 Superposition theorem 1.9 Newton's theorem & Thevenin's theorem 1.10 Maximum power transfer theorem 1.11 To solve the D.C network problems using above theorems & laws</p>	
2. Sinusoidal Excited Circuits and Resonance	<p>2.1 To state the condition for series Resonance 2.2 To determine the expression of frequency at resonance condition 2.3 To draw the frequency response curve 2.4 To define quality factor 2.5 to define bandwidth 2.6 To state the condition for parallel resonance 2.7 To determine the resonance frequency for parallel L-C Circuit 2.8 To draw the frequency response curve for the parallel resonance 2.9 To solve problems on series and parallel resonance</p>	6
3. Switches, Relays & Contactors	<p>3.1 Characteristics of switches and contactors, 3.2 Mechanism of toggle switches, 3.3 Microswitches, Push button switches, Rotary band change over switches, Thumbwheel switches, Proximity switches, Knife switches, 3.4 RF plug and sockets, 3.5 RF Connections, 3.6 Edge connector, Automated Switches & Relay, 3.7 Usage of switches</p>	6
4. Semiconductor Components, Diodes	<p>4.1 Semiconductor Physics 4.2 To describe the properties of semiconductor 4.3 The principle of conduction in crystal 4.4 Doping 4.5 Unbiased diode 4.6 Forward and reverse biased diode 4.7 Characteristics and application of diodes 4.8 To describe the volt amps. Characteristics of diode 4.9 To explain the property of ideal diode 4.10 To define the resistance of diode and describe the method of measurements 4.11 To describe practical diode 4.12 To state the important specifications of semiconductor diode 4.13 To describe the half wave and full wave rectifier circuits 4.14 To calculate the efficiency of rectifier circuit 4.15 To write the formulae of calculating the parameters of rectifier circuit 4.16 Special Purpose Diodes</p> <ul style="list-style-type: none"> ➤ Zener diode ➤ Capacitive diode ➤ Light Emitting Diode ➤ Photodiode 	8

	<ul style="list-style-type: none"> ➤ Schottky diode ➤ Constant current diode ➤ Step recovery diode ➤ Tunnel diode ➤ PIN diode ➤ Gun diode 	
5. Transistors	<p>5.1 To describe the construction of transistor</p> <p>5.2 To describe the working principle of transistor</p> <p>5.3 To state the types of transistor</p> <p>5.4 To understand the characteristics of transistor and method of drawing characteristic curves</p> <p>5.5 To explain the amplifying characteristics</p> <p>5.6 To describe the amplifying characteristics in (a)common base(b)common emitter(c)common collector configuration</p> <p>5.7 To define</p> <ul style="list-style-type: none"> ➤ current amplification factor ➤ collector current ➤ emitter current ➤ leakage current ➤ input resistance ➤ output resistance ➤ base current amplification factor <p>5.8 To establish the relation between α and β</p> <p>5.9 To describe the method of drawing of the</p> <ul style="list-style-type: none"> ➤ input characteristics curve ➤ output characteristics curve <p>5.10 To compare the characteristics of three different configuration CB, CE, CC.</p> <p>5.11 To analyse the load line of a transistor (both for dc and ac)</p> <p>5.12 To describe the function of the heat sink of a transistor</p> <p>5.13 To write the specification of a transistor</p> <p>5.14 To state the conditions for faithful amplification</p> <p>5.15 To define transistor biasing</p> <p>5.16 To describe the effect of selection of different operating point on the load line</p> <p>5.17 To state the essential requirements of a transistor biasing circuit</p> <p>5.18 To define stability factor</p> <p>5.19 To describe</p> <ul style="list-style-type: none"> ➤ base resistor biasing ➤ feedback resistor biasing ➤ voltage divider ➤ biasing ➤ emitter biasing 	10
6. Photo electronic Devices	<p>6.1 To describe the Electromagnetic spectrum of Light.</p> <p>6.2 To list the application of photo Electronic Devices.</p> <p>6.3 To describe, the spectral response, Illumination and Irradiance of Optoelectronic Devices.</p> <p>6.4 To describe the photoconductive sensors e.g.</p> <ul style="list-style-type: none"> 6.4.1 Bulk-type photoconductive cells 6.4.2 PN photodiode 6.4.3 PIN Photodiode 6.4.4 Avalanche Photodiode 	8

	6.4.5 NPN Photodiode 6.4.6 NPN Phototransistor 6.4.7 Photo Darlington Transistor 6.5 To describe the applications of Photodiodes and phototransistors 6.6 To describe the function of light Emitters e.g. LED's Infrared Emitters, Laser diode. 6.7 To describe the functions of, Photo-couplers, Application of the photo coupler circuit	
7. Electronic Power Control Devices and Switches	7.1 Diodes, transistors, thyristors, hybrids 7.2 The thyristor family, SCR, SUS, DIAC, TRIAC, GTOSCR 7.3 Principles of operation and trigger modes 7.4 Size selection and heat sink determination 7.5 Limitations and safety consideration.	4

REFERENCES:

1. Basic Electronics (Solid State), By B. L. Thereja (S. Chand Publishers)
2. Principle of Electronics By V.K. Mehta & Rohit Mehta (S. Chand Publishers)
3. Objective Electrical Technology By V.K. Mehta & Rohit Mehta (S. Chand Publishers)
4. A Text Book of Electrical Technology, Vol 1 & Vol 4 By B. L. Thereja (S. Chand Publishers)
5. Circuit Theory (Analysis and Synthesis) By A. Chakrabarti (Dhanpat Rai & Co.)
6. Electronics Lab Manual, Volume 1. And 2 Author. K.A. Navas. Publisher. PHI Learning Private Limited

Human Biology-I

L	T	P	Total Marks : 100	Course Code No: MELPC205
2	0	0		Theory
Total Contact Hours				End Term : 60
Lecture : 30 Hrs				Progressive Assessment : 40
Pre Requisite : NIL				
Credit : 2				

RATIONALE:

Knowledge of Human Anatomy is very much essential for studying Medical Electronics. The characteristics of cells and their Electrical Properties gives a thorough knowledge of developing measuring, monitoring, and operating devices. As the students are basically from physical science group they may have deficiency in knowledge of Human Anatomy. This course will help to have clear idea regarding above subjects.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Describe cell terminology and characteristics of cells
- Explain working of digestive system and excretory system
- Comprehend the anatomy and characteristics and their influence to light on special senses.
- Discuss Haematology of blood
- Explain structure and spectral characteristics of Hard Tissues

DETAILED COURSE CONTENTS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HOURS)
1. Introduction	1.1 Nomenclature (Medical Terminology) 1.2 Cell physiology-Cell and its organelles, reproduction/differentiation, growth and ageing. 1.3 Cell electrophysiology – Resting potential, Membrane potential, action potential, depolarisation and repolarisation. 1.4 Cellular response to environment – response to chemical, electrical, mechanical stimulation, effect of temperature, effect of load, effect of oxygen and nutrients. 1.5 Cell specialization – Nerve cell, skeletal muscle, smooth muscle, cardiac muscle, cancer cell.	10
2. Digestive System	2.1 Anatomy of the Gastro-intestinal tract, their functions, cancer cell with special reference to motility tract. 2.2 Various digestive juices, their actions. 2.3 Digestion of foodstuff. 2.4 Functions of Gastro-intestinal tract. 2.5 Anatomy of biliary apparatus, functions of liver.	8
3. Excretory	3.1 Anatomy of kidney, ureters, urinary bladder & urethra	6

System	3.2 Formation of urine 3.3 Skin, Response to physio-chemical environment.	
4. Special senses	4.1 Anatomy of eye and ear. <ul style="list-style-type: none"> • Functions of different parts, retina and its functions. • Physiology of vision & hearing. • Structure of human eye. • Absorbance and refractivity of various components in ocular media. Colour vision mechanism, colour receptors and their spectral sensitivity. Effects of UV-A,B,C, visible and IR-A,B,C irradiation on human vision. • Retinal maximum permissible exposures of optical radiation. 4.2 Skin. <ul style="list-style-type: none"> • Structure of human skin. • Thicknesses and optical properties of appropriate skin layers. The Kubelka - Munk model. • Experimental data on skin absorbance and remittance in different spectral regions. Skin pigments (melanin, bilirubin, carotene, haemoglobin) and their spectra. • Influence of UV radiation to human skin. • Human erythema action spectra. Melanogenesis (tanning) and its mechanism. • Classification of human skin types according to sunburn. Sunscreens; sun protection factor (SPF) values and subsequent effects. 	10
5. Haematology of blood	5.1 Composition of blood. Spectral properties of erythrocytes, thrombocytes and blood plasma. 5.2 Differences between oxygenated and unoxygenated haemoglobin absorption spectra.	5
6. Hard Tissues	Structure of human bones, nails and teeth; their spectral characteristics.	5

List of Books

1. 'Essential of Human Anatomy' Asim Kumar Dutta, Current Book of international
2. 'Human Physiology' by C.C.Chatterjee, Medical Allied Agency
3. Human Anatomy I & II by Chaurasia

DIGITAL FUNDAMENTALS

L	T	P	Total Marks : 100	Course Code No: MELPC207
2	0	0		Theory
Total Contact Hours				End Term : 60
Lecture : 30 Hrs				Progressive Assessment : 40
Pre Requisite : ES110				
Credit : 2				

RATIONALE:

This course provides students a structured approach to learning the principles and practical applications of digital electronics used by computers, communications equipment and control systems. Through a balanced series of lectures, computer-based exercises and hands-on laboratory sessions, the student will acquire a solid foundation in digital logic, including gates, binary numbers, flip-flops, registers, counters, display devices and applications of Boolean algebra.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Comprehend the Basic Logic Gates and Universal Gates and its functions.
- Discuss Computer Number System and method of conversion from one form to another.
- Explain the laws of Boolean algebra and Standard form of Boolean Expression
- Comprehend from which a device exhibits two stable states is extremely useful as a memory element in the binary system.
- Comprehend Shift Registers its circuit diagram, truth tables and timing diagram.

