LIST OF EXPERIMENTAL SETUP IN EACH LABORATORY /WORKSHOP

S.No.	Name of the Laboratory	List of Experiments
Biomedical Engineering		
1	GE8161 – Problem Solving and Python Programming Laboratory (Semester – I)	Compute the GCD of two numbers. Find the square root of a number (Newton‘s method) Exponentiation (power of a number) Find the maximum of a list of numbers Linear search and Binary search Selection sort, Insertion sort Merge sort First n prime numbers Multiply matrices Programs that take command line arguments (word count) Find the most frequent words in a text read from a file Simulate elliptical orbits in Pygame Simulate bouncing ball using Pygame
2	BS8161 – Physics and Chemistry Laboratory (Semester – I)	**Physics Laboratory** Determination of rigidity modulus – Torsion pendulum Determination of Young‘s modulus by non-uniform bending method a) Determination of wavelength, and particle size using Laser b) Determination of acceptance angle in an optical fiber. Determination of thermal conductivity of a bad conductor – Lee‘s Disc method Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer Determination of wavelength of mercury spectrum – spectrometer grating Determination of band gap of a semiconductor Determination of thickness of a thin wire – Air wedge method **Chemistry Laboratory** Estimation of HCl using Na2CO3 as primary standard and Determination of alkalinity in water sample. Determination of total, temporary & permanent hardness of water by EDTA method. Determination of DO content of water sample by Winkler‘s method. Determination of chloride content of water s4ample by argentometric method. Estimation of copper content of the given solution by Iodometry. Determination of strength of given hydrochloric acid using pH meter. Determination of strength of acids in a mixture of acids using conductivity meter. Estimation of iron content of the given solution using

		potentiometer. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method). Estimation of sodium and potassium present in water using flame photometer. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer. Pseudo first order kinetics-ester hydrolysis. Corrosion experiment-weight loss method. Determination of CMC. Phase change in a solid. Conductometric titration of strong acid vs strong base.
3	19ES213 - Problem Solving and Python Programming Laboratory (Semester – II)	Write algorithms and pseudo code to solve real time problems, Draw flow chart, Working in Python Interpreter, Simple python programming using looping and conditional statements, Programs to handle strings, Programs using list, tuples and dictionaries, Programs using functions, Programs using modules and packages, Program to handle files and exception handling, Program to draw various charts.
4	19BS102 - Engineering Physics & 19BS105 - Chemistry Laboratory (Semester – I)	**Physics Laboratory** Determination of rigidity modulus – Torsion pendulum Determination of Young's modulus by non-uniform bending method Determination of Young's modulus by uniform bending method Determination of wavelength and particle size using Laser Determination of acceptance angle and numerical aperture in an optical fiber Determination of thermal conductivity of a bad conductor – Lee's Disc method Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer Determination of wavelength of mercury spectrum – spectrometer grating Determination of band gap of a semiconductor Determination of thickness of a thin wire – Air wedge method **Chemistry Laboratory** Determination of Total, Temporary & Permanent hardness of water by EDTA method, Determination of chloride content of water sample by Argentometric method, Determination of Dissolved oxygen content in water sample using Winklers Method, Determination of Alkalinity in Water Sample,

		Determination of strength of given hydrochloric acid using pH meter, Determination of strength of acids in a mixture of acids using conductivity meter, Conductometric titration of Weak acid vs Weak base, Estimation of iron content of the given solution using potentiometer, Conductometric titration of strong acid vs strong base, Determination of Molecular weight of polyvinyl alcohol using Ostwald viscometer, Estimation of iron content of the water sample using spectrophotometer, Estimation of Copper in Brass.
5	GE8261 – Engineering Practices Laboratory (Semester – II)	**GROUP A (CIVIL & MECHANICAL)** **Civil Engineering Practice** **Buildings:** Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects. **Plumbing Works**: Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings. Study of pipe connections requirements for pumps and turbines. Preparation of plumbing line sketches for water supply and sewage works. Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components. Demonstration of plumbing requirements of high-rise buildings. **Carpentry using Power Tools only:** Study of the joints in roofs, doors, windows and furniture. Hands-on-exercise:Wood work, joints by sawing, planing and cutting. **MECHANICAL ENGINEERING PRACTICE** **Welding:** Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding. Gas welding practice **Basic Machining:** Simple Turning and Taper turning Drilling Practice **Sheet Metal Work:** Forming & Bending: Model making – Trays and funnels. Different type of joints. **Machine assembly practice:** Study of centrifugal pump Study of air conditioner

