

		Tray dryer
		Adsorption studies
		Liquid-liquid/Vapour -liquid equilibrium
		Liquid extraction - (cross current: 1 and 2 or 3 stage)
		Hold up studies in packed columns
		Rotary/ vacuum dryers
		Wetted wall column
		Cooling tower
		Solid dissolution
7	PROCESS CONTROL LABORATORY	Thermometer
		Single tank - Step Response
		Non Interacting Tanks - Step Response
		Interacting Tanks - Step Response
		Pressure Tank
		Non Interacting Tanks - Impulse Response
		Interacting Tanks - Impulse Response
		Level/Flow/Pressure/pH/Temperature control - P controller
		Level/Flow/Pressure/pH/Temperature control - PI controller
		Level/Flow/Pressure/pH/Temperature control - PD controller
		Level/Flow/Pressure/pH/Temperature control - PID controller
		Valve characteristics.
		Valve Positioner

List of Major Software Packages available

Sl. No	Software
1	ASPEN Plus
2	HYSYS
3	CAESER II
5	MAT LAB
6	MS Office

**LABORATORY:**

For each Laboratory

➤ List of Major Equipment/Facilities:

**INDL. ENGG. & MNGT.**

SI No	Name of the lab	Major equipments
1	Metrology and Measurements Laboratory	<ul style="list-style-type: none"> <li>• Profile Projector</li> <li>• Tool Makers Microscope</li> <li>• Autocollimator</li> <li>• Surface roughness tester</li> <li>• Floating carriage diameter measuring instrument</li> <li>• Centre Lathe</li> <li>• Sensitive Drilling Machine</li> <li>• CNC CMM Machine</li> <li>• Cathode Ray Oscilloscope</li> <li>• Optical Flats</li> <li>• Lathe Tool Dynameters</li> <li>• Drilling Tool Dynameters</li> <li>• Milling Tool Dynameters</li> <li>• Vibration Analyzer</li> <li>• Stroboscope</li> </ul>
2	Industrial Engineering Laboratory	<ul style="list-style-type: none"> <li>• Computerized Walking Simulator</li> <li>• Computerized Bicycle Ergometer</li> <li>• Acer Computer Systems - 5 Nos.</li> <li>• Walking Simulator</li> <li>• PDA Device</li> <li>• Prestosign Display Board</li> </ul>

3	Quality Engineering Lab	<ul style="list-style-type: none"> <li>• Digital Motorized Multifunctional Height Gauge Z- Cal 350</li> <li>• Data Logger and Data transmitter</li> <li>• Statistical Quality Unit Display with Software</li> <li>• Acer Computer Systems - 5 Nos.</li> <li>• PDA Device</li> </ul>
4	Computer Laboratory	<ul style="list-style-type: none"> <li>• Network of Computers – 24 Nos.</li> <li>• LCD Projector – 2 Nos</li> <li>• 20 KVA Capacity UPS</li> <li>• HP LaserJet – 1022</li> <li>• HP Color LaserJet – 2605</li> </ul>
5	R&D Centre	<ul style="list-style-type: none"> <li>• Network of Computers – 10 Nos</li> </ul>
6	Calibration Centre for Metrology and Measurement (being established)	<ul style="list-style-type: none"> <li>• Profile Projector</li> <li>• Horizontal Electronic Level</li> <li>• Granite Surface Plate</li> <li>• Electronic Comparator with Comparator Stand.</li> <li>• Dial Calibration Tester with DRO, 25mm probe with suitable software and computer.</li> <li>• Surface Roughness Tester with Printer.</li> </ul>

**List of experimental setup**

SI No	Name of the lab	Name of the experiment conducted
1	Industrial Engineering Laboratory	<ul style="list-style-type: none"> <li>• Outline Process Chart.</li> <li>• Multiple Activity Chart.</li> <li>• Flow Process Chart.</li> <li>• String diagram experimental set up.</li> <li>• Two handed Process Chart for Bolt and Nut Assembly</li> <li>• Pin board Assembly set up.</li> <li>• Rating practice using Walking Simulator</li> <li>• Rating practice for Pin Board assembly.</li> <li>• Rating practice for dealing deck of cards.</li> <li>• Rating practice for Marble collection experiment.</li> <li>• Determination of standard time for simple operation.</li> <li>• Experimental set up to estimate standard time using PDA device.</li> <li>• Experimental set up for rating experiment – Dealing of cards.</li> <li>• Walking Simulator for fatigue measurement.</li> <li>• Measurement of parameters (heart beat rate, calorie consumption, etc) using computerized ergonometer.</li> </ul>
2	Quality Engineering Laboratory	<ul style="list-style-type: none"> <li>• Testing Goodness of fit – Normal distributions</li> <li>• Testing Goodness of fit –Binomial distributions</li> <li>• Testing Goodness of fit –Uniform distributions</li> <li>• Testing Goodness of fit –Poisson distributions</li> <li>• Conducting Gauge R&amp;R using R&amp;R software</li> <li>• Process capability studies using Normal Probability Paper</li> <li>• Process capability studies using DMMHG &amp; SQC Display Unit</li> <li>• Construction of control chart for variable quality characteristic using DMMHG &amp; SQC Display Unit</li> <li>• Construction of control chart for variable quality characteristic using SQC Software</li> <li>• Construction of control chart for variable quality characteristic using Systat Software</li> <li>• Experiment on Correlation and Simple Linear Regression</li> <li>• Experiment on Multiple Linear Regression</li> <li>• Experiment on Seven QC Tools as applied to manufacturing and service operation.</li> </ul>

3	Measurements & Metrology Laboratory	<ul style="list-style-type: none"> <li>• Linear Variable differential transformer.</li> <li>• Profile Projector setup to measure screw thread profile.</li> <li>• Toolmaker's Microscope to measure gear profile.</li> <li>• Experimental set up to calibrate micrometer using slip gauges.</li> <li>• Experimental set up to measure the unknown angle of an object using sine-bar.</li> <li>• Experimental set up to measure straightness and flatness of a given surface using spirit level.</li> <li>• Experimental set up for roundness measurement.</li> <li>• Experimental set up to measure unknown speed using Stroboscope.</li> <li>• Experimental set up for vibration analysis with power oscillator, vibration exciter and vibration sensor.</li> <li>• Experimental set up of Cathode ray Oscilloscope.</li> <li>• Ultrasonic flow detector with test mandrel.</li> <li>• Rapid moisture teller.</li> <li>• Surface Roughness tester.</li> <li>• Load Cells with Strain gauges.</li> <li>• Torque indicator set up.</li> <li>• Lathe tool dynamometer, Drilling tool Dynamometer, Milling tool dynamometer with indicators for the above.</li> <li>• Optical flats.</li> </ul>
4	Computer Aided Machine Drawing Laboratory	<ul style="list-style-type: none"> <li>• Section of solids</li> <li>• Orthographic views</li> <li>• Thread forms</li> <li>• Fasteners</li> <li>• Riveted joints</li> <li>• Couplings</li> <li>• Screw jaw assembly</li> <li>• Plummer block assembly</li> <li>• Machine vice</li> </ul>
5	Simulation Laboratory	<ul style="list-style-type: none"> <li>• Features of simulation package – ARENA – 5.0.</li> <li>• Modeling concepts using ARENA simulation package.</li> <li>• Building simulation model for Inventory.</li> <li>• Building simulation model for Line Balancing.</li> <li>• Building simulation model for Scheduling.</li> <li>• Building simulation model for small manufacturing system with transporters.</li> <li>• Building simulation model for service activities like Bank Transactions.</li> <li>• Building a generic call centre system.</li> <li>• Building a simulation model for food world chains.</li> <li>• Modeling simple discrete / continuous system – A coal loading operation.</li> <li>• Exercise on identifying probability distribution for given data.</li> <li>• Statistical analysis of simulation models (2 Exercises).</li> </ul>
6	Enterprise Solution Laboratory	<ul style="list-style-type: none"> <li>• Exercise on processing seasonal customer orders.</li> <li>• Exercise on processing unseasonal customer orders.</li> <li>• Exercise on processing blanket customer orders.</li> <li>• Generating bill of materials for various Engineering Designs</li> <li>• Creating item master for various engineering design</li> <li>• Creating suppliers masters for items</li> <li>• Creating Make masters for items</li> <li>• Creating Purchase Masters for items</li> <li>• Creating Work Order for items</li> <li>• Creating MINN for items</li> </ul>

		<ul style="list-style-type: none"> <li>• Creating INJC for items</li> <li>• Creating Dispatch instruction for items</li> <li>• Creating Payslips for items</li> <li>• Analysis of existing capacity, defining and optimizing the resources along routes</li> <li>• Optimization problems using OR packages</li> <li>• MRP - II Generating MRP reports for confirmed orders.</li> </ul>
7	CNC & Robotics Lab	<p>Part - A</p> <ul style="list-style-type: none"> <li>• Introduction to CNC Programming</li> <li>• Execution and simulation of turning operation - Model - I using ESPIRT</li> <li>• Execution and simulation of turning operation - Model - II using ESPIRT</li> <li>• Execution and simulation of milling operation Model - I using ESPRIT</li> <li>• Execution and simulation of milling operation Model - II using ESPRIT</li> <li>• Execution and simulation of drilling operation using ESPRIT</li> <li>• Manual part programming - execution and simulation of turning operation mode 1 using PREDATOR</li> <li>• Manual part programming - execution and simulation of turning operation mode 2 using PREDATOR</li> <li>• Manual part programming - execution and simulation of turning operation mode 3 using PREDATOR</li> <li>• Manual part programming - execution and simulation of milling and drilling operations using PREDATOR</li> </ul> <p>PART - B</p> <ul style="list-style-type: none"> <li>• Introduction to Robotics programming and execution</li> <li>• Robotic programming using lead through and offline method</li> <li>• Robotic programming using palletizing operation</li> </ul>

➤ **List of Major Software Packages available**

Sl.No	Software Packages used
1	Operating systems : Windows - 98 / 2000
2	M.S. Office 2003
3	Auto CAD 2000 and 2007
4	Arena - Version11 simulation package
5	Sixth Sense ERP
6	SYSTAT -12 ( Statistical Software Package)
7	E-Factory Suit of UGS Software Solution
8	QSA (Quantitative System analysis)
9	Statistical Quality Display Unit with software
10	R&R Software
11	Timer Pro Software for time study.
12	Solid edge software.
13	SPC Software
14	TORA Software

**LABORATORY:**

For each Laboratory

➤ List of Major Equipment/Facilities:

**INSTRUMENTATION TECH.**

Sl No	Name of the lab	Major equipments
1	Simulation Laboratory	IBM Server
		UPS
		IBM PC's

2	Process Instrumentation Laboratory	Digital Storage Oscilloscope
		Temperature Control Process Station
		Level Control Process Station
		Flow Control Process Station
		Logic State Analyzer
		Programmable Logic Controller

#### List of experimental setup

SI No	Name of the lab	Name of the experiment conducted
1	Simulation Laboratory	Microcontrollers (PIC16f877) Experiments Setup list is attached below
		8086 Microprocessor (For IT & ML) list is attached below
		DSP Lab (For IT & ML) list is attached below
		Mipower Related Experiments Setup (For EEE) list is attached below
		BDSP Lab (For ML)
		Signal Processing Lab is attached below
2	Process Instrumentation Laboratory & Control Systems Lab	Temperature Measurement
		Load & Strain Measurement
		Flow Measurement
		Level Measurement
		Speed Measurement
		Displacement Setup
		Vibration Measurement
		Photo Transistor & LDR Demo
		Programmable Logic Controller
		Inductive & Capacitive Pickup Measurements
		Bridges - 1. DC POT Meter Setup (Calibration of Ammeter, Voltmeters) 2. Shearing Bridges 3. Kelvin's Double Bridges 4. Maxwell's Bridge
		PID Controller, Lead, Lag, Lead & Lag, PGA, Sample & Hold Ckt. And ADC & DAC Ckts.