DETAILED COURSE CONTENTS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HOURS)
1. Logic Gates	1.1 Basic logic gates: OR, AND, and NOT: 1.1.1 Definitions 1.1.2 Implementation examples using switches 1.1.3 Truth tables, 1.1.4 Logic symbols, 1.1.5 Logic voltage levels, 1.1.6 Logic circuit design examples 1.2. Integrated circuits and packaging 1.3. NOR, NAND, Exclusive OR, and Exclusive NOR gates. 1.4. The controllable inverter. 1.5. Alternate forms of Exclusive OR and Exclusive NOR circuits. 1.6. NOR and NAND gates used as inverters. 1.7. Fan-in and fan-out 1.8. Termination of unused inputs	4

	<p>1.9. AND and OR gates constructed from NAND and NOR gates</p> <p>1.10. IC handling precautions.</p>	
2. Computer Number System	<p>2.1. Counting in Binary, Octal and Hexadecimal Systems</p> <p>2.2. Adding in the binary number system</p> <p>2.2.1 Half adder & full adder</p> <p>2.2.2 Adding two binary numbers of arbitrary length.</p> <p>2.2.3 Parallel binary adder</p> <p>2.3. Subtraction in the binary number system:</p> <p>2.1.1 1's complement method</p> <p>2.1.2 2's complement method</p> <p>2.1.3 Parallel adder/subtractor</p> <p>2.4. Conversion from one number system to another:</p> <p>2.4.1 Binary to decimal</p> <p>2.4.2 Decimal to binary</p> <p>2.4.3 Binary to octal (binary-to-octal decoder)</p> <p>2.4.4 Octal to binary (octal-to-binary encoder)</p> <p>2.4.5 Hexadecimal to binary</p>	4
3. Boolean Algebra	<p>3.1. Boolean operations (OR, AND, NOT)</p> <p>3.2. Representation of logic circuits by Boolean expressions.</p> <p>3.3. Laws of Boolean algebra:</p> <p>3.3.1 Double inversion: $A''=A$</p> <p>3.3.2 OR identities: $A+0 = A$, $A+1=1$, $A+A=A$, $A+A'=1$</p> <p>3.3.3 AND identities: $A.0=0$, $A.1=A$, $A.A=A$, $A.A'=0$</p> <p>3.3.4 Cumulative laws: $A+B=B+A$, $A.B=B.A$</p> <p>3.3.5 Associative laws: $(A+B)+C=A+(B+C)$, $(A.B).C=A.(B.C)$</p> <p>3.3.6 Distributive laws: $A+(B.C)=(A+B).(A+C)$, $A.(B+C)=A.B+A.C$</p> <p>3.3.7 DeMorgan's theorems: $(A+B+C+...)'=A'.B'.C'...$, $(A.B.C...)'=A'+B'+C'...$</p> <p>3.3.8 Applications to logic circuit simplifications and design</p> <p>3.4. Equivalent logic gates</p> <p>3.5. NAND and NOR implementations of logic circuits.</p> <p>3.6. Standard forms of Boolean expressions</p> <p>3.6.1 Sum-of-products (SOP)</p> <p>3.6.2 Expanded sum-of-products (ESOP)</p> <p>3.6.3 Product-of-sums (POS)</p> <p>3.6.4 Expanded product-of-sums (EPOS)</p> <p>3.7. Karnaugh mapping</p>	4
4. Latches And Flip-Flops	<p>4.1. Basic definitions</p> <p>4.2. Voltage pulses</p> <p>4.3. Basic latches:</p> <p>4.3.1. NOR latch</p> <p>4.3.2. NAND latch</p>	6

	<p>4.3.3. Example uses of latches (burglar alarm circuit, switch contact debouncer)</p> <p>4.4. Gated latches:</p> <p>4.4.1. Gated S-R latch</p> <p>4.4.2. Gated D-latch</p> <p>4.5. Flip-flops:</p> <p>4.5.1. Master-slave and edge-triggered principles</p> <p>4.5.2. S-R flip-flop</p> <p>4.5.3. D-type flip-flop</p> <p>4.5.4. J-K flip-flop</p> <p>4.5.5. T-type flip-flop</p> <p>4.5.6. Flip-flop timing diagrams</p>	
5. LED Displays	<p>Explain the working principle of</p> <p>5.1. Basic properties</p> <p>5.2. LED to TTL interface</p>	4
6. Counters	<p>Describe and draw the circuit diagram and explain the working principle of</p> <p>6.1. Binary counters, up-down counter (circuits, truth tables, and timing diagrams) :</p> <p>6.1.1. Asynchronous counters, ripple counter</p> <p>6.1.2. Synchronous counters</p> <p>6.2 Counter decoding</p> <p>6.3. The decade counter</p> <p>6.4. Module – 3 counter and its combinations</p> <p>6.5. Divide-by-n counters obtained from truncated binary sequences</p>	5
7. Shift Registers	<p>Draw the circuits, truth tables, and timing diagrams of</p> <p>7.1. Serial input shift register.</p> <p>7.2. Serial/parallel load shift register.</p> <p>7.3. Shift register counters:</p> <p>7.3.1. Ring counter</p> <p>7.3.2. Self-starting ring counter</p> <p>7.3.3. Johnson counter</p> <p>7.4. Buffer Register – SISO, PISO Registers</p>	5
8. Elements Of Relay Logic	<p>State and describe the following</p> <p>8.1. Physical features of relays</p> <p>8.2. Basic logic functions</p> <p>8.3. Contact networks and Boolean expressions</p> <p>8.4. Complements of contact networks</p>	3
9. Semiconductor Memories	<p>9.1 Differentiate between volatile and non-volatile memories. Give examples of each.</p> <p>9.2 Define the terms ROM, RAM, PROM, EPROM. Draw a typical memory cell for each.</p> <p>9.3 Design a small diode matrix ROM to serve as a code converter.</p> <p>9.4 Design and draw the logic diagram of a specified size memory system using standard integrated circuit memory chips.</p> <p>9.5 Describe how dynamic memory works.</p> <p>9.6 List the advantages and disadvantages of dynamic memory vs. static memory.</p>	5
10. Clocked Sequential	10.1. Combinational vs. sequential circuits – Adder,	6

Circuit Design	Subtractor, decoder, multiplexer, de-multiplexer, comparator. 10.2. Finite state machines 10.2.1. Definitions 10.2.2. Moore and Mealy machines 10.3. State diagrams 10.4. Synchronous counter design (Karnaugh map method) : - Using D-type flip-flops - Using J-K flip-flops	
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Reference Books:

1. 'Modern Digital Electronics' R P Jain
2. 'Electronic Devices And Circuits' S Salivahanan, N Suresh Kumar, A Vallavaraj

PRINCIPLES OF ANALOG COMMUNICATION

L	T	P	Total Marks : 100	Course Code No: MELPC209
3	0	0		Theory
Total Contact Hours				End Term : 60
Lecture : 45 Hrs				Progressive Assessment : 40
Pre Requisite : NIL				
Credit : 3				

RATIONALE:

The knowledge of the Electronics Communication is very essential for transmitting the information for one place to other. As the type of messages and information are different for different field of application different type of communication media are used. The type of modulation, transmission frequencies and media also changes. For this reason, the study of analogue and digital communications have been included in this subject. In addition to above the study of Antenna, microwave, Facsimile, Television and Fiber optic system have also been included in this subject.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Describe functions and application of Modulation and Demodulation systems on Amplitude Modulation, Frequency Modulation, and Pulse Modulation.
- Explain electronic exchange and principles of facsimile communication
- Discuss the functions of the satellite system, orbits antennas
- Describe about satellite services
- Evaluate electronic circuits and diagrams of all the sections mentioned.