		Demonstration on: Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt. Foundry operations like mould preparation for gear and step cone pulley. Fitting – Exercises – Preparation of square fitting and V – fitting models. **GROUP B (ELECTRICAL & ELECTRONICS)** **ELECTRICAL ENGINEERING PRACTICE** Residential house wiring using switches, fuse, indicator, lamp and energy meter. Fluorescent lamp wiring. Stair case wiring Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit. Measurement of energy using single phase energy meter. Measurement of resistance to earth of electrical equipment. **ELECTRONICS ENGINEERING PRACTICE** Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR. Study of logic gates AND, OR, EX-OR and NOT. Generation of Clock Signal. Soldering practice – Components Devices and Circuits – Using general purpose PCB. Measurement of ripple factor of HWR and FWR.
6	19ES220 - Engineering Practices (Semester – II)	Forming of simple object in sheet metal using suitable tools (Example: Dust Pan / Soap Box Fabrication of a simple component using thin and thick plates. (Example: Book rack) Making a simple component using carpentry power tools. (Example: Pen stand/Tool box/ Letter box. Prepare a "V" (or) Half round (or) Square joint from the given mild Steel flat. Construct a household pipe line connections using pipes, Tee joint, Four way joint, elbow, union, bend, Gate way and Taps (or) Construct a pipe connections of house application centrifugal pump using pipes, bend, gate valve, flanges and foot valve. Prepare a green sand mould using solid pattern/split pattern. Dismantling and assembly of Centrifugal Gear Pump / Gear box. Dismantling and assembly of two-stroke and four-stroke petrol engine. Preparation of butt joints, lap joints and T- joints by Electric Arc Welding. Gas Welding practice.

		Mini-Project (Fabrication of small components).
7	BM8211 – Bio Chemistry Laboratory (Semester – II)	General guidelines for working and functional component of biochemistry lab Preparation of solutions: percentage solutions, molar solutions, normal solutions Standardization of pH meter, preparation of buffers, emulsions. Spectroscopy: Determination of absorption maxima (λmax) of a given solution General tests for carbohydrates, proteins and lipids. Identification of Blood Collection Tubes and Phlebotomy equipments Preparation of serum and plasma from blood. Estimation of Haemoglobin Estimation of blood glucose. Estimation of creatinine. Estimation of urea. Estimation of Uric acid Estimation of cholesterol Assay of SGOT/SGPT. ELISA test Separation of proteins by SDS electrophoresis(Demo) Separation of amino acids by thin layer chromatography (Demo).
8	19BS106 - Bio Chemistry Laboratory (Semester – I)	Preparation of solutions: 1) Percentage solutions, 2) Molar solutions, 3) Normal solutions, Determination of strength of given solution using pH meter, Spectroscopy: Determination of absorption maxima (λmax) of a given solution, General tests for carbohydrates, proteins and lipids, Preparation of serum and plasma from blood, Estimation of Haemoglobin from blood, Estimation of blood glucose from blood, Estimation of urea from blood, Estimation of creatinine from blood, Estimation of cholesterol from blood.
9	BM8311 – Pathology and Microbiology Laboratory (Semester – III)	Urine physical and chemical examination (protein, reducing substances, ketones, bilirubin and blood) Study of parts of compound microscope Histopathological slides of benign and malignant tumours. Manual paraffin tissue processing and section cutting (demonstration) Cryo processing of tissue and cryosectioning (demonstration) Basic staining – Hematoxylin and eosin staining. Special stains – cresyl fast Blue (CFV)- Trichrome – oil red O – PAS Capsule stain Simple stain.