#### ➤ List of Major Software Packages available

1. Code Composer Studio
2. Lab View
3. Mi Power
4. MPLAB
5. Mat Lab 7.3 With All Related Tool Boxes
  - a. Matlab
  - b. Simulink
  - c. Signal Processing Toolbox
  - d. Signal Processing Block Set
  - e. Control System Tool Box
  - f. Robust Control Tool Box
  - g. Optimization Tool Box
  - h. Genetic Algorithm & Direct Search Tool Box
  - i. Statistics Tool Box
  - j. Neural Network Tool Box
  - k. Bioinformatics Tool Box
  - l. Fuzzy Logic Tool Box
  - m. Communications Tool Box
  - n. Wavelet Tool Box
  - o. R F Tool Box
  - p. Image Processing Tool Box
  - q. Image Acquisition Tool Box
  - r. Mapping Tool Box

**LABORATORY:**

For each Laboratory

➤List of Major Equipment/Facilities:

**INFORMATION SC. & ENGG.**

SI No	Name of the lab	Major equipments
1	LAB 01 DES 307	Windows Server : 2.8 GHz. CPU dual Xeon CPU with 1 GB RAM, 36 GB HDD – 2 nos. 72 GB 10 K RPM SCSI Ultra 320 HDD- 3 nos for RAID 5 architecture - Being used for ISE and CSE
		Linux Server based on Intel certified server with 2.8 GHz. CPU dual Xeon CPU with 1 GB RAM, 36 GB HDD – 2 nos. 72 GB 10 K RPM SCSI Ultra 320 HDD- 3 nos for RAID 5 architecture. Being used for ISE and CSE
		Sun Solaris 8.0 Server : E250 with ultra spark II with 400 MHz Speed, 512 MB RAM, 36 GB HDD, PGA 32 VGA card with Country Kit Inc Being used for ISE and CSE
		TEQIP Audit Server : A P3 Computer with 600 MHz, 40 GB HDD, 256 MB SD RAM, 1.44 MB FDD, 52xCD ROM drive, 52x CD Writer,
		Acer P4 Computer, 1GB RAM , with 52x CD DVD Writer , 17" TFT Monitor (Rational Rose Server/ IBM DB2 Server / Practical Examination Server / Terminal Server)
		A cluster of P4 2.0 / 2.4 GHz, 512MB RAM , 1.44 MB FDD, CD ROM drives
2	LAB 02 DES 206	5 KVA Online UPS with 20 AH Tubular Batteries 7.5 tons Air Purifier
		Intel core 2 duo CPU with 2 GB RAM, 160 GB HDD, DVD Writer, 19" TFT Monitor, Len ova Keyboard, Optical Mouse
		Intel core 2 duo CPU with 2 GB RAM, 160 GB HDD, DVD Writer, 19" TFT Monitor, Len ova Keyboard, Optical Mouse
		5 KVA Online UPS with 80 AH Tubular Batteries
		Air Purifiers 7.5 tons
3	LAB 03 DES 403 (RESEARCH LABORATORY)	SGI Altix XE Servers & Clusters
		Altix XE 210 Head Node
		Altix XE 310 Compute Nodes
		Internal DVD ROM
		24 Port Gigabit Switch
		1 KVM Console
		20 U Rack
		C++ & FRTRAN Compilers
		Scali Manager Software
		SUSE Enterprise LINUX 10
		Rack Rails & 20 U Rack
		Intel core 2 duo 2.13 Ghz, CPU with 2 GB RAM, 160 GB HDD, 1.44 FDD, DVD Writer, 17" TFT Monitor, Dell Keyboard, Dell Optical Mouse. (Sponsored by Intel )
		Intel core 2 duo CPU with 2 GB RAM, 160 GB HDD, DVD Writer, 19" TFT Monitor, Len ova Keyboard, Optical Mouse
		HP workstation: PIV computer with 4 GB RAM, 500GB HDD, 19" TFT Monitor.
7.5 KVA Online UPS with 80 AH Tubular Batteries		

4	LAB 04 (ANALOG AND DIGITAL LAB) [BEING USED FOR ISE AND CSE]	Acer P4 Computer, 1GB RAM , with 52x CD DVD Writer , 17" TFT Monitor
		25 Dual Trace CRO 10 No's Function Generators 10 No's Table Top Multimeter 03 No's Han held Multimeter 12 No's Power Supplies 0-30v with digital Display 15 No's Fixed Power Supply 12 V/ 15 V Amps 15 No's Trainer Kits, Digital IC Trainer 12 No's Spring Boards 20 No's Component Organizer 2 No's Mains Transformer 5 No's Digital Ammeter 5 No's 10 KVA Online UPS with 80 AH Tubular Batteries

#### List of experimental setup

SI No	Name of the lab	Name of the experiment conducted
1	LAB 01 DES 307	DIGITAL DESIGN
		Data Structures
		FILE STRUCTURES
		SOFTWARE ENGINEERING
		DATABASE MANAGEMENT SYSTEMS
		WEB PROGRAMMING LAB
		MICROPROCESSORS
		ANALYSIS AND DESIGN OF ALGORITHMS
		FILE STRUCTURES (VTU)
		PROJECT WORK
2	LAB 02 DES 206	OBJECT ORIENTED WITH C++
		COMPUTER COMMUNICATIONS
		OPERATING SYSTEMS
		NETWORKS LABORATORY
		PROGRAMMING IN UNIX
		SYSTEM SOFTWARE (VTU)
PROJECT WORK		
3	LAB 03 DES 403 (RESEARCH LABORATORY)	RESEARCH WORK
4	LAB 04 (ANALOG AND DIGITAL LAB) [BEING USED FOR ISE AND CSE]	DIGITAL DESIGN (BEING USED FOR ISE AND CSE)
		MICROPROCESSORS (BEING USED FOR ISE AND CSE)

#### ➤ List of Major Software Packages available

SL No	Software Installed
1.	Windows 2003 Server Enterprise Edition
2.	Windows Vista Business Edition
3.	Windows 2000 Professional
4.	M S Office 2003
5.	Visual Studio 6.0
6.	Rational Rose Toolkit
7.	Norton Antivirus 2002 Version
8.	Turbo C / C++
9.	Oracle 9i Client/Server
10.	Kaspersky Anti-Virus 6.0 for Windows Workstations

**LABORATORY:**

For each Laboratory

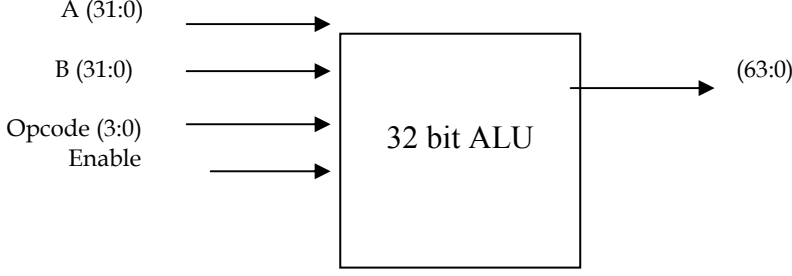
➤ List of Major Equipment/Facilities:

**TELECOM ENGG.**

SI No	Name of the lab	Major equipments
1	Communication and Microwave Lab	Spectrum Analyzer
		Cathode Ray Oscilloscopes
		LCR Meter
		Modulation Meter
		Digital Multimeters
		Hand Held Digital Multimeters
		Analog Multimeters
		Frequency Counter
		Function Generators (3 MHz)
		Function Generators (20 MHz)
		AM / FM Generator
		Arbitrary Wave form generator
		Synthesized Signal Generator
		Power Supply (0-30 V, Single channel)
		Power Supply (0-30 V, dual channel, digital display)
		+12V DC Power Supply
		+13.5V Digital Power Supply
		Fiber Optic Kit with Power Supply
		Linear IC Trainer Kit
		Decade Resistance box
		Decade Capacitance box
		Decade Inductance box
		QPSK Kit with Power Supply
		DPSK Kit with Power Supply
		Voltage Stabilizer
		Radio Receiver Kit
		Digitized Oscilloscopes
RF Power Meter with sensor		
Voltage Stabiliser		
Microwave bench with accessories (X-band) a) Gunn Source b) Klystron Source		
Microwave source with accessories (S-band)		
2	Digital Electronics Lab / Microcontroller Lab	Cathode Ray Oscilloscopes
		LCR Meter
		Digital Multimeters
		Analog Multimeters
		Function Generators (3 MHz)
		Pulse Generator
		Power Supply (0-30 V, Single channel)
		Power Supply (0-30 V, dual channel, digital display)
		5V DC Power Supply
		+ 12V Power Supply
		8085 Microprocessor Kit a) ESA 85 b) MPS 85
		Interface Units
		10 KVA UPS
		Microcontroller Trainer with Power Supply
		IC Trainer Kits
		IC Tester
Computer Systems		