DETAILED COURSE CONTENTS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HOURS)
1. Amplitude Modulation	To describe the construction and working principles of superheterodyne Receivers 1.1 To define 1.1.1 Tuning range 1.1.2 Tracking 1.1.3 Sensitivity and gain 1.1.4 Image rejection 1.1.5 Superior responses 1.1.6 Adjacent channel selectivity 1.1.7 Automatic gain control 1.2 To define 1.2.1 Amplitude modulation 1.2.2 Amplitude Modulation Index 1.2.3 Modulation for sinusoidal Amplitude Modulation 1.2.4 Frequency spectrum for sinusoidal Amplitude Modulation 1.2.5 Average power for sinusoidal Amplitude 1.2.6 Effective voltage and current for sinusoidal Amplitude Modulation 1.2.7 Non- sinusoidal modulation h) double sideband suppressed carrier modulation 1.3 To describe 1.3.1 Amplitude modulation circuits 1.3.2 Diagonal peak clipper 1.3.3 Negative peak clipper 1.3.4 The amplitude modulated transmitter 1.3.5	10

	Amplitude Modulated Broadcast transmitter 1.3.6 Practical circuit of amplitude modulated Receivers 1.3.7 Amplitude Modulated Receiver using phase locked loop (PLL) noise in Amplitude Modulated Systems	
2. Single Sideband Modulation	2.1 To describe and explain the 2.1.1 Double side band principles 2.1.2 Single sideband principles 2.1.3 Balanced modulation 2.1.4 Method of single sideband generation, Balanced modulator filter method, Phasing method, Third method Unit Topic / Sub Topic Hours 2.1.5 Single sideband reception 2.1.6 Pilot carrier single side band 2.1.7 Frequency division multiplexing 2.1.8 Signal-to-noise ratio for single sideband	5
3. Angle Modulation	3.1 To explain 3.1.1 Frequency Modulation 3.1.2 Sinusoidal frequency Modulation 3.1.3 Frequency spectrum for Sinusoidal frequency Modulation 3.1.4 Average power in Sinusoidal frequency Modulation 3.1.5 Non-Sinusoidal frequency Modulation (Determination of deviation ratio) 3.1.6 The method of measurement of modulation 3.1.7 Index for Sinusoidal frequency Modulation 3.1.8 Phase Modulation 3.2 To establish the Equivalence between phase Modulation and Frequency Modulation 3.3 To explain (a) Sinusoidal phase Modulation (b) Digital Phase Modulation 3.4 To describe Angle modulator circuits (a) varactor diode modulators (b) Transistors modulators 3.5 To describe the working principles of (a) FM Transistors (b) FM Broadcast transmitter 3.6 To describe the working principle of Angle Modulation Detectors 3.6.1 Basic Detection of FM Signals 3.6.2 Foster see ley Discrimination 3.6.3 Ratio detection 3.6.4 Quadrature detector 3.6.5 Phase locked loop detector 3.6.6 Noise in frequency modulation system 3.7 Explain the term Pre-emphasis and De-emphasis 3.8 To describe the FM Broadcast Receivers	8
4. Radio Waves	4.1 To start the range of frequencies for Radio Wave propagation 4.2 To describe propagation in Free Space Microwave Systems Tropospheric propagation (mode of propagation, Radio horizon, contour maps, super and sub refractions, attenuation in the atmosphere, VHF/UHF radio systems) 4.3 To describe Ionospheric propagation, Ionospheric layers, Plasma frequency and critical frequency, Optimum working frequency, Virtual height, Effect of earth's magnetic field, service range, Ionospheric irregularities ionic disturbances and, fading, summery F1, F2 layer), H.F Radio systems 4.4 To describe surface wave, Mode of Propagation, ground wave, Broadcast Fading Zone 4.5 To describe low frequency propagation and very low frequency propagation, Extreme low frequency propagation	5
5. Antennas	5.1 To describe 5.1.1 Antenna equivalent Circuits 5.1.2 Co-ordinate systems 5.1.3 Radiation Fields 5.1.4 Polarization 5.1.5 Isotropic radiator 5.1.6 Power gain of an antenna 5.1.7 Effective area of an antenna 5.1.8 Effective length of an antenna	8

	<p>5.1.9 Hertzian Dipole 5.1.10 Half wave dipole 5.2.1 To describe vertical antenna (a) ground reflections (b) grounded vertical antenna 5.3 To describe 5.3.1 Folded elements 5.3.2 Loop and ferrite-rod receiving antennas 5.3.3 Non resonant antennas 5.3.4 Driver arrays 5.3.5 Broadside array 5.3.6 End -fire array 5.3.7 Turnstile antenna 5.3.8 Parasitic antenna (paratic reflector, Parasitic directors, Yagi-Uda Array, Plane reflector array) 5.4 To describe VHF-UHF Antennas 5.4.1 Dicome Qunni 5.4.2 Helical Antenna 5.4.3 Log periodic antenna 5.5 To describe Microwave Antenna (Harns, paraboloidal, reflector antenna, dielectric lens antennas start antennas</p>	
6. Telemedicine	<p>6.1 To describe wire telephones and its circuits 6.2 To describe 6.2.1 Electronic telephone and its circuits 6.2.2 Electronic subscriber line interface circuit 6.2.3 Subscriber loop lines 6.2.4 Transmission Bridges 6.2.5 Two wire repeaters 6.2.6 Four wire transmission 6.3 To describe the public telephone network systems 6.4 To explain facsimile Transmission 6.5 To describe the 6.5.1 Facsimile Transmitter system (Transmitter and Receiver) 6.5.2 Digital For Transmission system 6.6 Describe 6.6.1 Orbit 6.6.2 Geostationary orbit 6.6.3 Satellite station keeping 6.6.4 Frequency plane and polarization 6.6.5 Transponders 6.6.6 Overall link budget calculation 6.6.7 Multiple access methods</p>	12

Reference Books:

1. Electronic Communication (Latest edition) Dennis Roddy and John Coolen (PHI)

ELECTRICAL & ELECTRONICS MEASUREMENT LAB

L	T	P	Total Marks : 100	Course Code No: MELPC211
0	0	2		Practical
Total Contact Hours :				End Term : 40
Practical : 30 Hrs				Progressive Assessment : 60
Pre Requisite : ES104				
Credit : 1				

RATIONALE:

Knowledge and skills of Electrical and Electronics Instruments and measurement by these instruments form the most vital component of not only the Electrical and Electronics Engineering disciplines but also for any other disciplines these days. Performances of any Electrical and Electronics circuits depend on the functioning of the devices. Measurement of the parameters of the devices are therefore, essential and as such adequate knowledge of the functional and operational principles of electrical and electronics instruments including the measurement techniques their troubleshooting, calibration are basic requirements of study.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Measure the resistance by Kelvin's Double bridge, inductance by Maxwell's Bridge And capacitance by Wein Bridge
- Identify the different parts and demonstrate CRO
- Develop the circuit for constructing the B-H loop of a magnetic material using CRO
- Demonstrate multimeter by measuring various electronics devices
- Measure high resistance and insulation resistance using megger

DETAILED COURSE CONTENTS

Sl No.	Topic	Hours
1	To measure the low resistance of a coil by Kelvin's Double Bridge method	1
2	To measure inductance by Maxwell's Bridge and compare the value by measuring it with Commercial Digital R-C-L bridge and 3¾ Digital Multimeter.	1
3	To measure capacitance by Wien Bridge and compare the measured value from those of commercial Digital R-C-L bridge and 3¾ Digit Digital Multimeter.	1
4	To identify the different parts of CRO	1
5	To demonstrate usage of DSO for steady state periodic waveforms produced by a function generator.	1

6	To developed the circuit for constructing the B-H loop of a magnetic material using CRO	1
7	Demonstration of Function generator by understanding different waveforms.	1
8	Demonstration of multimeter by measuring various electronics devices.	1
9	To measure high resistance and insulation resistance using megger	1

Books recommended:

1. A.K.Sawhney. "Electrical and Electronic Measurement and Instrumentation", DHANPAT RAI & CO
2. Gupta J.B., " A Course in Electronics and Electrical Measurements and Instrumentation", S.K.Kataria & Sons
3. H.S.Kalsi, "Electronic Instrumentation', Tata McGraw –Hill Education.
4. 4. D. Patranabis, ' Sensors& Transducers'

ELECTRICAL & ELECTRONICS CIRCUIT-I LAB

L	T	P	Total Marks : 100	Course Code No: MELPC213
0	0	2		Practical
Total Contact Hours :				End Term : 40
Practical : 30 Hrs				Progressive Assessment : 60
Pre Requisite : ES104				
Credit : 1				

RATIONALE:

Electrical Engineering cannot stand alone without the study of Electronic Devices & Circuits. The modern Electrical Equipment are mostly controlled by electronic circuits where both the circuits are mostly designed on the basis of linear and binary operation of the solid-state devices. This subject provides the facility for the study of basic knowledge of the solid-state devices and their application. Care has been taken so that the studies of the practical circuits are included in this subject rather than theoretical approach. Some problems on designing of simple electronic circuits have also been included here.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Determine the forward and reverse characteristics of PN junction diode, Zener diode
- Design Half Wave Rectifier using PN Junction Diode and Full Wave Rectifier using PN Junction Diode with Filter Circuit.
- Determine the common emitter characteristics of NPN transistor.
- Study the phenomenon of Series Resonance
- Study the phenomenon of Parallel Resonance and
 - Measurement of capacitors using resonance
 - Measurement of inductor using resonance.
 - Measurement of frequency using resonance and variable capacitor

DETAILED COURSE CONTENT

SL. No.	Topics	Hours
1	To identify the active and passive components	1
2	To determine the forward and reverse characteristics of PN junction diode	1
3	To determine the forward and reverse characteristics of a Zener diode	1
4	To Design Half Wave Rectifier using PN Junction Diode	1
5	To Design Full Wave Rectifier using PN Junction Diode with Filter Circuit.	1

6	To determine the common emitter characteristics of NPN transistor.	1
7	To study the phenomenon of Series Resonance	1
8	To study the phenomenon of Parallel Resonance I. Measurement of capacitors using resonance II. Measurement of inductor using resonance. III. Measurement of frequency using resonance and variable capacitor	1

Reference Books:

1. Basic Electronics (Solid State), By B. L. Thereja (S. Chand Publishers)
2. Principle of Electronics By V.K. Mehta & Rohit Mehta (S. Chand Publishers)
3. Objective Electrical Technology By V.K. Mehta & Rohit Mehta (S. Chand Publishers)
4. A Text Book of Electrical Technology, Vol 1 & Vol 4 By B. L. Thereja (S. Chand Publishers)
5. Circuit Theory (Analysis and Synthesis) By A. Chakrabarti (Dhanpat Rai & Co.)
6. Electronics Lab Manual, Volume 1. And 2 Author. K.A. Navas. Publisher. PHI Learning Private Limited