**List of experimental setup**

SI No	Name of the lab	Name of the experiment conducted
1	Analog Electronics and Circuits Lab	<ol style="list-style-type: none"> <li>1. Wiring of RC coupled Single stage BJT amplifier and determination of the gain- frequency response, input and output impedances.</li> <li>2. Wiring of BJT Darlington Emitter follower with and without bootstrapping and determination of the gain, input and output impedances (Single circuit) (One Experiment)</li> <li>3. Wiring of a two stage BJT Voltage series feed back amplifier and determination of the gain, Frequency response, input and output impedances with and without feedback (One Experiment)</li> <li>4. Wiring and Testing for the performance of BJT-RC Phase shift Oscillator for <math>f_0 = 10</math> KHz</li> <li>5. Testing for the performance of BJT - Hartley &amp; Colpitts Oscillators for RF range <math>f_0 = 100</math> KHz.</li> <li>6. Testing for the performance of BJT -Crystal Oscillator for <math>f_0 &gt; 100</math> KHz</li> <li>7 Testing of Diode clipping (Single/Double ended) circuits for peak clipping, peak detection</li> <li>8. Testing of Clamping circuits: positive clamping /negative clamping.</li> <li>9. Testing of a transformer less Class - B push pull power amplifier and determination of its conversion efficiency.</li> <li>10. Testing of Half wave, Full wave and Bridge Rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency</li> <li>11. Verification of Thevinin's Theorem and Maximum Power Transfer theorem for DC Circuits.</li> <li>12. Characteristics of Series and Parallel resonant circuits.</li> </ol>
2	Digital Electronics and Circuits Lab	<ol style="list-style-type: none"> <li>1. Simplification, realization of Boolean expressions using logic gates/Universal gates.</li> <li>2. Realization of Half/Full adder and Half/Full Subtractors using logic gates.</li> <li>3. (i) Realization of parallel adder/Subtractors using 7483 chip (ii) BCD to Excess-3 code conversion and vice versa.</li> <li>4. Realization of Binary to Gray code conversion and vice versa</li> <li>5. MUX/DEMUX - use of 74153, 74139 for arithmetic circuits and code converter.</li> <li>6. Realization of One/Two bit comparator and study of 7485 magnitude comparator.</li> <li>7. Use of a) Decoder chip to drive LED display and b) Priority encoder</li> <li>8. Truth table verification of Flip-Flops: (i) JK Master slave (ii) T type and (iii) D type</li> <li>9. Realization of 3 bit counters as a sequential circuit and MOD - N counter design (7476, 7490, 74192, 74193)</li> <li>10. Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74S95</li> <li>11. Wiring and testing Ring counter/Johnson counter</li> <li>12. Wiring and testing of Sequence generator.</li> </ol>
3	HDL Lab	<ol style="list-style-type: none"> <li>1. Write HDL code to realize all the logic gates</li> <li>2. Write a HDL program for the following combinational designs <ol style="list-style-type: none"> <li>a. 2 to 4 decoder</li> <li>b. 8 to 3 (encoder without priority &amp; with priority)</li> <li>c. 8 to 1 multiplexer</li> <li>d. 4 bit binary to gray converter</li> <li>e. Multiplexer, de-multiplexer, comparator.</li> </ol> </li> <li>3. Write a HDL code to describe the functions of a Full Adder Using three modeling styles.</li> </ol>

		<p>4. Write a model for 32 bit ALU using the schematic diagram shown below</p>  <p>□□ALU should use combinational logic to calculate an output based on the four bit op-code input.  □ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.  □□ALU should decode the 4 bit op-code according to the given in example below.</p> <p><b>OPCODE ALU OPERATION</b></p> <ol style="list-style-type: none"> <li>1. A + B</li> <li>2. A - B</li> <li>3. A Complement</li> <li>4. A * B</li> <li>5. A AND B</li> <li>6. A OR B</li> <li>7. A NAND B</li> <li>8. A XOR B</li> </ol> <p>5. Develop the HDL code for the following flip-flops, SR, D, JK, T.  6. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and "any sequence" counters</p> <p><b>INTERFACING (at least four of the following must be covered using VHDL/Verilog)</b></p> <ol style="list-style-type: none"> <li>1. Write HDL code to display messages on the given seven segment display and LCD and accepting Hex key pad input data.</li> <li>2. Write HDL code to control speed, direction of DC and Stepper motor.</li> <li>3. Write HDL code to accept 8 channel Analog signal, Temperature sensors and display the data on LCD panel or Seven segment display.</li> <li>4. Write HDL code to generate different waveforms (Sine, Square, Triangle, Ramp etc.,) using DAC change the frequency and amplitude.</li> <li>5. Write HDL code to simulate Elevator operations</li> <li>6. Write HDL code to control external lights using relays.</li> </ol>
4	Microcontrollers Lab	<p><b>I PROGRAMMING</b></p> <ol style="list-style-type: none"> <li>1. Data transfer- block move, Exchange, Sorting, finding largest element in an array</li> <li>2. Arithmetic instructions- Addition/subtraction, multiplication and division, square, cube- (16 bits arithmetic operations-bit addressable)</li> <li>3. Counters</li> <li>4. Boolean and Logical Instructions (Bit manipulations)</li> <li>5. CALL and RETURN</li> <li>6. Code Conversion: BCD-ASCII, ASCII-Decimal, Decimal-ASCII, HEX-Decimal, and Decimal-HEX</li> <li>7. Programs to generate Delay</li> </ol> <p><b>II INTERFACING</b></p> <p>Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions</p> <ol style="list-style-type: none"> <li>8. Key Board interface to 8051 to detect the key pressed</li> <li>9. Seven segment interface to 8051 to display the message</li> <li>10. Simple calculator using 6 digit seven segment display and Hex keyboard interface to 8051</li> <li>11. Generate different waveforms Sine, Square, Triangular, Ramp etc using DAC interface to 8051, change the frequency and amplitude.</li> <li>12. Stepper motor interface to 8051</li> <li>13. Elevator interface to 8051</li> <li>14. ADC interface to 8051 to measure the analog voltage</li> </ol>

5	Analog Communication + LIC Lab	<ol style="list-style-type: none"> <li>1. Second order active LPF and HPF</li> <li>2. Second order active BPF and BE</li> <li>3. Schmitt Trigger Design and test a Schmitt trigger circuit for the given values of UTP and LTP             <ol style="list-style-type: none"> <li>4. Design and test R-2R DAC using op-amp</li> </ol> </li> <li>5. Design and test the following circuits using IC 555             <ol style="list-style-type: none"> <li>a. Astable multivibrator for given frequency and duty cycle</li> <li>b. Monostable multivibrator for given pulse width W</li> </ol> </li> <li>6. Class C Single tuned amplifier Amplitude modulation using transistor (Generation and detection)</li> <li>7. Pulse amplitude modulation and detection</li> <li>9. PWM and PPM.</li> <li>10. Frequency modulation using 8038/2206</li> <li>1. Precision rectifiers-both Full Wave and Half Wave</li> </ol>
6	VLSI Circuits & Systems Lab	<ol style="list-style-type: none"> <li>1. Inverter using FETs</li> <li>2. NAND, NOR, XOR, XNOR, Realization of Boolean expressions</li> <li>3. Flipflops</li> <li>4. Adders</li> <li>5. Multiplexers, Decoders</li> <li>6. shift registers</li> <li>7. asynchronous &amp; synchronous counters</li> </ol>
7	Microwave & Antenna Lab	<ol style="list-style-type: none"> <li>1) Measurement of Microwave Power</li> <li>2) Three point method of obtaining equivalent circuit parameters</li> <li>3) Measurement of impedance using slotted line Assembly</li> <li>4) Measurement of dielectric strength</li> <li>5) Calibration of crystal detector</li> <li>6) Calibration of Variable waveguide attenuator</li> <li>7) Study of Circulator / Isolator</li> <li>8) Study of Directional coupler. Extraction of S-Parameter</li> <li>9) Study of E-Plane, H-Plane &amp; Magic tee. Extraction of S-Parameter</li> <li>10) Measurement of phase shift for a ferrite phase shifter</li> <li>11) Field intensity measurement of a Horn antenna</li> <li>12) Field intensity measurement of a parabolic dish</li> </ol>
8	Microprocessor Lab	<ol style="list-style-type: none"> <li>I) Programs involving             <ol style="list-style-type: none"> <li>1) data transfer instructions like:                 <ol style="list-style-type: none"> <li>i) Byte and word data transfer in different addressing modes</li> <li>ii) Block move (with and without overlap)</li> <li>iii) Block interchange</li> </ol> </li> <li>2) Arithmetic and logical operations like:                 <ol style="list-style-type: none"> <li>i) Additions and subtractions of multi precision number</li> <li>ii) Multiplication and division and signed and unsigned hexadecimal numbers</li> <li>iii) ASCII adjustment instructions</li> <li>iv) Code conversion</li> <li>v) Arithmetic programs to find square, cube, LCM, GCD and factorical</li> </ol> </li> <li>3) Bit manipulation instructions like checking:                 <ol style="list-style-type: none"> <li>i) Whether the given data is positive or negative</li> <li>ii) Whether the given data is odd or even</li> <li>iii) Logical 1's and 0's in a given data</li> <li>iv) 2 out 5 code</li> <li>v) Bit wise and nibble wise palindrome</li> </ol> </li> </ol> </li> </ol>

		<p>4) Branch/Loop instructions like:</p> <p>i) Arrays: addition and subtraction of N numbers, finding largest and smallest numbers, Ascending and descending orders</p> <p>ii) Near and far conditional and unconditional jump, calls and returns</p> <p>5) programs on string manipulation like string transfer, string reversing, searching for a string etc.</p> <p>6) Programs involving software interrupts Program to use DOS interrupts INT 21h function calls for reading a character from keyboard buffered keyboard input, display of character / string on console</p> <p>II) Experiment on interfacing 8086 with the following interfacing modules through DIO (digital input/ output - PCI bus compatible) card</p> <p>a) matrix keyboard interfacing , b) 7 segment display interface c) Logical controller interface , d) Stepper motor interface</p> <p>III) Other interfacing programs</p> <p>a) interfacing a printer to an X86 microcomputer b) pc to pc communication</p>
9	Advanced Communication lab	<ol style="list-style-type: none"> <li>1. TDM and recovery of two band limited signals of PAM signals</li> <li>2. ASK &amp; FSK generation and detection</li> <li>3. PSK generation and detection</li> <li>4. DPSK generation and detection</li> <li>5. QPSK generation and detection</li> <li>6. PCM generation and detection using CODEC chip</li> <li>7. Measurement of losses in a given optical fiber(propagation loss, bending loss)and numerical aperture</li> <li>8. Analog and Digital (with TDM) communication link using optical fiber</li> <li>9. Measurement of frequency, guide wave length, power, VSWR and attenuation in a microwave test bench</li> <li>10. Measurement of directivity and gain of antennas: Standard dipole (printed dipole), microstrip patch antenna and yagi antenna(printed)</li> <li>11. Determination of coupling and isolation characteristic of a strip line (Microstrip) directional coupler</li> <li>12. a) Measurement of resonant characteristics of a microstrip ring resonator and determination of dielectric constant of the substrate b) Measurement of power division and isolation characteristics of a microstrip 3dB power divider</li> </ol>
10	CCN lab	<ol style="list-style-type: none"> <li>I. CCN programming experiments in C/C++ (3 lab sessions of three hours each) <ol style="list-style-type: none"> <li>1) Simulate bit/character stuffing and de-stuffing using HDLC</li> <li>2) Simulate the shortest path algorithm</li> <li>3) Encryption and decryption of a given message</li> <li>4) Find minimum spanning tree of a sub-net</li> <li>5) Compute polynomial code check sum for CRC-CCITT</li> </ol> </li> <li>II) CCN experiments using hardware ( 1 lab session for 3 hrs each) <ol style="list-style-type: none"> <li>1) Asynchronous and Synchronous communication using RS232/optical fiber/twisted pair/RJ45</li> <li>2) Using fork function creates TWO processes and communicate between them</li> <li>3) Communicate between TWO PCs using a simple socket function.</li> </ol> </li> <li>III) Demonstrate the operation of rlogin and telnet</li> <li>IV) Demonstrate the operation of ftp,mail box.</li> </ol>