Human Biology-I LAB

L	T	P	Total Marks : 100	Course Code No: MELPC215
0	0	2		Practical
Total Contact Hours :				End Term : 40
Practical : 30 Hrs				Progressive Assessment : 60
Pre Requisite : NIL				
Credit : 1				

RATIONALE:

Knowledge of Human Anatomy is very much essential for studying Medical Electronics. The characteristics of cells and their Electrical Properties gives a thorough knowledge of developing measuring, monitoring, and operating devices. As the students are basically from physical science group they may have deficiency in knowledge of Human Anatomy. This course will help to have clear idea regarding above subjects.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Study the function of different parts of central nervous system, parts of digestive system, palpation of lever , excretory system (kidney, palpation of kidney and locate kidney in contrast raphigraphy).
- Draw the diagram of endocrine system, liver, spleen, extension of thyroid gland from model and software
- Explain different part of movements of Joints
- Study X-rays of brain, cells under microscopes.
- Explain the structure of muscle fatigue and properties of cardiac muscles

DETAILED COURSE CONTENT

Sl No.	Topics	Hour
1	To identify and observed the function of different parts of central nervous system.	1
2	To identify and observed the function of different parts of digestive system, palpation of lever.	1
3	To check the excretory system (kidney, palpation of kidney and ability to locate kidney in contrast raphigraphy).	1
4	To draw the diagram of endocrine system, Liver, spleen, extension of thyroid gland from model and software	1
5	To demonstrate different part of movements of Joints,	1
6	To show X – Ray of brain.	1
7	To observe Cell under microscope.	1
8	To show the effect of change of strength of the stimulus on the response of a skeletal muscle of a frog.	1
9	To show simple muscle curve and effect of two successive stimuli in case of a frog.	1

10	To show muscle fatigue	1
11	To show effects of free and alter loading of frogs “Gastro Chemins Muscle Ergograph”.	1
12	To show properties of a cardiac muscle.	1

REFERENCES:

- ‘Essential of human anatomy’ Asim Kumar Dutta, Current Book of International
- ‘Human physiology’ by C. C. Chatterjee, Medical Allied Agency

Digital Fundamentals Lab

L	T	P	Total Marks : 100	Course Code No: MELPC217
0	0	2		Practical
Total Contact Hours :				End Term : 40
Practical : 30 Hrs				Progressive Assessment : 60
Pre Requisite : ES110				
Credit : 1				

RATIONALE:

This course provides students a structured approach to learning the principles and practical applications of digital electronics used by computers, communications equipment and control systems. Through a balanced series of lectures, computer-based exercises and hands-on laboratory sessions, the student will acquire a solid foundation in digital logic, including gates, binary numbers, flip-flops, registers, counters, display devices and applications of Boolean algebra.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Verify the truth table by developing gate circuits using Diodes
- Connect LEDs in (a) common anode (b) Common Cathode combination and to form a 7 segment LED display.
- Develop a set –reset Flip Flop using (a) two NAND gate (b) two NOR gate and determine the truth table of the above two.
- Develop a J-K F/F using basic building block chips, a 4 bit ripple counter by using FF , a decade counter by using a 7490 IC
- Interface the seven segment display with a decoder

LIST OF PRACTICALS

Sl No.	Topics	Hour
1	To develop the gate circuits by Diodes and verify the truth table.	1
2	To determine the required current and voltage to light up a light emitting Diode	1
3	To connect the logic ‘high’ and ‘low’ inputs to a NAND gate.	1
4	To connect a output display unit (LED – Register combination)	1
5	To connect LEDs in (a) common anode (b) Common Cathode combination and to form a 7 segment LED display.	1
6	To develop a set –reset Flip Flop using (a) two NAND gate (b) two NOR gate and determine the truth table of the above two	1
7	To develop a J-K F/F using basic building block chips	1
8	To interface the seven segment display with a decoder	1
9	To develop a 4 bit ripple counter by using FF	1
10	To develop a decade counter by using a 7490 IC	1

REFERENCES:

1. ‘Modern Digital Electronics’ R P Jain
2. ‘Electronic Devices And Circuits’ S Salivahanan, N Suresh Kumar, A Vallavaraj

INTERNSHIP I

L 0	T 0	P 4		Course Code No.: I-201
Total Contact hrs.: Credit: 2			Total Marks: 100	Evaluation Scheme: End Term Exam: 40 P.A.: 60

RATIONALE:

Internship provides an in-depth knowledge on engineering students. This internship enables the students to understand and learn the current trend in the job market. Internship provides great opportunity to get real life experience and exposure.

Students will be exposed to structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them to build their profile for their jobs and also for their higher studies.

INTERNSHIP PROTOCOL:

Students are required to take up an Internship/ Entrepreneurial activities / Project work/ Seminar and Inter/ Intra Institutional Training.

As per AICTE guideline the institutes have the flexibility to schedule internship, Project work, Seminar etc. according to the availability of the opportunities. Students are required to be involved in Inter/ Intra Institutional Activities viz.,

- Training with higher Institutions;
- Soft skill training organized by **Training and Placement Cell of the respective institutions;**
- Contribution at incubation/ innovation /entrepreneurship cell of the institute;
- Participation in conferences/ workshops/ competitions etc.;
- Learning at Departmental Lab/ Idea Lab/ Institutional workshop;
- Working for consultancy/ research project within the institutes and
- Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos

SEMESTER - IV

ELECTRICAL & ELECTRONICS CIRCUIT-II

L	T	P	Total Marks : 100	Course Code No: MELPC202
2	1	0		Theory
Total Contact Hours				End Term : 60
Lecture and tutorial : 45 Hrs				Progressive Assessment : 40
Pre Requisite : MELPC203				
Credit : 3				

RATIONALE:

This subject has been introduced with a view to provide understanding and hands-on experience in hardware and software on medical equipment, like amplifiers, safety of uses of these equipment and some associated design aspect.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Explain the basic of Amplification, Constructional Details of Single Stage and Multi-Stage Amplifier, UJT, Its Characteristics, Constructional Details and Application.
- Explain FET, Its Characteristics, constructional details, and Application, MOSFET, Its Characteristics, Constructional Details, Handling Precautions and Application.
- Discuss the Oscillators, Differential Amplifiers, its types, constructional details, and applications.
- Analyse the Internal Circuitry of IC 555 Timer and its application for construction of different types of multi-vibrators and wave generators.
- Study fixed dual voltage power supply using ICs 78XX and 79XX and adjustable dual voltage regulated power supply ICs LM317 and LM337.

DETAILED COURSE CONTENTS

UNIT NO. & TITLE	CONTENT	TIME ALLOTED (HOURS)
1. Amplifier	1.1 To describe the function of a small signal using Single Stage Amplifier 1.2 To calculate the voltage and power gain of amplifier 1.3 To describe the classification of amplifiers 1.4 To define the multistage amplifier 1.5 To state and describe different types of coupling used in amplifiers	3
2. Uni-	2.1 To describe the construction, working principle and	4

junction Transistor.	<p>characteristics of Uni-junction Transistor.</p> <p>2.2 To define (a) Intrinsic standoff ratio(b) emitter voltage(c) emitter diode voltage (d) Emitter current(e) negative resistance region (f) saturation region.</p> <p>2.3 To describe the UJT relaxation Oscillator circuit and write expression for the time period of the oscillator.</p> <p>2.4 To state some application of UJT relaxation oscillator.</p>	
3. Field Effect Transistor	<p>3.1 To describe the construction, operation and characteristics of Junction Field Effect Transistor.</p> <p>3.2 To define</p> <ol style="list-style-type: none"> a) Channel ohmic region b) Pinch off region c) Drain resistance d) Tran conductance e) Zero-gate-voltage Drain Current f)Dissipation g) Gate out off current. <p>3.3 To describe the effect of temperature on FET parameters</p> <p>3.4 To describe the common source AC amplifier circuit and</p> <p>3.5 To describe</p> <ol style="list-style-type: none"> a) Voltage gain b) Output resistance c) Input resistance d) Input capacitance <p>3.6 To Describe</p> <ol style="list-style-type: none"> .1 Fixed bias with self-bias circuit .2 The common drain or source follower circuit .3 The common gate FET amplifier. <p>3.7 To explain the frequency response of FET amplifier.</p>	5
4. MOSFET (Metal Oxide Semiconduc tor FET.	<p>4.1 To describe (a) Depletion MOSFET (b) Enhancement MOSFET.</p> <p>4.2 To differentiate the characteristics of JFET and MOSFET.</p> <p>4.3 To describe</p> <ol style="list-style-type: none"> (a) The handling precautions of MOSFET, (b) Dual gate MOSFET (c) Integral gate protection. <p>4.4 To describe the testing procedure of Field Effect Transistor</p> <p>4.5 To describe the application of a dual gate MOSFET in automatic gate control amplifier.</p> <p>4.6 To Describe the function of a Field Effect Diode</p> <p>4.7 To describe the application of FET in oscillators.</p>	5
5. Oscillator	<p>5.1 To state types of Electrical Oscillation</p> <p>5.2 To describe damped and un-damped oscillation</p> <p>5.3 To state the condition for oscillation</p> <p>5.4 To describe different type of Oscillators</p> <p>5.5 Tuned collector Oscillator</p> <p>5.6 Hartley Oscillator</p>	6

	<p>5.7 Colpitt's Oscillator 5.8 Phase shift Oscillator 5.9 Wien Bridge Oscillator 5.10 Crystal Oscillator</p>	
6. Differential Amplifier.	<p>6.1 To define a differential amplifier and explain its significance 6.2 To describe four different configuration of the differential amplifier. 6.3 To draw the equivalent circuit for a differential amplifier configuration 6.4 To determine the voltage gain, differential input resistance and output resistance 6.5 To Define and explain Common Mode Rejection Ratio 6.6 To explain the importance of FET differential amplifier. 6.7 To describe the constant current bias circuit, current mirror circuit in Differential amplifier and explain its importance 6.8 To determine the overall voltage gain, the input resistance and the output resistance for the cascade arrangement of several amplifier stages.</p>	6
7. Operational Amplifier	<p>7.1 To define operational amplifier and study its constructional details 7.2 To define SSI, MSI, LSI and VLSI packages 7.3 To define (a) Input offset voltage (b) Input offset current (c) Common Mode Rejection Ratio (d) Large signal voltage gain (e) Slew rate (f) Output resistance (g) Output short circuit current of operational amplifier 7.4 To state the seven important properties of the Ideal Op-Amp 7.5 To draw the equivalent circuit of Op-Amp 7.6 To define (a) Open loop Op-Amp configuration (b) Differential amplifier (c) Inverting amplifier (d) Non-inverting amplifier 7.7 To define, Ground terminal, Virtual ground 7.8 To draw the inverting and non-inverting amplifier circuit 7.9 To calculate the closed loop gain of inverting and non-inverting amplifiers 7.10 To develop mathematical expression and state the applications of OPAMPS for Adder, Subtractor, Integrator, Differentiator circuit, Voltage follower, Zero crossing detector with hysteresis, Voltage to current converter,</p>	9

	<p>Currents to voltage converter</p> <p>7.11 To study comparator and show the output waveform for sinusoidal input and the reference voltages, Zero voltage, Positive voltage, Negative voltage, To State different applications of Op-Amp.</p> <p>7.12 Zener diode tester, Diode tester and LED tester</p> <p>7.13 Temperature to voltage converter (use of AD 590)</p> <p>7.14 To explain the operation of a multi vibrator circuit and sketch its output voltage waveform and calculate the frequency of Oscillation.</p> <p>7.15 To study Monostable and Astable multi-vibrator using IC 741</p> <p>7.16 To develop a square / triangular wave generation using Op-Amp, resistors and capacitor and determine frequency of oscillation</p> <p>7.17 To develop basic differential amplifier using op-amp</p> <p>7.18 To develop an adjustable gain instrumentation amplifier</p> <p>7.19 To describe the, Low pass, High pass and Band pass filter</p>	
8. Integrated Circuit Timer	<p>8.1 To describe the internal block diagram and pin connection of a 555 timer chip</p> <p>8.2 To describe the function of, Output, Reset, Discharge, Control voltage, Trigger and Threshold terminals of a 555 timer</p> <p>8.3 To describe the circuits and working principle of 555 timer used as, Astable Multi-vibrator, Monostable Multi-vibrator, Pulse width modulator and Pulse position modulator</p>	5
9. Power Supply and Regulated Power Supply	<p>9.1 To design a full wave bridge rectifier circuit by choosing the proper size of transformer, diode and capacitors</p> <p>9.2 To measure the percent regulation, percent ripple</p> <p>9.3 To Design a bipolar unregulated power supply</p> <p>9.4 To develop a fixed dual voltage power supply using 7800 and 7900n series of IC three terminal regulator</p> <p>9.5 To develop an adjustable dual voltage regulated power supply using LM317 and LM337 chips</p>	5

REFERENCES:

1. Basic Electronics (Solid State), By B. L. Thereja (S. Chand Publishers)
2. Principle of Electronics By V.K. Mehta & Rohit Mehta (S. Chand Publishers)
3. Objective Electrical Technology By V.K. Mehta & Rohit Mehta (S. Chand Publishers)
4. A Text Book of Electrical Technology Vol 4 By B. L. Thereja (S. Chand Publishers)
5. OPAMPS & Linear ICs by Ramakant A. Gayekwad (Pearsons)
6. Electronics Lab Manual, Volume 1. And 2 Author. K.A. Navas. Publisher. PHI Learning Private Limited

Microprocessor & Microcontroller

L	T	P	Total Marks : 100	Course Code No: MELPC204
3	0	0		Theory
Total Contact Hours				End Term : 60
Lecture : 45Hrs				Progressive Assessment : 40
Pre Requisite : MELPC207				
Credit : 3				

RATIONALE:

A lot of MSI, LSI, VLSI, and Microprocessor have been developed and are being widely used in the Industrial Applications. This course is designed to introduce the student to the field of microprocessors. This course covered architecture of 8 bits and 16 bits microprocessors, its functions and its instruction set. Machine language of 8085 is covered in details and the students are given the opportunity of writing programmes and controlling devices using an 8085 microprocessor kit. This subject also covered the addressing mode of 8086 and instruction set of 8086 microprocessors.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Discuss generation and evolution of microprocessors
- Describe Architecture of 8085
- Explain working of timing diagrams, instruction set and programming of 8085 microprocessor
- Explain memory interfacing, I/O interfacing, I/O data transfer, I/O interfacing devices
- Discuss architecture, addressing modes and instruction set of 8086 microprocessor

DETAILED COURSE CONTENTS

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HOURS)
1. Introduction to microprocessor	1.1 Generation and evaluation of microprocessors	2
2. Architecture of 8085 microprocessor	2.1 Architecture of intel-8085, registers, timing and control, address, buffer and data, interrupts control, serial input and output control 2.2 Pin configuration of 8085 microprocessor 2.3 De-multiplexing and buffering the system bus	5
3. Timing cycle of 8085	3.1 Machine cycle, instruction cycle, instruction fetch cycle, read cycle and write cycle, bus idle cycle	5
4. Programming of 8085	4.1 Addressing modes of 8085, classification of instruction and instruction set of 8085, concept of assembly language programming – basic assembler	7

	directives and labels.	
5. Memory interfacing	5.1 Generalized internal structure of memory device, bus interface, address decoding, interfacing of ROM, SRAM and DRAM UNIT	5
6. Input/Output interfacing	6.1 Address decoding, interfacing I/O devices, isolated I/O versus memory mapped I/O.	4
7. I/O Data transfer	7.1 Synchronous and asynchronous data transfer, interrupt driven data transfer, single interrupt, multiple interrupt, priority interrupt controller. Interrupts in 8085 – software and hardware – vectored interrupt, direct memory access – block transfer DMA – cycle stealing DMA	7
8. I/O interfacing devices	8.1 Functional block diagram and programming of a) 8253 programmable counter b) 8255 PPI, c) 8279 keyboard and display controller 8.2 Functional block description and control word development of a) 8237 programmable DMA controller, b) 8259 programmable interrupt controller 8.3 Interfacing of DAC and ADC with 8085.	7
9. Introduction to 8086	9.1 Block diagram of 8086: bus interface unit, execution unit, general purpose register, flag register, pointer and index register 9.2 Memory address space and generating a memory address 9.3 Pin configuration of 8086 – minimum and maximum mode 9.4 Addressing mode of 8086 9.5 Instruction set of 8086	5

REFERENCES:

1. Digital Electronics and Microcomputers - R.K.Gaur (Dhanpur Rai)
2. Fundamental Engineering - Lionard S. Bobrow(Oxford)
3. Digital Principles and application - Malvino & Leach (TMH)
4. Digital Electronics and Microprocessor (Problems and solution) - R.P.Jain (TMH)
5. Elements of Computer Science by S.Srinivasan (New Central Book Agency (Pvt) Ltd)

Human Biology -II

L	T	P	Total Marks : 100	Course Code No: MELPC206
2	0	0		Theory
Total Contact Hours				End Term : 60
Lecture : 30 Hrs				Progressive Assessment : 40
Pre Requisite : MELPC205				
Credit : 2				

RATIONALE:

Knowledge of Human Physiology is very much essential for studying Medical Electronics. The characteristics of cells and their Electrical Properties gives a thorough knowledge of developing measuring, monitoring, and operating devices. As the students are basically from physical science group they may have deficiency in knowledge of Human Physiology. This course will help to have clear idea regarding above subject.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Describe the functions of Anatomy of Cardio-vascular system and Respiratory System
- Comprehend Anatomy of Central Nervous system, nervous receptions and their functions
- Discuss Anatomy of endocrine glands, their secretions and functions
- Comprehend bones and joints contractile mechanism of skeletal muscles
- Identify features of male and female reproductive systems

DETAILED COURSE CONTENT

UNIT NO & TITLE	CONTENT	TIME ALLOTTED (HOURS)
1. Cardio – Vascular System	1.1 Anatomy of the heart, pericardium, myocardium, endocardium, heart valves and attachments, cardiac cycle 1.2 Cardiac muscle – its special properties 1.3 Electrical activity of the heart 1.4 Special conductive tissues of the heart, cardiac cycle 1.5 Blood pressure, its regulative mechanisms, physiologic variations, and factors influencing BP 1.6 Arterial and venous system	12
2. Respiratory System	2.1 Anatomy of the respiratory tract 2.2 Function of different parts 2.3 Mechanism of respiration	10