**LABORATORY:**

For each Laboratory

➤ List of Major Equipment/Facilities:

**MEDL. ELO.**

SI No	Name of the lab
1	MEDICAL SCIENCE LAB

**List of the Major Equipment / Facilities :**

Sl. No	Item Name	Department Identification No.	Instrument SI No / Reference No.	Total Nos.
1.	Servo voltage stabilizer 5KVA	1	MSRIT/ML /STB / 011,	03
		2	MSRIT/ML /STB / 012 ,	
		3	MSRIT/ML /STB / 014	
2.	LCR Q - Meter (6018 type)	4	MSRIT/ML /LCR Q / 29300	01
3.	CRO - Digital Storage type (60 MHz, 2 Ch DSO)	5	MSRIT/ML /DSO / 1/US39150180,	02
		6	MSRIT/ML /DSO /2/ US39150181	
	CRO (Scintech make - HM 201 Type)	7	MSRIT/ML /CRO /[21] 1285334	08
		8	MSRIT/ML /CRO /[[ 22] 395694	
		9	MSRIT/ML /CRO /[[ 23] 395691	
		10	MSRIT/ML /CRO /[[ 24] 395692	
		11	MSRIT/ML /CRO /[[ 25] 395693	
		12	MSRIT/ML /CRO /[[ 26] 395722	
4.	Function Generators - JS Instruments - (815 Type)	13	MSRIT/ML /CRO /[[ 27] 395723	06
		14	MSRIT/ML /CRO /[[ 28] 395682	
		15	MSRIT/ML/SGFG/026	
		16	MSRIT/ML/SGFG/027	
		17	MSRIT/ML/SGFG/028	
		18	MSRIT/ML/SGFG/029	
Signal Generators- Aplab make - (2029 type)		19	MSRIT/ML/SGFG/030	02
		20	MSRIT/ML/SGFG/031	
		21	MSRIT/ML/SGFG [32]9730030	
		22	MSRIT/ML/SGFG [33] 9730031	
5.	Analog Multimeter (Motwane make AVO 8)	23	MSRIT/ML/SGFG [01] 26790397	06
		24	MSRIT/ML/SGFG [02] 26710397	
		25	MSRIT/ML/SGFG [03] 26640397	
		26	MSRIT/ML/SGFG [04] 25750297	
		27	MSRIT/ML/SGFG [05] 26900397	
		28	MSRIT/ML/SGFG [06] 26520397	
6.	Digital Handy Multimeter HP make- E 2373A(3.5 digit)	29	MSRIT/ML/DMM/ 3846]32945	04
		30	MSRIT/ML/DMM/ 385]033465	
		31	MSRIT/ML/DMM/ 3967]33486	
		32	MSRIT/ML/DMM/ 3987]3346	
7.	Linear IC trainer kit	33	MSRIT/ML/D-LIC TR/ 01	02
		34	MSRIT/ML/D-LIC TR/ 02	
8.	Digital IC Trainer kit	35	MSRIT/ML/D-DIC TR/14	02
		36	MSRIT/ML/D-DIC TR/15	
9.	Single Channel Power supply (0-30 V) MSRIT make	37	MSRIT/ML/PS/06	05
		38	MSRIT/ML/PS/07	
		39	MSRIT/ML/PS/12	
		40	MSRIT/ML/PS/22	
		41	MSRIT/ML/PS/24	
10.	Spectrum Analyzer (HP make)	42	MSRIT/ML/ S A /1/ ( US 39162752).	01
11.	Logic Analyzer (HP make)	43.	MSRIT/ML/LA/01	01

12.	ECG Analyzer (P80)	44	MSRIT/ML/ECG A / 80648	01
13.	Opto Electronics Transducer	45	MSRIT/ML/DM-3/01	01
14.	Piezo Electric Transducer (DM-3)	46	MSRIT/ML/PET/DM-3/01	01
15.	Audio meter (PAM 010)	47	MSRIT/ML/MS/AUDIOMTR/01	01

16.	Spectrophotometer	48	MSRIT/ML/SPTRM/PT/103/01	01
17.	Blood pressure meter ( Mechanical type)	49	MSRIT/ML/BPDI/DMEI/01	05
		50	MSRIT/ML/BPDI/DMEI/02	
		51	MSRIT/ML/BPDI/DMEI/03	
		52	MSRIT/ML/BPDI/DMEI/04	
		53	MSRIT/ML/BPDI/DMEI/05	
18.	Blood pressure meter (Digital type)	54	MSRIT/ML/BPMTR/DS115/06	05
		55	MSRIT/ML/BPMTR/DS115/07	
		56	MSRIT/ML/BPMTR/DS115/08	
		57	MSRIT/ML/BPMTR/DS115/09	
		58	MSRIT/ML/BPMTR/DS115/10	
19.	Ultra sound scanner ( BPL Make )	59	MSRIT/ML/MS/US/SND/SCNRS/101 - P/01	01
20.	ECG ( Electro Cardio Graph ) Cardiart - 108T MK-VI (BPL Make) With - ( ECG System PAM 101 ) ECG Simulator - PAM 102	60	MSRIT/ML/MS/JSG 8786	01
21.	EEG ( Electro Encephalograph ) - ( PAM 201 )	61	MSRIT/ML/MS/EEGSY/PAM201/01	01
22.	EMG ( Electro Mayo Graph ) - ( PAM 301 )	62	MSRIT/ML//MS/EMGSYS/PAM301/ 01	01
23.	Blood flow meter ( PAM 034 )	63	MSRIT/ML/MS/BFMS/PAM/034/01	01

24.	Stimulator ( TENS PAM - 027 )	64	MSRIT/ML/MS/TNSPR/01	01
25.	X-Y Recorder Yokogawa ( model 3025 )	65	MSRIT/ML/MS/XYP/ 3025	01
26.	Strain gauge -( Load Measurement Trainer ) - Unique Make model (OITM -04 Type)	66	MSRIT/ML/MS/STNGG/1213	01
27.	Digital Spectrophotometer (166 Systronics type)	67	MSRIT/ML/MS/ SPTRP/397	01
28.	Micro pH system (Sl.No. 242 )  ( Systronics Make Model 362 )	68	MSRIT/ML/MS/MPHS/242	01

29.	Recorder System Systronics Make 1501	69	MSRIT/ML/MS/RECS/ 540	01
30.	Digital Photo Electric Colorimeter ( Sl No.067 )-Type 115	70	MSRIT/ML/MS/ PEC/ 067	01
31.	Temperature Indicator A) 0 - 200 Degree B) 0 - 400 Degree	71	MSRIT/ML/MS/TI/01	02
		72	MSRIT/ML/MS/TI/02	
32.	Sterilizer with temperature controller	73	MSRIT/ML/MS/STZR/01	03
		74	MSRIT/ML/MS/STZR/02	
		75	MSRIT/ML/MS/STZR/03	
33.	IC -Tester (MME Adit 40 ) MINMAX Electronics.	76	MSRIT/ML/ICT/01	01
34.	OHP with Screen Meteor + phil corp Ltd Model 27.01.12/03.3.00	77	MSRIT/ML/MS/OHP/01	01
35.	Dot matrix - TVS printer Model MPS 335	78	MSRIT/ML/MS/DOTPR/01	01
36.	HP desk Jet 200 CCI printer	79	MSRIT/ML/MS/HPJPTR/01	01
37.	Decade Resistance Box	80	MSRIT/ML/DRB/01	06
		81	MSRIT/ML/DRB/03	
		82	MSRIT/ML/DRB/04	
		83	MSRIT/ML/DRB/05	
		84	MSRIT/ML/DRB/07	
		85	MSRIT/ML/DRB/10	
38.	Decade Inductance Box	86	MSRIT/ML/DIB/04	06
		87	MSRIT/ML/DIB/05	
		88	MSRIT/ML/DIB/07	
		89	MSRIT/ML/DIB/08	
		90	MSRIT/ML/DIB/09	
		91	MSRIT/ML/DIB/10	
39.	Decade capacitance Box	92	MSRIT/ML/DCB/02	06
		93	MSRIT/ML/DCB/03	
		94	MSRIT/ML/DCB/04	
		95	MSRIT/ML/DCB/06	
		96	MSRIT/ML/DCB/09	
		97	MSRIT/ML/DCB/10	
40.	Distortion Meter HM 5027 Type Scientific Make	98	MSRIT/ML/MS/DIS /88130	01
41.	Microprocessor 8085 Kits with SMPS	99	MSRIT/ML/ $\mu$ P /001	06
		100	MSRIT/ML/ $\mu$ P /002	
		101	MSRIT/ML/ $\mu$ P /003	
		102	MSRIT/ML/ $\mu$ P /004	
		103	MSRIT/ML/ $\mu$ P /005	
		104	MSRIT/ML/ $\mu$ P /006	
42.	Microprocessor 8086 Kits with SMPS	105	MSRIT/ML/ $\mu$ P /001	02
		106	MSRIT/ML/ $\mu$ P /002	
43.	<b>Microprocessor Interfacing units:</b>			
	a. Stepper motor Interface	107.	MSRIT/ML/ $\mu$ P/IF/STEP/001	01
	b. DAC for ADC &Temperature Sensor	108	MSRIT/ML/ $\mu$ P/IF/A DAC/001	01
	c. (8) - Channel ADC	109	MSRIT/ML/ $\mu$ P/IF/8CHADC/001	01
	d. (7)- SEGMENT Display (LED)	110	MSRIT/ML/ $\mu$ P/IF/LED/001	01

	e. E prom programmer	111	MSRIT/ML/ $\mu$ P/IF/E PROM/001	01
	f. Audio Tape interface	112	MSRIT/ML/ $\mu$ P/IF/AT/001	01
	g. Dual ADC	113	MSRIT/ML/ $\mu$ P/IF/ DSADC/001	01
	h. Logic controller	114	MSRIT/ML/ $\mu$ P/IF/LC/001	01
	i. DMA interface	115	MSRIT/ML/ $\mu$ P/IF/DMA/001	01
	j. Musical tone generator	116	MSRIT/ML/ $\mu$ P/IF/MTG/001	01
	k. Real time clock interface	117	MSRIT/ML/ $\mu$ P/IF/RTC/001	01
	l. 16 - Channel ADC	118	MSRIT/ML/ $\mu$ P/IF/16- ADC/001	01
	m. CRT Controller	119	MSRIT/ML/ $\mu$ P/IF/CRTC/001	01
	n. Floppy drive Inter face	120	MSRIT/ML/ $\mu$ P/IF/FLP D/001	01
	o. Stepper Motor	121	MSRIT/ML/ $\mu$ P/IF/STP MTR/001	01
	p. Traffic Light Controller	122	MSRIT/ML/ $\mu$ P/IF/TRL/001	01
	q. Dual slope ADC	123	MSRIT/ML/ $\mu$ P/IF/DS/ ADCMTR/001	01