	2.4 Gaseous exchange 2.5 Lung volumes 2.6 Abnormal respiration 2.7 Artificial respiration 2.8 Central Nervous System	
3. Central Nervous System	3.1 Nervous receptions and their functions. Anatomy of cerebral hemisphere, cerebellum, thalamus, hypothalamus brainstem & spinal cord – their functions 3.2 Structure of neuron 3.3 Synapses and their properties 3.4 Neuro-muscular junction 3.5 Transmission of nerve impulse	10
4. Endocrinology	4.1 Anatomy of endocrine glands, their secretions and functions with special reference to thyroid gland	6
5. Locomotor System	5.1 Bones and joints contractile mechanism of skeletal muscles	3
6. Reproductive System	6.1 Male and female RS anatomy 6.2 Hormones secreted & their functions	3

REFERENCES:

1. 'Essential of human anatomy' Asim Kumar Dutta, Current Book of International
2. 'Human physiology' by C. C. Chatterjee, Medical Allied Agency

Basic Medical Electronics-I

L	T	P	Total Marks : 100	Course Code No: MELPC208
3	0	0		Theory
Total Contact Hours				End Term : 60
Lecture : 45 Hrs				Progressive Assessment : 40
Pre Requisite :MELPC203				
Credit : 3				

RATIONALE:

This subject has been introduced with a view to provide the principles behind the Medical Electronics instruments. The course begins with an overview of the subject of Medical Electronics, discussing its scope and relevance to Engineers. This course will familiarise students with some of the important medical applications of electronics, where there is direct connection to the body, and to explain how the requirements for the equipment are derived.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Identify the scope and relevance of Medical Electronics to Engineering
- Discuss origins of electrophysiological signals and their characteristics, of electrodes and electrical stimulation
- Explain operational amplifiers and its applications.
- Comprehend the knowledge and understanding of electric shock hazards and safety devices.
- Apply knowledge of stimulators and biomedical amplifiers during laboratory practical.

DETAILED COURSE CONTENT

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HOURS)
1. Introduction	1.1.Introduction to Medical Electronics	1
2.Bioelectric signals and electrode	2.1 Electrophysiology. 2.2 Nerves, Nerve structure, 2.3 Resting Potential, Action Potentials (regeneration), Action Potential (propagation), Volume Conductor Effects, Recorded nerve signals. 2.4 Electrodes. Terminology, Variety of Electrodes, Calculation of Resistances in Volume Conductor, Half-cell potentials,	14

	Reference Electrodes, Non-polarisable (silver-silver chloride electrode), Polarisable electrode (platinum), Circuit models of electrodes. 2.5 Electrical Stimulation. Nerve stimulation due to current flow, response to stimulation (strength-duration curve, twitch response, tetanic contractions, force-pulse frequency effect, force-modulation frequency), design of stimulators, uses of muscle stimulation, simulation of neuron activation.	
3. Biomedical Amplifiers.	3.1 Characteristics of biomedical signals, 3.2 Common mode interference, 3.3 Differential amplifiers, 3.4 Common Mode Rejection Ratio, 3.5 Effect of source resistances.	6
4. Fundamentals of tissue optics.	4.1 Propagation of optical radiation in tissues. 4.2 Optical wavelength range: ultraviolet, visible and infrared spectral regions and their limits; specific "A", "B" and "C" bands of UV and IR. 4.3 Main processes of the light-matter interaction: absorption, scattering, reflection, refraction, luminescence, interference, and polarization; their physical models and mechanisms. Energetic structure of matter in gaseous, liquid and solid state, character of corresponding absorption and emission spectra. 4.4 Specific features of living tissues from the point of optics. Relations of scattering and absorption in tissues; the "therapeutic window". 4.5 Models of light propagation in tissues and the parameters used: absorption and scattering coefficients, anisotropy, penetration depth, transport parameters; their connection with diffuse reflectance (remission). 4.6 Time-resolved remittance models. 4.6 Modelling of an-isotropic, isotropic and layered tissue structures. 4.7 Experimental studies of light propagation in tissues; tissue phantoms in experiments. Basic principles of optical tomography.	12
5 Electrical Safety and Shock Hazard	5.1 Electricity Supply and Sources of Hazard. 5.2 Experimental results; Internal, External; Threshold levels; 5.3 Electric Shock hazards (vacuum cleaner example, etc); 5.4 Earth Leakage and "Patient" leakage; 5.5 Isolation and circuit breakers	5
6 Applications	Bio-potential Signal Recording. EEG, ECG, EMG, ENG, ERG.	6
7 Applications	Stimulation. Defibrillators, pacemakers, FES, cochlear stimulators.	6

REFERENCES:

1. R. H. S. Carpenter, Neurophysiology (3rd Edition), Arnold, 1996.
2. J. G. Webster (Editor), Medical Instrumentation - Application and Design, Houghton Mifflin Co. Note: Third Edition £39.95. Beware that the Second Edition sells for the much inflated price of £75
3. H. Brown, R. H. Smallwood, D. C. Barber, P. V. Lawford and D. R. Hose, Medical Physics and Biomedical Engineering, Institute of Physics Publishing, 1999.

ELECTRICAL & ELECTRONICS CIRCUIT-II LAB

L	T	P	Total Marks : 100	Course Code No: MELPC210
0	0	2		Practical
Total Contact Hours :				End Term : 40
Practical : 30 Hrs				Progressive Assessment : 60
Pre Requisite : MELPC213				
Credit : 1				

RATIONALE:

This subject has been introduced with a view to provide understanding and hands-on experience in hardware and software on medical equipment, like amplifiers, safety of uses of these equipment and some associated design aspect.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Connect a single stage amplifier and multistage amplifiers check the cut off, saturation and normal biasing conditions and amplification and gain on input signal by varying the biasing.
- Draw the Emitter characteristics curve of the unijunction Transistor and identify cutoff, negative resistance region and saturation region of the device
- Construct an integrator and differentiator circuit and note the output waveform for a square wave input and a comparator circuit with sinusoidal input at the non-inverting input terminals
- Establish an astable multi vibrator circuit by using IC 555
- Develop a regulated power supply unit using step down transformer, Four arm bridge rectifier , Filter and three terminal 7800 group IC regulator/LM 317

List of Experiments: EEC-II

Sl. No.	Topic/Course Content	Hours
1	To construct a Wien Bridge Oscillator.	1
2	To assemble two stage R.C. coupled transistor amplifier and check the amplification of the input signal.	1
3	To connect a single stage amplifier and check the cut off, saturation and normal biasing conditions on input signal by varying the biasing.	1
4	To construct a multistage amplifier with power Amplifier and check the amplification of input signal with and without negative feedback	1
5	To draw the Emitter characteristics curve of the unijunction Transistor and identify cut off, negative resistance region and saturation region of the device	1
6	To construct the inverting amplifier and inverting amplifier and verify the gain of amplifier with various ratio of Ri and Rf. Also check the gain of input, output signals (use IC 741)	1

7	To construct an integrator and differentiator circuit and note the output waveform for a square wave input	1
8	To construct an integrator and differentiator circuit and note the output waveform for a square wave input	1
9	To develop a comparator circuit and note the output waveform with sinusoidal input and (a) zero volt (b) positive voltage and (c) negative voltage inputs as the reference input at the non-inverting input terminals	1
10	To establish an astable multi vibrator circuit by using IC 555	1
11	To develop a regulated power supply unit using (a) step down transformer (b) Four arm bridge rectifier (c) Filter and (d) three terminal 7800 group IC regulator/LM 317	1
12	To perform the test for different load current and input voltage and determine percent regulation.	1

REFERENCES:

1. Basic Electronics (Solid State), By B. L. Thereja (S. Chand Publishers)
2. Principle of Electronics By V.K. Mehta & Rohit Mehta (S. Chand Publishers)
3. Objective Electrical Technology By V.K. Mehta & Rohit Mehta (S. Chand Publishers)
4. A Text Book of Electrical Technology Vol 4 By B. L. Thereja (S. Chand Publishers)
5. OPAMPS & Linear ICs by Ramakant A. Gayekwad (Pearsons)
6. Electronics Lab Manual, Volume 1. And 2 Author. K.A. Navas. Publisher. PHI Learning Private Limited

Microprocessor & Microcontroller Lab

L	T	P	Total Marks : 100	Course Content No: MELPC212
0	0	2		Practical
Total Contact Hours :				End Term : 40
Practical : 30 Hrs				Progressive Assessment : 60
Pre Requisite : MELPC217				
Credit : 1				

RATIONALE:

A lot of MSI, LSI, VLSI, and Microprocessor have been developed and are being widely used in the Industrial Applications. This course is designed to introduce the student to the field of microprocessors. This course covered architecture of 8 bits and 16 bits microprocessors, its functions and its instruction set. Machine language of 8085 is covered in details and the students are given the opportunity of writing programmes and controlling devices using an 8085 microprocessor kit. This subject also covered the addressing mode of 8086 and instruction set of 8086 microprocessors.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Identify the microprocessor elements.
- write simple programming
- Write simple mathematical calculation programs
- Write program from analog values to digital values
- Write program for the operation of counter