44	Piezoelectric transducer Kit comprising of amplifier, transducer and electrodes	126	MSRIT/ML/PZOELC / TR-KIT /01	01
45	Polarized Electrodes with built-in amplifier	127	MSRIT/ML/POLELTRD / AMPR /01	01
46	Non- Polarized Electrodes with built-in amplifier	128	MSRIT/ML/NON-POL-ELTRD / AMPR /01	01
47	Multipoint Electrodes with built-in amplifier	129	MSRIT/ML/MULTI-POINT-ELTRD / AMPR /01	01
48	ECG -Model -2 ECG Amplifier Model ECG Simulator Basic Module	130	MSRIT/ML/ECG MODEL -Amplifier - Simulator / 01	01
49	EOG - Amplifier Model	131	MSRIT/ML/EOG MODEL / Amplifier - / 01	01
50	EOG - Simulator Basic Amplifier Model	132	MSRIT/ML/EOG MODEL -Simulator /01	01
51	Ultra sound blood flow meter with 2 MHz, 5 MHz, & 8 MHz transducers	133	MSRIT/ML/ULTRA BFM /01	01
52	Pulse rate measuring / recording (optical, finger and cliff type ) photo electric transducer - pulse Rate Monitor	134	MSRIT/ML/PLs RT Monitor / 01	01
53	Study unit of breathing rate Measuring instrument (Strain gauge and Thermistor type ) Respiration Monitor with Apnea alarm	135	MSRIT/ML/BRTH- RT Monitor / 01	01
54	Nerve stimulator	136	MSRIT/ML/NRV -SIMU / 01	01
55	Bladder stimulator	137	MSRIT/ML/ BLR -SIMU / 01	01

LIST OF ITEMS PROCURED UNDER TEQIP:				
56	<b>HP Laser Jet Printer</b> 1200 DPI type HP 1022 SL No. UNR 1780015(Office Use)	138	MSRIT /TQPER/08002	01
	<b>HP Color Laser Jet Printer</b> Sphere HP color Tonners HP 2605 Dn dtn Sl No.: 7051501041	139	MSRIT /TQPCP/ 08032	01
57	<b>LCD Projector</b> NEC VT 37 GS7N	140	MSRIT / TQPCP/LCDP/ 05083	01
58	<b>Image processing software :</b> (1)Image Processing tool box software MAT LAB CD Kit for PC & Unix Release R 2006 B License No 30 Users (2) Image Processing tool Kit DOC Kit	141	MSRIT / TQPCP/2006-07/ITPB  (IT Department Custody @ Simulation Lab)	01
59	<b>Data Acquisition system</b> (1) Ni CompaQ DAQ instrumentation (Academic User ) 777448 - 61-01 (2) Signal Processing Hard ware set (3) Bio Medical Image Processing Hardware set Up	142	MSRIT /ML/TQPCP/2006-07/037	01
60	<b>Lap tops</b> ( HOD custody Prof. G. Kumaravelu custody Asst. Prof D. Jayadevappa custody )	143	MSRIT / TQPLABTOP/	03
		144	MSRIT / TQPLABTOP/	
		145	MSRIT / TQPLABTOP/	
61	<b>Note pad</b> ( Digital ink pad)	146	MSRIT / /NOTE PAD /01	01
62	<b>Sitting Stools</b> Wooden Round Type with adjustable Ht.) (30 Nos.)	147	MSRIT / ML/TQPFR/STOOLS/01	30
		148	MSRIT /ML/TQPFR/STOOLS/02	
		149	MSRIT /ML/TQPFR/STOOLS/03	
		150	MSRIT /ML/TQPFR/STOOLS/04	
		151	MSRIT /ML/TQPFR/STOOLS/05	
		152	MSRIT /ML/TQPFR/STOOLS/06	
		153	MSRIT /ML/TQPFR/STOOLS/07	
		154	MSRIT /ML/TQPFR/STOOLS/08	
		155	MSRIT /ML/TQPFR/STOOLS/09	
		156	MSRIT /ML/TQPFR/STOOLS/10	
		157	MSRIT /ML/TQPFR/STOOLS/11	
		158	MSRIT /ML/TQPFR/STOOLS/12	
		159	MSRIT /ML/TQPFR/STOOLS/13	
		160	MSRIT /ML/TQPFR/STOOLS/14	
		161	MSRIT /ML/TQPFR/STOOLS/15	
		162	MSRIT /ML/TQPFR/STOOLS/16	
		163	MSRIT /ML/TQPFR/STOOLS/17	
		164	MSRIT /ML/TQPFR/STOOLS/18	
		165	MSRIT /ML/TQPFR/STOOLS/19	
		166	MSRIT /ML/TQPFR/STOOLS/20	
167	MSRIT /ML/TQPFR/STOOLS/21			
168	MSRIT /ML/TQPFR/STOOLS/22			
169	MSRIT /ML/TQPFR/STOOLS/23			
170	MSRIT /ML/TQPFR/STOOLS/24			
171	MSRIT /ML/TQPFR/STOOLS/25			

		172	MSRIT /ML/TQPFR/STOOLS/26	
		173	MSRIT /ML/TQPFR/STOOLS/27	
		174	MSRIT /ML/TQPFR/STOOLS/28	
		175	MSRIT /ML/TQPFR/STOOLS/29	
		176	MSRIT /ML/TQPFR/STOOLS/30	
63	<b>Regulated Power Supply</b> ( 30 V / 5A Variable & Fixed o/p)	177	MSRIT /TQPEQ /08124	06
		178	MSRIT /TQPEQ /08125	
		179	MSRIT /TQPEQ /08126	
		180	MSRIT /TQPEQ /08127	
		181	MSRIT /TQPEQ /08128	
		182	MSRIT /TQPEQ /08129	
64	<b>Digital Multimeter</b> ( Table Top 4 ½ digits )	183	MSRIT /TQPEQ /08130	06
		184	MSRIT /TQPEQ /08131	
		185	MSRIT /TQPEQ /08132	
		186	MSRIT /TQPEQ /08133	
		187	MSRIT /TQPEQ /08134	
		188	MSRIT /TQPEQ /08135	
65	<b>Function Generator</b> (10 Mhz with sine , with sine, square triangular pulse & FM out put 20 V Pp Max)	189	MSRIT /TQPEQ /08136	06
		190	MSRIT /TQPEQ /08137	
		191	MSRIT /TQPEQ /08138	
		192	MSRIT /TQPEQ /08139	
		193	MSRIT /TQPEQ /08140	
		194	MSRIT /TQPEQ /08141	
66	<b>Sphygmomanometer</b> (With mercury meter Table stand Type Model Indicator set.	195	MSRIT /TQPEQ /08142	06
		196	MSRIT /TQPEQ /08143	
		197	MSRIT /TQPEQ /08144	
		198	MSRIT /TQPEQ /08145	
		199	MSRIT /TQPEQ /08146	
		200	MSRIT /TQPEQ /08147	
67	<b>Stethoscope</b> ( Bell type - 01)	201	MSRIT /TQPEQ /08148	06
		202	MSRIT /TQPEQ /08149	
		203	MSRIT /TQPEQ /08150	
		204	MSRIT /TQPEQ /08151	
		205	MSRIT /TQPEQ /08152	
		206	MSRIT /TQPEQ /08153	
68	<b>Thermister</b> (4.7 & 2K)	207	MSRIT /TQPEQ /08154	06
		208	MSRIT /TQPEQ /08155	
		209	MSRIT /TQPEQ /08156	
		210	MSRIT /TQPEQ /08157	
		211	MSRIT /TQPEQ /08158	
		212	MSRIT /TQPEQ /08159	
69	<b>Thermocouple</b>	213	MSRIT /TQPEQ /08160	06
		214	MSRIT /TQPEQ /08161	
		215	MSRIT /TQPEQ /08162	
		216	MSRIT /TQPEQ /08163	
		217	MSRIT /TQPEQ /08164	
		218	MSRIT /TQPEQ /08165	
70	<b>RTD Probe</b>	219	MSRIT /TQPEQ /08166	06
		220	MSRIT /TQPEQ /08167	
		221	MSRIT /TQPEQ /08168	
		222	MSRIT /TQPEQ /08169	
		223	MSRIT /TQPEQ /08170	
		224	MSRIT /TQPEQ /08171	

71	<b>DSO Probes</b>	225	MSRIT /TQPEQ /08172	06
		226	MSRIT /TQPEQ /08173	
		227	MSRIT /TQPEQ /08174	
		228	MSRIT /TQPEQ /08175	
		229	MSRIT /TQPEQ /08176	
		230	MSRIT /TQPEQ /08177	
72	<b>Personnel Computer with Flat monitors.</b> <i>Acer systems</i> Dual drive PD 945/512 Mb DDR 2.2 / 160 GB 72 K sata, Optical Mouse, LAN scope linex speaker PS 2KBD/ USB Acer Tower, Flat screen Acer 1716, With DVD Read / Write (3 Nos in the Laboratory 01 with HOD 01 with Mrs. Prabha Ravi Custody)	231	MSRIT /ML/TQPCP/PC/	05
		232	MSRIT /ML/TQPCP/PC/	
		233	MSRIT /ML/TQPCP/PC/	
		234	MSRIT /ML/TQPCP/PC/	
		235	MSRIT /ML/TQPCP/PC/	
73	<b>Personnel Computer</b> with monitor Intel P4 HT With DVD read write <b>Zenith PC &amp; UPS</b> ( 01 with Mrs.Ravikala K Prabhu, 01 with Office Staff Nagaraj , with Mr. Babu)	236	MSRIT /ML/PC/	03
		237	MSRIT /ML/PC/	
		238	MSRIT /ML/PC/	
73	<b>Personnel Computer</b> with monitor & UPS Intel P4 HT With DVD read write <b>IBM PC UPS</b> (01 with Mr.C K Narayanappa Custody)	239	MSRIT /ML/PC/	01
		73	<b>Personnel Computer</b> with monitor & UPS Celeron P4 Samsung DVD Writer, Philips Monitor UPS (01 with Mrs.Uma)	240
74	<b>HP Laser Jet Printer</b> 1200 DPI (Lab)			241
75	<b>Scanner ( HP Scan Jet )</b> CN 76EA & BB(Lab)	242	MSRIT /ML/SCNR/01	01
76	<b>Digital BP Meter</b> Amron type Automatic Blood BP Monitor. LCD Digital display, 0-299 mmHg pressure 40- 180 beats/ min.	243	MSRIT /ML/DBPM/01	01
	<b>Digital Trainer Kit</b>	244	MSRIT/ML/D-DIC TR/3	17
		245	MSRIT/ML/D-DIC TR/4	
		246	MSRIT/ML/D-DIC TR/5	
		247	MSRIT/ML/D-DIC TR/6	
		248	MSRIT/ML/D-DIC TR/7	
		249	MSRIT/ML/D-DIC TR/8	
		250	MSRIT/ML/D-DIC TR/9	
		251	MSRIT/ML/D-DIC TR/10	
		252	MSRIT/ML/D-DIC TR/11	
		253	MSRIT/ML/D-DIC TR/12	

		254	MSRIT/ML/D-DIC TR/13	
		255	MSRIT/ML/D-DIC TR/14	
		256	MSRIT/ML/D-DIC TR/15	
		257	MSRIT/ML/D-DIC TR/16	
		258	MSRIT/ML/D-DIC TR/17	
		259	MSRIT/ML/D-DIC TR/18	
		260	MSRIT/ML/D-DIC TR/19	
78	<b>Linear IC Trainer Kits</b>	261	MSRIT/ML/D-DLIC TR/03	<b>02</b>
		262	MSRIT/ML/D-DLIC TR/04	
79	<b>CHARTS : EDUCATIONAL CHARTS.</b>	<b>263</b>	<b>MSRIT/ML/Charts</b>	<b>ONE EACH TOTAL = 24</b>
	CRO	P- 18		
	Laser	P - 28		
	Electro Magnetic radiation	P S- 6		
	Life cycle : HIV	BI -149		
	Heart attack	BI- 122		
	Jaundice	BI-123		
	Laboratory Safety	BI-154		
	Electron microscope	BI- 167		
	Drug acting On Nervous system	BI-170		
	Drug Packing System	BI-187		
	Local Anesthetics	BI-193		
	Human Heart	HA-3		
	Respiratory System	HA-7		
	Brain	HA-9		
	Ear	HA-12		
	Eye	HA-13		
	Nervous System	HA-16		
	Blood	HA-22		
	Circulatory system	HA-41		
	Arterial system	HA-04		
	Venous system	HA-05		
	Effects of Electric Current	PS-13		
	WILHELM ROENTGEN	SP-18		
	X-RAYS	PS-16		

List of experimental setup

Sl No	Name of the lab	Name of the experiment conducted
1	ANALOG ELECTRONICS LAB	Testing of Full wave and Bridge Rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency
		Wiring of RC coupled Single stage FET & BJT amplifier and determination of the gain- frequency response, input and output impedances.
		Wiring of BJT Darlington Emitter follower with and without bootstrapping and determination of the gain, Input and Output impedances (Single circuit) (One Experiment)
		Wiring of a two stage BJT Voltage series feed back amplifier and determination of the gain, Frequency response, Input and Output impedances with and without feedback (One Experiment)
		Wiring and Testing for the performance of BJT-RC Phase shift Oscillator for $f_o = 10 \text{ KHz}$
		Testing for the performance of BJT - Hartley & Colpitts Oscillators for RF range $f_o = 100 \text{ KHz}$ .
		Testing for the performance of BJT -Crystal Oscillator for $f_o > 100 \text{ KHz}$
		Testing of Diode clipping (Single/Double ended) circuits for peak clipping, peak Detection
		Testing of clamping circuits : Positive clamping / Negative clamping
		Testing of a transformer less Class - B push pull power amplifier and determination of its conversion efficiency.
2	LOGIC DESIGN LAB	Simplification, realization of Boolean expressions using logic gates/Universal gates.
		Realization of Half/Full adder and Half/Full Subtractors using logic gates. (i) Realization of parallel adder/Subtractors using 7483 chip (ii) BCD to Excess-3 code conversion and vice versa.
		Realization of Binary to Gray code conversion and vice versa
		MUX/DEMUX - use of 74153, 74139 for arithmetic circuits and code converter.
		Realization of One/Two bit comparator and study of 7485 magnitude comparator.
		Use of a) Decoder chip to drive LED display and b) Priority encoder.
		Truth table verification of Flip-Flops: (i) JK Master slave (ii) T type and (iii) D type.
		Realization of 3 bit counters as a sequential circuit and MOD - N counter design (7476, 7490, 74192, 74193)
Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74S95. 10) Wiring and testing Ring counter/Johnson counter.		
3	MICROCONTROLLER LAB	Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array
		Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube - (16 bits Arithmetic operations - bit addressable) Counters
		Boolean & Logical Instructions (Bit manipulations)
		Conditional CALL & RETURN
		Code conversion: BCD - ASCII; ASCII - Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX

		<p>Programs to generate delay, Programs using serial port and on-Chip timer / counter</p> <p><b>INTERFACING:</b> <i>Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions</i></p> <p>Simple Calculator using 6 digit seven segment display and Hex Keyboard interface to 8051</p> <p>Alphanumeric LCD panel and Hex keypad input interface to 8051</p> <p>External ADC and Temperature control interface to 8051</p> <p>Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude</p> <p>Stepper and DC motor control interface to 8051</p>
4	<b>LINEAR INTEGRATED CIRCUITS LAB</b>	<ol style="list-style-type: none"> <li>1. Determination of characteristics of (a) DC amplifier and (b) Isolation amplifier</li> <li>2. Determination of characteristics of a current amplifier &amp; Instrumentation amplifier</li> <li>3. Design of Precision Rectifiers</li> <li>4. Design of Schmitt Trigger</li> <li>5. Frequency response of active filters LPF / HPF</li> <li>6. Astable Multivibrator using Op Amp</li> <li>7. Monostable Multivibrator using Op Amp</li> <li>8. Astable Multivibrator using 555 timer</li> <li>9. Monostable Multivibrator using 555 timer</li> <li>10. Voltage Regulator using 723 IC</li> <li>11. A/D converter</li> <li>12. D/A converter</li> </ol>
5	<b>C++ &amp; DATA STRUCTURES LAB</b>	<ol style="list-style-type: none"> <li>1. Write a program to demonstrate the initialization of structure variables.</li> <li>2. Write a program to demonstrate the use of pointer to and address of operator.</li> <li>3. Write a Program to create a file with at least five records, each record with following fields. <ol style="list-style-type: none"> <li>i. University Seat Number : Non Zero Positive Integer</li> <li>ii. Name : Twenty-Five Characters</li> <li>iii. Marks1, Marks2, Marks3 : Positive Integer</li> </ol> </li> <li>4. Write a Program to demonstrate working of stack of size N using an array. The elements on stack can be integer or real. The operation should be PUSH and POP.</li> <li>5. Write a Program to demonstrate the working of Queue using arrays.</li> <li>6. Write a Program to implement circular Queue using arrays.</li> <li>7. Write a Program to implement priority.</li> <li>8. Write a Program to construct the singly linked list and to do the following operations <ol style="list-style-type: none"> <li>a. Insertion – at front, at end and at any position in the list</li> <li>b. Deleting a note based on given field</li> <li>c. Searching a note based on given field</li> <li>d. Displaying the list</li> </ol> </li> <li>9. Write a Program Implement stack using dynamic variables</li> <li>10. Write a Program to implement Queue using dynamic variables.</li> </ol> <p>At least 80% of the programs has to be implemented using C++. The above program can also be tried with Matlab and LabVIEW..</p>

6	<b>BIO SIGNALS &amp; MEASUREMENTS LAB</b>	<ol style="list-style-type: none"> <li>1. Determination of LVDT Characteristics</li> <li>2. Determination of Temperature Transducers Characteristics</li> <li>3. Determination of Resistive Transducer Characteristics</li> <li>4. Determination of Piezo Transducer Characteristics</li> <li>5. Determination of Photo Transducer Characteristics</li> <li>6. Determination of Ultrasonic Transducer Characteristics</li> <li>7. Determination of Electrode Characteristics: Polarized/ Non-Polarized</li> <li>8. Determination of Electrode Characteristics: Multi point</li> <li>9. Determination of pH of given solutions</li> <li>10. Determination of Output Characteristics for Transducer bridge with amplifier circuit</li> <li>11. Determination of percentage Transmittance, Absorbance &amp; Concentration of given solutions using Spectrophotometer</li> <li>12. Determination of percentage Transmittance, Absorbance &amp; Concentration of given solutions using Colorimeter</li> </ol>
7	<b>DIGITAL IMAGE PROCESSING LAB</b>	<ol style="list-style-type: none"> <li>1. Simulation and display of an image, negative of an image (Binary &amp; Gray Scale)</li> <li>2. Implementation of relationships between pixels</li> <li>3. Implementation of transformations of an image</li> <li>4. Contrast stretching of a low contrast image, histogram, and histogram equalization</li> <li>5. Display of bit planes of an image</li> <li>6. Display of FFT (1-D &amp; 2-D) of an image</li> <li>7. Computation of mean, standard deviation and correlation coefficient of the given images</li> <li>8. Implementation of image smoothing filters (Low pass and Median filters)</li> <li>9. Implementation of image sharpening filters (High pass and derivative filters)</li> <li>10. Implementation of homomorphic filtering technique for image enhancement</li> <li>11. Implementation of image restoring techniques</li> </ol>
8	<b>DIGITAL SIGNAL PROCESSING LAB</b>	<ol style="list-style-type: none"> <li>1. Representation and display of basic sequences.</li> <li>2. Verify the Sampling theorem.</li> <li>3. Determine linear convolution, Circular convolution and Correlation of two given sequences. Verify the result using theoretical computations.</li> <li>4. Determine the linear convolution of two given point sequences using FFT algorithm.</li> <li>5. Determine the correlation using FFT algorithm.</li> <li>6. Display of original sequence along with operation on sequence like shifting, folding, time scaling and multiplication.</li> <li>7. Display of DTFS of a sequence</li> <li>8. Display of DFTF of a sequence.</li> <li>9. Computation and verification FFT of a sequence.</li> <li>10. Realization and design of FIR filter for a given specification and verification for (a) LP (b) HP (c) BP (d) Notch filter.</li> <li>11. Design and test FIR filter using Windowing method (Hamming window and Kaiser window) for the given order and cut-off frequency.</li> <li>12. Realization of design of IIR filter for a given specification and verification.</li> </ol>