LIST OF EXPERIMENTS

Sl. No.	Topic	Hours
1	To examine the 8085A training Kit, identify the microprocessor, Keyboard interface chip, Input Output Interface Chip, Programmable timer/counter chip, serial communication chip, interrupt controller chip, RAM and ROM area.	1
2	To move a data (a) by immediate addressing (b) from register to register (c) register to memory (d) memory to registers	1
3	To add two hexadecimal numbers	1
4	To subtract one hexadecimal number from other	1
5	To add five hexadecimal numbers which are stored in 5 successive memory location	1
6	To arrange five random hexadecimal numbers in memory locations in a sequential order (Starting from highest to lowest)	1
7	To divide two hexadecimal numbers and convert the result from hexadecimal to decimal value	1

8	(a) To develop a time delay subroutine (b) To convert 5 hexadecimal (number into its corresponding Analog Value and display it on CRO screen using the time delay subroutine as per Sl. No. 8 (a)	1
9	To convert the analog values into its corresponding digital value and display it in the address and data field	1
10	To develop a programme for driving a stepper motor	1
11	To develop a programme for Traffic Control System	1
12	. To develop a programme to display the second and Minute of a clock	1
13	To develop a programme for the operation of a counter	1

REFERENCES:

1. Digital Electronics and Microcomputers - R.K.Gaur (Dhanpur Rai)
2. Fundamental Engineering - Lionard S. Bobrow(Oxford)
3. Digital Principles and application - Malvino & Leach (TMH)
4. Digital Electronics and Microprocessor (Problems and solution) - R.P. Jain (TMH)
5. Elements of Computer Science by S. Srinivasan (New Central Book Agency)

Human Biology-II Lab

L	T	P	Total Marks : 100	Course Code No: MELPC214
0	0	2		Practical
Total Contact Hours:				End Term : 40
Practical : 30 Hrs				Progressive Assessment : 60
Pre Requisite : MELPC215				
Credit : 1				

RATIONALE:

Knowledge of Human Physiology is very much essential for studying Medical Electronics. The characteristics of cells and their Electrical Properties gives a thorough knowledge of developing measuring, monitoring, and operating devices. As the students are basically from physical science group they may have deficiency in knowledge of Human Physiology. This course will help to have clear idea regarding above subject.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Detect the condition of the lungs.
- Perform cardiography machine, blood pressure machines, EEG machines
- Detect Blood clot by Doppler test.
- Explain the working of central nervous system.

List of Experiment

Sl. No.	Topic	Hours
1	Lung Function Test*	1
2	Operating a cardiography machine	1
3	Use and reading of a blood pressure instrument	1
4	Running a EEG machine *	1
5	Identify and locate the major functional parts of a reproductive system*	1
6	Doppler test (blood clotting test) *	1
7	Cardio-vascular system*	1
8	Effect of acetyl chlorine on frog's heart **	1
9	Effect of adrenalin on frog's heart **	1
10	Blood cell counting, Newbauer's chamber*	1
11	Central nerves system*	1

N.B.

* STUDENTS ARE TO BE ATTACHED WITH THE HOSPITAL / MEDICAL COLLEGE TO PERFORM THE EXPERIMENTS

** STUDENTS ARE TO BE ATTACHED TO THE BIO-SCIENCE DEPARTMENT OF A COLLEGE / UNIVERSITY

***STUDENTS MAY ALSO BE SHOWN THROUGH SIMULATION, VIDEO etc.

REFERENCES:

'Essential of human anatomy' Asim Kumar Dutta, Current Book of International □ 'Human physiology' by C. C. Chatterjee, Medical Allied Agency

Basic Medical Electronics-I Lab

L	T	P	Total Marks : 100	Course Code No: MELPC216
0	0	2		Practical
Total Contact Hours:				End Term : 40
Practical: 30 Hrs.				Progressive Assessment : 60
Pre Requisite : MELPC 213				
Credit	1			

RATIONALE:

This subject has been introduced with a view to provide the principles behind the Medical Electronics instruments. The course begins with an overview of the subject of Medical Electronics, discussing its scope and relevance to Engineers. This course will familiarise students with some of the important medical applications of electronics, where there is direct connection to the body, and to explain how the requirements for the equipment are derived.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Detect the different parts of constructional detail with their applicators for EEG, ECG, EMG, ERG and Infrared thermo therapy machine
- Draw an Instrumentation Amplifier with discrete OPAMP Chip and determination of common mode rejection and gain.
- Trace the working of different part of a defibrillator and operation*
- Measure the pH of different solutions by a pH Meter
- Trace the circuit and draw the electrical diagram of stabilizer unit

LIST OF EXPERIMENTS

Sl. No.	Topic	Hours
1	To locate the different parts of Constructional Detail of the probes with their applicators for EEG, ECG, EMG, ERG.	1
2	To stress and draw the Electrical Power System and their method of protection against shock hazards for the above mentioned equipment *	1
3	To construction of an Instrumentation Amplifier with discrete OPAMP Chip and determination of common mode rejection and gain.	1
4	To tracing and study of different part of a defibrillator and operation*	1
5	To identify the construction details of EEG Machine and perform the operation*	1
6	To identify the construction details of ECG Machine and	1

	perform the operation *	
7	To identify the construction details of Infrared thermo therapy Machine and perform the operation *	1
8	To measure the pH of different solutions by a pH Meter	1
9	To open the enclosure of stabilizer unit trace the circuit and draw the electrical diagram.	1

* THE EXPERIMENTS MARKED STAR (*) MAY BE PERFORMED AT ANY HOSPITAL.

*THE STUDENTS CAN BE SHOWN VIDEO SIMULATION

REFERENCES:

1. R. H. S. Carpenter, Neurophysiology (3rd Edition), Arnold, 1996.
2. J. G. Webster (Editor), Medical Instrumentation - Application and Design, Houghton Mifflin Co. Note: Third Edition £39.95. Beware that the Second Edition sells for the much inflated price of £75
3. H. Brown, R. H. Smallwood, D. C. Barber, P. V. Lawford and D. R. Hose, Medical Physics and Biomedical Engineering, Institute of Physics Publishing, 1999.

OPEN ELECTIVE -I

Programming in C++ & MATLAB

L	T	P	Total Marks : 100	Course Code No: MELOE202A
0	1	4		Practical
Total Contact Hours				End Term : 40
Tutorial : 15 Hrs Practical : 60 Hrs				Progressive Assessment : 60
Pre Requisite : NIL				
Credit : 3				

RATIONALE: C++ is the most widely used and versatile computer programming language and ideal for building resource- light, large enterprice software infrastructure and applications and and able to interact directly with the actual computer hardware it uses to run. This language allows developers to fine-tune code optimization in any IT environment. While MATLAB can develop algorithms much faster than in traditional languages. MATLAB is designed specifically to analyze and design systems and products that transform our world. This curriculum will allow students the knowledge to understand and write programming both in C++ and MATLAB.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Write simple programs to demonstrate various features of C++ programming
- Solve simple mathematical problems using C++
- Write programs to demonstrate various functions of C++
- Write simple programs using MATLAB commands and operators.
- Demonstrate use of MATLAB Image Processing Tool box and Simulink

Sl. No.	Topic	Hour
1	Write a simple C++ program to print "HELLO" on the output screen	1
2	Write a program to perform simple mathematical operations.	1
3	Write a program to implement class and object concept	1
4	Write programs to implement all the control structures in C++.	1
5	Write programs to implement various access specifiers.	1
6	Write a simple program to implement functions in C++	1
7	Write a C++ program to implement call by reference and return by value concept.	1
8	Write a C++ program to implement following concepts: a) Inline functions b) Friend functions c) Static function d) Object as a function argument and returning object	1
9	Write a C++ program on nesting of functions.	1
10	Write a C++ program to perform following string operations	1

	using pre-defined string functions and without using pre-defined string functions :- a) String concatenation b) String Comparison c) Find position of an character in a given string d) String reversing	
11	Write a C++ program to implement operator overloading	1
12	Write a C++ program to implement operator overriding (polymorphism).	1
13	Write a C++ program to implement following types of inheritances using various access specifiers :- a) Single inheritance b) Multilevel inheritance c) Multiple inheritance d) Hierarchical inheritance e) Hybrid inheritance	

MATLAB Laboratory

Sl. No.	Topic	Hours
1	To familiarize with MATLAB Software Environment, MATLAB Interface and some of the commonly used important MATLAB Commands and Operators.	1
2	To Write programs of Simple Mathematical Expressions, Data types, Matrix, Differentiation, Integration.	1
3	To write programs with Conditional Operators, For loop, While loop	1
4	To write programs for Plotting of linear variables, Plotting of signals	1
5	To get familiarized with Image Processing Toolbox, Type of Image, Image Resizing	1
6	To get introduced with MALTLAB Simulink	1

REFERENCES:

- 1.'Object Oriented programming with C++ ' by E Balagurusamy
2. Information Technology Workshop in MATLAB eighth edition by Hari Prabhat Gupta

RENEWABLE ENERGY TECHNOLOGIES

L	T	P	Total Marks : 100	Course Code No: MELOE202B
3	0	0		Theory
Total Contact Hours				End Term : 60
Lecture : 45 Hrs				Progressive Assessment : 40
Pre Requisite : NIL				
Credit : 3				

RATIONALE:

For the last few decades, the whole of world is in search of the non-conventional energy, which may be the substitute of the conventional energy sources like oil and coal. A lot of research works are being carried out all over the world. The country like India is also following the same path. But the speed of development is not remarkable. It is necessary to start Research and Development work in a massive way. This need awakens among the people of this country as well as the Technocrats. If the concept of non-conventional energy is transmitted through the Technical Education system new horizon will be open to the countrymen and a widespread activity will be undertaken. Care has been taken to cover all the areas of non-conventional energy system. However, an attempt has been made to have the in-depth study for all the topics. It has been tried to provide the latest information regarding the recent development in this area.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Explain the working of Ocean Energy Technologies
- Describe the working of Solar PV and Concentrated Solar Power Plants
- Describe the working of Wind Power Plants of India
- Discuss the fundamentals of Small Wind Turbines
- Explain the working of Biomass Power Plant