9	<b>BIO-MEDICAL INSTRUMENTATION LAB</b>	<ol style="list-style-type: none"> <li>1) ECG: Analysis of Waveform; Heart rate Determination; Vector Cardiogram</li> <li>2) EEG: Analysis of Waveforms</li> <li>3) EMG: Analysis of Waveform; Calculation of Nerve Conduction Velocity</li> <li>4) EOG: Analysis of Waveform</li> <li>5) Determination of       <ol style="list-style-type: none"> <li>a. Respiratory Rate using Temperature Transducer</li> <li>b. Pulse Rate using Photo Transducer</li> </ol> </li> <li>6) Determination of Hearing Loss by Air conduction &amp; bone Conduction tests using Audiometer</li> <li>7) Blood Pressure Measurement using:       <ol style="list-style-type: none"> <li>a. Sphygmomanometer</li> <li>b. Digital Meter</li> </ol> </li> <li>8) Determination of Output Characteristics of Nerve Stimulator/ Bladder Stimulator</li> <li>9) Demonstration &amp; Study of:       <ol style="list-style-type: none"> <li>a. Output Characteristics of recorded Bio Signal using: X-Y Recorder/ X-t Recorder</li> <li>b. Principle &amp; Working of Ultrasound Scanner</li> </ol> </li> <li>10) Demonstration of interfacing the following equipment:       <ol style="list-style-type: none"> <li>a. Oximeter</li> <li>(b). Spirometer</li> <li>c. Ventilator</li> <li>d. Haemodialysis Machine</li> <li>e. Physiotherapy Equipment</li> <li>f. Electrotherapy Equipment</li> </ol> </li> </ol>										
10	<b>BIO MEDICAL DIGITAL SIGNAL PROCESSING LAB</b>	<ol style="list-style-type: none"> <li>1. Computation of Convolution and Correlation Sequences.</li> <li>2. Signal Averaging to Improve the SNR</li> <li>3. Read and plotting of ECG data, spectrum of ECG with 50 HZ noise.</li> <li>4. Realization of IIR filters for ECG analysis</li> <li>5. Design of FIR Filter for ECG.</li> <li>6. Integer filters for ECG</li> <li>7. PSD estimation for ECG, EEG and EMG</li> <li>8. QRS detection and Heart rate determination.</li> <li>9. Correlation and Template matching.</li> <li>10. Realization of Notch filter for removal of line interference</li> <li>11. Data Compression Techniques: AZTEC, TP algorithms.</li> <li>12. Data Compression Techniques: FAN, CORTES algorithms.</li> </ol>										
11	<b>BIO MEDICAL DIGITAL SIGNAL PROCESSING LAB</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">Computation of Convolution and Correlation Sequences</td> </tr> <tr> <td style="padding: 5px;">Signal averaging to improve the SNR</td> </tr> <tr> <td style="padding: 5px;">Read and plotting of ECG data, spectrum of ECG with 50 HZ noise.</td> </tr> <tr> <td style="padding: 5px;">Realization of IIR filters for ECG analysis</td> </tr> <tr> <td style="padding: 5px;">Design of FIR filters for ECG analysis</td> </tr> <tr> <td style="padding: 5px;">Integer filters for ECG</td> </tr> <tr> <td style="padding: 5px;">PSD estimation for ECG, EEG and EMG</td> </tr> <tr> <td style="padding: 5px;">QRS detection and heart rate determination</td> </tr> <tr> <td style="padding: 5px;">Correlation and template matching</td> </tr> <tr> <td style="padding: 5px;">Realization of Notch filter for removal of line interference</td> </tr> </table>	Computation of Convolution and Correlation Sequences	Signal averaging to improve the SNR	Read and plotting of ECG data, spectrum of ECG with 50 HZ noise.	Realization of IIR filters for ECG analysis	Design of FIR filters for ECG analysis	Integer filters for ECG	PSD estimation for ECG, EEG and EMG	QRS detection and heart rate determination	Correlation and template matching	Realization of Notch filter for removal of line interference
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		<b>Data Compression using Turning point algorithm</b>
		Data Compression using Fan algorithm
		Data Compression using AZTEC algorithm
		Data Compression using CORTES algorithm
12	<b>DIGITAL IMAGE PROCESSING LAB</b>	Simulation and display of an image, negative of an image (Binary & Gray Scale)
		Implementation of relationships between pixels
		Implementation of transformations of an image
		Contrast stretching of a low contrast image
		Histogram and Histogram equalization
		Display of bit planes of an image
		Display of FFT (1-D & 2-D) of an image
		Computation of mean, standard deviation and correlation co-efficient of the given images
		Implementation of image smoothening filters (Mean and Median filtering of an image)
		<b>Implementation of image sharpening filters</b>
		Edge detection using gradient filters and Canny edge detection algorithm
		Image compression by DCT, DPCM, HUFFMAN coding
		Implementation of image restoring techniques
		Implementation of image intensity slicing technique for image enhancement

➤ **List of Major Software Packages available**

Sl. No	Item Name	Nos.
(I)	Data Acquisition system <ul style="list-style-type: none"> <li>• Ni CompaQ DAQ instrumentation (Academic User ) 777448 - 61-01</li> <li>• Signal Processing Hard ware set</li> <li>• Bio Medical Image Processing Hardware set Up ( Supplied by M/s Trident Techlabs Pvt Ltd.,)</li> </ul>	<b>01 set</b>
(II)	Image processing software <ul style="list-style-type: none"> <li>• Image Processing tool box software MAT LAB CD Kit for PC &amp; Unix Realse R 2006 B</li> <li>• Licence No 30 User.</li> <li>• Image Processing tool Kit DOC Kit (supplied by M/s Cranes Software International Limited )</li> </ul>	<b>01 set</b>

**LABORATORY:**

For each Laboratory

➤ List of Major Equipment/Facilities:

**BIOTECHNOLOGY**

SI No.	Name of the lab	Major equipments
1	Biochemistry Lab/Enzyme Technology Lab	Electronic Analytical Balance Hot Air Oven Fume Hood Prefiltration Unit Water Purifier Incubator, -20°C Deep freezer , Cooling Centrifuge
2	Microbiology Lab	Incubator Orbital shaking Incubator Autoclave Hot Air Oven Laminar Air Flow B.O.D. Incubator, Incubator, Cooling Centrifuge
3	R & D Lab (General Unit)	HPLC
4	R & D Lab b)Animal Cell Culture Unit	CO <sub>2</sub> Incubator Inverted Research Microscope Laminar Air flow (Vertical) Bio spectrophotometer
5	Down stream Processing Lab	Gel Documentation Unit BioSpectrophotometer Lyophilizer Cooling Centrifuge -80°C Deep Freezer Thermal cycler Air Compressor Bio-Reactor 96-well PCR
6	Upstream Processing Lab	Plant Tissue Culture Unit Laminar Air Flow (Vertical) Hot Air Oven UV -VIS Spectrophotometer Autoclave
7	Bioinformatics Lab	Computer systems

**List of experimental setup**

SI No	Name of the lab	Name of the experiment conducted
1	Biochemistry Lab	<ol style="list-style-type: none"> <li>1. Qualitative tests for Carbohydrates</li> <li>2. Qualitative tests for Amino acids and Proteins.</li> <li>3. Titration of Amino acids- Sorenson's formal titration.</li> <li>4. Estimation of Cholesterol by Zak's method.</li> <li>5. Estimation of reducing Sugar by O-Toludine / DNS method.</li> <li>6. Estimation of inorganic Phosphate by Fiske-Subbarao method.</li> <li>7. Estimation of Amino acid by Ninhydrin method.</li> <li>8. Estimation of Protein by Lowry's method</li> <li>9. Estimation of Urea by Diacetyl Monoxime method.</li> <li>10. Estimation of Iron by Wong's method.</li> <li>11. Determination of Saponification value of Lipids.</li> <li>12. Determination of Iodine value of Lipid.</li> <li>13. Separation of plasma proteins by electrophoresis.</li> <li>14. Estimation of DNA by diphenylamine method</li> </ol>



5	Bioanalytical Techniques	<ol style="list-style-type: none"> <li>1. Calibration of pH meter and preparation of Buffers and standard solutions</li> <li>2. Thin layer Chromatographic separation of sugars / amino acids</li> <li>3. Column Chromatography</li> <li>4. Two dimensional paper chromatography of amino acids</li> <li>5. Electrophoresis separation of Proteins</li> <li>6. Elution from chromatography column and estimation</li> <li>7. DNA separation by Agarose Gel Electrophoresis</li> <li>8. Native PAGE</li> <li>9. Spectrophotometric estimation of biomolecules</li> <li>10. Separation and estimation of chlorophyll</li> <li>11. Fractionation of cellular components</li> <li>12. Isolation of chloroplasts</li> </ol>
6	Molecular Biology Lab	<ol style="list-style-type: none"> <li>1. Transformation of <i>E. coli</i> cells - Calcium chloride method</li> <li>2. Selection of recombinants (Blue-white screening)</li> <li>3. Isolation of plasmid DNA from <i>E.coli</i>.</li> <li>4. Quantification of nucleic acids by spectrophotometric, Gel and by densitometric methods</li> <li>5. Agarose gel electrophoresis of DNA</li> <li>6. Isolation of genomic DNA (plant / animal/ microbial sources - any one)</li> <li>7. Transfer of binary vector into Agrobacterium by tri-parental mating</li> <li>8. Restriction mapping (Single or double digestion)</li> <li>9. PCR (Demo experiment).</li> <li>10. Isolation of total RNA by TRIZol method</li> <li>11. cDNA synthesis from total RNA</li> <li>12. Study of cell structure (Prokaryotes &amp; Eukaryotes).</li> <li>13. Study of Mitotic stages by Squashing Technique (Onion root tips).</li> <li>14. Study of Meiotic stages and structure of special chromosomes and cell organelles.</li> </ol>
7	Immunology Lab	<ol style="list-style-type: none"> <li>1. ABO Blood grouping &amp; Rh typing</li> <li>2. Radial Immuno diffusion</li> <li>3. Ouchterlony Double Immuno Diffusion (ODD)</li> <li>4. Immunoelectrophoresis (IEP)</li> <li>5. Counter Immunoelectrophoresis (CIEP)</li> <li>6. Rocket Immunoelectrophoresis</li> <li>7. Widal &amp; VDRL tests</li> <li>8. Total count of RBC, WBC.</li> <li>9. Differential count of WBC</li> <li>10. Enzyme linked Immunosorbent assay (ELISA)</li> <li>11. Precipitation of Immunoglobulins</li> <li>12. Separation of Lymphocytes from blood.</li> <li>13. Immunoblot. (Demo)</li> <li>14. Purification of Immunoglobulins</li> </ol>
8	Bioreaction Engineering	<ol style="list-style-type: none"> <li>1. Analysis of batch reactor</li> <li>2. Analysis of Plug flow reactor</li> <li>3. Analysis of mixed flow reactor</li> <li>4. Analysis of Semi batch reactor</li> <li>5. RTD of batch reactor</li> <li>6. RTD of Plug flow reactor</li> <li>7. RTD of Semi batch reactor</li> <li>8. Effect of temperature on reaction rate kinetics</li> <li>9. Effect of temperature on reaction rate constant</li> <li>10. Batch growth kinetics (Evaluation of doubling time and decay time)</li> </ol>

		<ol style="list-style-type: none"> <li>11. Fermenter performance</li> <li>12. Effect of pH on reaction rate kinetics</li> <li>13. Effect of dissolved oxygen on growth kinetics</li> <li>14. Enzyme immobilization kinetics</li> </ol>
9	Genetic Engineering	<ol style="list-style-type: none"> <li>1. Preparation of DNA for PCR applications- Isolation, purity &amp; quantification</li> <li>2. Introduction to PCR - working of PCR equipment and programming.</li> <li>3. Primer designing using soft-wares</li> <li>4. Gene/DNA amplification by random/specific primers.</li> <li>5. Southern hybridization.</li> <li>6. Gene Transformation.</li> <li>7. Isolation of total RNA by Trizol method.</li> <li>8. Preparation of cDNA</li> <li>9. Amplification of known gene/s using cDNA</li> <li>10. Triparental mating method of transferring binary plasmids into <i>Agrobacterium</i>.</li> <li>11. Restriction digestion of plasmid/genomic DNA and Southern blotting</li> <li>12. Isolation of fusion proteins using expression vectors.</li> <li>13. Transfer of <i>gus A</i> reporter gene into plant cells by leaf disc method.</li> <li>14. Histochemical staining for GUS expression</li> </ol>
10	Enzyme Technology	<ol style="list-style-type: none"> <li>1. Isolation of enzymes (alpha-amylase from sweet potato or saliva urease from horse gram or kidney gram, acid phosphatase from sweet potato)</li> <li>2. Determination of Enzyme activity and Specific activity.</li> <li>3. Determination of specific activity of Enzymes</li> <li>4. Effect of substrate concentration on enzyme activity (<math>K_m</math> &amp; <math>V_{max}</math> determination)</li> <li>5. Effect of pH on enzyme activity</li> <li>6. Effect of temperature on enzyme activity</li> <li>7. Effect of inhibitors on enzyme activity</li> <li>8. Effect of Time on enzyme activity</li> <li>9. Assay of Clinically important enzymes( LDH/SGOT/SGPT/ALP/ACP)</li> <li>10. Enzyme Immobilization Techniques and Kinetics.</li> <li>11. ELISA - Application</li> <li>12. Partial purification of proteins (Dialysis/column chromatography Gel filtration)</li> <li>13. Molecular weight determination of a protein by gel electrophoresis/ molecular sieving</li> <li>14. Separation of Isoenzymes by SDS-PAGE</li> </ol>
11	Upstream Process Technology	<ol style="list-style-type: none"> <li>1. Callus Induction Techniques</li> <li>2. Development of suspension culture from callus</li> <li>3. Production of Secondary metabolite - Anthocyanin</li> <li>4. Artificial seed production (Axillary buds /somatic embryo)</li> <li>5. Shake flask studies; Comparison of yield in synthetic and complex media</li> <li>6. Estimation of DNA (by diphenyl method)</li> <li>7. Estimation of unknown protein by silver nitrate.</li> <li>8. Development of inocula; lag time effect</li> <li>9. Preparation &amp; validation of the Fermenter</li> <li>10. Production of Ethanol in fermenter - Study of growth,</li> </ol>

		<p>product formation kinetics, end substrate utilization</p> <ol style="list-style-type: none"> <li>11. Single Cell Protein (SCP) production by continuous culture.</li> <li>12. Preparation of seed culture</li> <li>13. Study of effect of substrate inhibition on cell growth</li> <li>14. Replica plating for screening of auxotrophs/antibiotic resistant strain</li> </ol>
12	Bioinformatics	<ol style="list-style-type: none"> <li>1. Searching bibliographic databases for relevant information</li> <li>2. Sequence retrieval from nucleic acid and protein databases</li> <li>3. Restriction mapping.</li> <li>4. Sequence (FASTA and BLAST) searches.</li> <li>5. Pair wise comparison of sequences.</li> <li>6. Multiple alignment of sequences.</li> <li>7. Evolutionary studies / Phylogenetic analysis.</li> <li>8. Identification of genes in Genomes.</li> <li>9. RNA folding.</li> <li>10. Primer Design.</li> <li>11. Protein databank retrieval and visualization.</li> <li>12. Superposition of structures.</li> <li>13. Secondary structure prediction of proteins.</li> <li>14. Identification of membrane proteins.</li> </ol>
13	Upstream Processing Laboratory (vii sem -vtu)	<ol style="list-style-type: none"> <li>1) Callus Induction Techniques - Carrot/Beet root/ or any other material.</li> <li>2) Development of suspension culture from callus.</li> <li>3) Induction of Secondary metabolite - Anthocyanin.</li> <li>4) Estimation of Lycopene from tomato fruits.</li> <li>5) Estimation of Anthocyanin from leaf / callus tissue.</li> <li>6) Estimation of DNA (by DPA method)</li> <li>7) Estimation of unknown protein by Lowry's method.</li> <li>8) Development of inocula; lag time effect.</li> <li>9) Shake flask studies; Comparison of yield in synthetic and complex media (Bacteria/yeast)</li> </ol>
14	Downstream Processing Laboratory	<ol style="list-style-type: none"> <li>1) Cell disruption techniques.</li> <li>2) Solid - liquid separation methods: Filtration</li> <li>3) Solid - liquid separation methods: Sedimentation.</li> <li>4) Solid - liquid separation methods: Centrifugation.</li> <li>5) Product enrichment operations: Precipitation - (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> Fractionation of a protein.</li> <li>6) Product enrichment operations: Two - phase aqueous extraction.</li> <li>7) Product drying techniques.</li> <li>8) Separation of amino acids / Carbohydrates by TLC.</li> <li>9) Characterization of protein by Western blotting.</li> <li>10) Estimation of % of ethanol from fermented broth.</li> <li>11) Estimation of Citric acid from fermented broth.</li> <li>12) Separation of proteins by molecular sieving / SDS PAGE.</li> <li>13) Analysis of biomolecules by HPLC / GC (using standard spectra).</li> </ol>

➤ **List of Major Software Packages available**

1. GCG Software
2. TSAR 3D
3. Special Treats-Software for Biospectrophotometer
4. DGELDAS- Software for Gel Documentation Unit
5. HPLC-Software

**LABORATORY:**

For each Laboratory

➤ List of Major Equipment/Facilities:

**PHYSICS**

SI No	Name of the lab	Major equipments
1	Engineering Physics	1. Zener Diode setups, 2. Transistor characteristics setup, Signal generators, 3. Digital signal Generators, 4. Multimeters, 5. AC/DC volt/ ammeters, 6. Travelling microscopes, 7. Spectrometers, 8. Stop clocks, 9. Transformers, 10. Gratings, 11. Sodium lamp sets, 12. Mercury bulb sets 13. Rough Balance, 14. Battery eliminators 15. Fermi energy kit 16. Energy gap kit 17. Planck's constant setup 18. Dielectric constant setup 19. Semiconductor Lasers

**List of experimental setup**

SI No	Name of the lab	Name of the experiment conducted
1	Engineering Physics Lab	1. LCR circuit 2. Verifications of Stefan's law 3. Transistor Characteristics 4. Zener Diode Characteristics 5. Fermi Energy 6. Energy gap of semiconductor 7. Laser Diffraction 8. Planck's constant 9. Dielectric Constant 10. B-H curve 11. Single Cantilever 12. Newton's Rings 13. Air Wedge 14. Sonometer 15. Diffraction grating

➤ **List of Major Software Packages available**

Sl. No.	Name of the Software installed	Purpose
1	MS Office	Official, Lecture notes preparation Research reports preparation, etc.,
2	MatLab	Computation & research
3.	Mathematica	Computation & research
4.	WinGX package	Crystallography Research
5.	CCP4i package	Crystallography Research
6.	Chemdraw, ultra-8, Chemskeetch	Molecular modelling
6.	C, C++,	Computation

**LABORATORY:**

For each Laboratory

➤ List of Major Equipment/Facilities:

**CHEMISTRY**

Sl No	Name of the lab	Major equipments
1	I/II sem B.E Lab	pH meter Conductivity meter, Potentiometer, Colorimeter, Flamephotometer, electronic balance, and electric oven.
2	III/IV sem BE technical lab	Conductivity meter, pH meter, suction pump, water distillation unit, water bath, hot plate, electronic balance, and electric oven.
3	R&D Lab	UV-visible spectrophotometers (Shimadzu and Elico) Specific-ion analyzer (F <sup>-</sup> , NO <sub>3</sub> and NH <sub>3</sub> ) COD - Digester Laminar - Air flow unit (vertical) BOD incubator Electronic balances Water Bath Autoclave High speed centrifuge Nephelometer Flame photometer High temperature furnace to prepare nanomaterials

## List of experimental setup

**ENGINEERING CHEMISTRY LABORATORY for I/II sem B.E****PART - A**

1. Potentiometric estimation of FAS using standard K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution.
2. Colorimetric determination of copper.
3. Conductometric estimation of an acid mixture using standard NaOH solution.
4. Flame photometric estimation of sodium in the given sample of water.
5. Determination of pK<sub>a</sub> of a weak acid using pH meter.
6. Determination of single electrode potential and EMF of a cell.

**PART - B**

1. Determination of Total Hardness of a sample of water using disodium salt of EDTA.
2. Determination of dissolved oxygen in the given sample of water by Winkler's method
3. Estimation of iron in the rust
4. Determination of Iron in the given sample of Hematite ore solution using potassium dichromate crystals by external indication method.
5. Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample.

**MATHEMATICS**➤ **List of Major Software Packages available**

**MAPLE and its addon tool box** - Maple 12, Maple Sim, Matlab toolbox, Global Optimization toolbox, Financial Modeling toolbox, Introduction to Grid Computing, Block Builder for Simulink, Block Importer for Simulink