DETAILED COURSE CONTENT

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HOURS)
1.Ocean Energy Technologies	1.1 Ocean energy map of India and its implications; 1.2 Specification, Construction and working of the following ocean energy technologies: 1.2.1 Tidal power technologies 1.2.2 Wave power technologies 1.2.3 Marine current technologies 1..3 Ocean Thermal Energy Conversion (OTEC) technologies	8

2.Solar PV and Concentrated Solar Power Plants	<p>2.1 Solar Map of India: Global solar power radiation, Solar PV</p> <p>2.2 Concentrated Solar Power (CSP) plants, 2.2.1 construction and working of: Power Tower, Parabolic Trough, Parabolic Dish, Fresnel Reflectors</p> <p>2.3 Solar Photovoltaic (PV) power plant: components layout, construction, working.</p> <p>2.4 Rooftop solar PV power system</p>	12
3 Large Wind Power Plants Wind Map of India:	<p>3.1 Wind power density in watts per square meter, Lift and drag principle;</p> <p>3.2 long path theory, Geared type wind power plants: components, layout and working,</p> <p>3.3 Direct drive type wind power plants: components, layout and working,</p> <p>3.4 Constant Speed Electric Generators: Squirrel Cage Induction Generators (SCIG), Wound Rotor Induction Generator (WRIG),</p> <p>3.5 Variable Speed Electric Generators: Doubly-fed induction generator (DFIG), wound rotor synchronous generator (WRSG), permanent magnet synchronous generator (PMSG).</p>	9
4 Small Wind Turbines	<p>4.1 Horizontal axis small wind turbine: direct drive type, components and working.</p> <p>4.2 Horizontal axis small wind turbine: geared type, components and working.</p> <p>4.3 Vertical axis small wind turbine: direct drive and geared, components and working.</p> <p>4.4 Types of towers and installation of small wind turbines on roof tops and open fields.</p> <p>4.5 Electric generators used in small wind power plants.</p>	9
5 Biomass-based Power Plants	<p>1.1 Properties of solid fuel for biomass power plants: bagasse, wood chips, rice husk, municipal waste. •</p> <p>1.2 Properties of liquid and gaseous fuel for biomass power plants: Jatropha, bio-diesel gohar gas. •</p> <p>1.3 Layout of a Bio-chemical based (e.g. biogas) power plant.</p> <p>1.4 Layout of a Thermo-chemical based (e.g. Municipal waste) power plant.</p> <p>1.5 Layout of a Agro-chemical based (e.g. bio-diesel) power plant.</p>	10

REFERENCES:

1. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi
2. Neill, Simon P.; Hashemi, M. Reza: Fundamentals of Ocean Renewable Energy: Generating Electricity from the Sea, Academic Press, ISBN:978-0-12-810448-4

3. David M. Buchla, Thomas E. Kissell, Thomas L. Floyd, Renewable Energy Systems, Pearson Education New Delhi , ISBN: 9789332586826,
4. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning, New Delhi, ISBN: 978-93-88028-49- 3; E-book 978-93-88028-50-9
5. Deambi, Suneel: From Sunlight to Electricity: a practical handbook on solar photovoltaic application; TERI, New Delhi ISBN:9788179935736
6. Gipe, Paul: Wind Energy Basics, Chelsea Green Publishing Co; ISBN: 978-1603580304
7. Wizelius, Tore, Earnest, Joshua - Wind Power Plants and Project Development, PHI Learning, New Delhi, ISBN:978-8120351660
8. Kothari, D.P. et aL: Renewable Energy Sources and Emerging Technologies, PHI Learning, New Delhi, ISBN: -978-81-203-4470-9
9. Bhadra, S.N., Kastha, D., Banerjee, S, Wind Electrical Systems installation; Oxford University Press, New Delhi, ISBN: 9780195670936.

Disaster Management

L	T	P	Total Marks : 100	Course Code No: MELOE202C
3	0	0		Theory
Total Contact Hours				End Term : 60
Lecture : 45 Hrs				Progressive Assessment : 40
Pre Requisite : NIL				
Credit : 3				

RATIONALE: This course will give the general orientation regarding the various kinds of disasters their causes, mitigation and management. The focus is to create awareness, sensitize and prepare the students to meet the challenges of safeguarding humanity against the dangers of disaster.

COURSE OUTCOMES:

After completion of the course the students will be able to

- 1 Learn about various types of natural and man-made disasters. •
- 2 know pre- and post-disaster management for some of the disasters. •
- 3 Know about various information and organisations in disaster management in India
4. Expose to technological tools and their role in disaster management

DETAILED COURSE CONTENT

UNIT NO. & TITLE	CONTENT	TIME ALLOTTED (HOURS)
Unit – I: Understanding Disaster	Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity	
Unit-2 Types, Trends, Causes, Consequences and Control of Disasters	Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban	
Unit-3 Disaster Management Cycle and Framework	Disaster Management Cycle – Paradigm Shift in Disaster Management. Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness. During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – D	

Unit-4 Disaster management in India	Disaster Management Act 2005 – Institutional and Financial Mechanism, National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Government	
Unit– V: Applications of Science and Technology for Disaster Management	Geo-informatics in Disaster Management (RS, GIS, GPS and RS). Disaster Communication System (Early Warning and Its Dissemination). Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters S&T Institutions for Disaster Management in India	

Reference Books

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
2. Bhandani, R. K., An overview on natural & man-made disasters and their reduction, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters in developing countries, Daya Publishers, Delhi
4. Alexander, David, Natural Disasters, Kluwer Academic London
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

MINOR PROJECT

L 0	T 0	P 4	Total Marks: 100	Course Code. No.: PR 202
Total Contact hrs.: Practical : 60 Credit: 2			Practical: End Term Exam. :40 P.A. : 60	

RATIONALE

Minor Project offers students an opportunity to apply theoretical knowledge in a practical setting, thereby enhancing their technical skill and problem solving skill. This course has been designed for students to understand the basics of carrying out any engineering project which includes Literature survey, methodology, setting up objective and scope of the project work.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Identify the objective and scope of work
- Undertake interdisciplinary literature survey.
- Prepare methodology of the project work.
- Demonstrate necessary field and laboratory experiments.
- Handle necessary equipment.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	HOURS
UNIT –I	Objective and Scope of work <ul style="list-style-type: none"> • Introduction to the project. • Clear statement of project objectives. • Explanation of the scope and limitations of the project. • Justification for why the project is important or relevant. 	12
UNIT –II	Literature Survey <ul style="list-style-type: none"> • Review of existing literature and research related to the project. • Identification of gaps in current knowledge. • Discussion of relevant theories, models, and previous work in the field. • Proper citations and references to sources. 	12
UNIT –III	Methodology <ul style="list-style-type: none"> • Detailed explanation of the research methods and approaches to be used. • Description of data collection techniques (if applicable). • Explanation of any experiments or simulations to be conducted. • Ethical considerations and research ethics, if applicable. 	12
UNIT –IV	Handling of Instruments and Experiments <ul style="list-style-type: none"> • Description of the tools, equipment, or software to be used. • Details on how experiments or simulations will be conducted. • Safety precautions and protocols, if relevant. • Data collection and analysis methods. 	12

UNIT –V	Comprehensive Progress Presentation <ul style="list-style-type: none"> • Regular progress reports or presentations to track the development of the project. • Presentation of findings, data, and results obtained so far. • Discussion of any challenges encountered and how they were addressed. • Feedback received from mentors or advisors and any adjustments made to the project plan. 	12
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ESSENCE OF INDIAN KNOWLEDGE AND TRADITION

L	T	P		Course Code No.: AU202
2	0	0		
Total Contact hrs.: Lecture: 30 Credit : 0				Progressive Assessment only

RATIONALE:

Considering the need of protecting Indian knowledge and tradition, the diploma level students of Automobile Engineering should be facilitated the concepts Indian traditional knowledge and to make them understand the importance of roots of knowledge system and methods of application in today's life and how to protect traditional knowledge system. Interpretation of the concepts of Intellectual property to protect the traditional knowledge as well as importance of Traditional knowledge in Agriculture and Medicine must be known.

COURSE OUTCOME:

On successful completion of the course, students will be able to:

- Discuss the concepts of traditional Indian knowledge and roots of knowledge system and indigenous knowledge system
- Explain the technique of protection of traditional Indian knowledge
- Discuss legal frameworks of traditional knowledge
- State intellectual property rights
- State traditional knowledge in Different Sectors

COURSE CONTENT

UNIT	TOPIC/SUB-TOPIC	HRS.	TOTAL HRS.
1	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge (Unani / Siddha/ Ayurveda), Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge of Meghalaya	07	30
2	Protection of traditional knowledge (TK): The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.	07	
3	Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.	06	
4	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Geographical Indications (GI).	04	

5	Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK	06	
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REFERENCE BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor.
3. Madhya Himalayi Sanskriti mein Gyan, Vigyan evam Paravigyan by Prof PC Pandey.

Suggested Online Link:

Web Links:

1. <https://www.youtube.com/watch?v=LZP1StpYEPM>
2. <http://nptel.ac.in/courses/12110600/>