		Gram stain. AFB stain. Antigen-Antibody reaction Immuno electrophoresis Slides of malarial parasites, micro filaria and leishmania donovani. Haematology slides of anemia and leukemia. Study of bone marrow charts.
10	19BM303 - Pathology and Microbiology Laboratory (Semester – III)	Urine physical and chemical examination Study of parts of compound microscope Histopathological slides of benign and malignant tumours. Manual paraffin tissue processing and section cutting (demonstration) Cryo processing of tissue and cryosectioning (demonstration) Basic staining – Hematoxylin and eosin staining Special stains – cresyl fast Blue (CFV)- Trichrome – oil red O – PAS Capsule , Simple, AFB and Gram stain Antigen-Antibody reaction Immuno electrophoresis Slides of malarial parasites, micro filaria and leishmaniadonovani Haematology slides of anemia and leukemia Study of bone marrow charts
11	BM8312 – Devices and Circuits Laboratory (Semester – III)	Characteristics of PN Junction Diode Zener diode Characteristics & Regulator using Zener diode Common Emitter input-output Characteristics Common Base input-output Characteristics FET Characteristics SCR Characteristics Clipper and Clamper & FWR Verifications of Thevinin & Norton theorem Verifications of KVL & KCL Verifications of Super Position Theorem Verifications of maximum power transfer & reciprocity theorem Determination Of Resonance Frequency of Series & Parallel RLC Circuits Transient analysis of RL and RC circuits
12	19ES217 – Devices and Circuits Laboratory (Semester – II)	Study of Electronic Components Measurement of AC Signal Parameter using CRO Characteristics of PN Junction Diode Characteristics of Zener Diode Measurement of Ripple factor of FWR& HWR Characteristics Common Emitter Configuration Characteristics Common Base Configuration FET Characteristics SCR Characteristics Frequency Response of BJT and FET Amplifiers Soldering Practice using general purpose PCB.
13	BM8313 – Human Physiology Laboratory	Collection of Blood Samples Identification of Blood groups (Forward and Reverse)

	(Semester – III)	Bleeding and Clotting time Estimation of Hemoglobin Total RBC Count Total WBC Count Differential count of Blood cells Estimation of ESR PCV, MCH, MCV, MCHC Hearing test – Tuning fork Visual Activity – Snellen‘s Chart and Jaeger‘s Chart
14	19BM304 - Human Physiology Laboratory	Collection of Blood Samples Identification of Blood groups (Forward and Reverse) Bleeding and Clotting time Estimation of Hemoglobin Total RBC Count Total WBC Count Differential count of Blood cells Estimation of ESR PCV, MCH, MCV, MCHC Hearing test – Tuning fork Visual Activity – Snellen‘s Chart and Jaeger‘s Chart
15	EC8381 – Fundamentals of Data Structures In C Laboratory (Semester – IV)	Basic C Programs – looping, data manipulations, arrays Programs using strings – string function implementation Programs using structures and pointers Programs involving dynamic memory allocations Array implementation of stacks and queues Linked list implementation of stacks and queues Application of Stacks and Queues Implementation of Trees, Tree Traversals Implementation of Binary Search trees Implementation of Linear search and binary search Implementation Insertion sort, Bubble sort, Quick sort and Merge Sort Implementation Hash functions, collision resolution technique
16	BM8411 – Integrated Circuits Laboratory (Semester – IV)	**DESIGN AND TESTING OF** Inverting, Non inverting and differential amplifiers. Integrator and Differentiator. Instrumentation amplifier Active low-pass, High-pass and band-pass filters. Astable & Monostable multivibrators and Schmitt Trigger using op-amp. RC Phase shift and Wien bridge oscillators using op-amp. Astable and monostable multivibrators using NE555 Timer. PLL characteristics and its use as Frequency Multiplier. DC power supply using LM317 and LM723. **LIST OF DIGITAL EXPERIMENTS** Design and implementation of code converters using logic gates BCD to excess-3 code and vice versa

		Binary to gray and vice-versa Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483 Design and implementation of Multiplexer and De-multiplexer using logic gates Design and implementation of encoder and decoder using logic gates Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters Design and implementation of 3-bit synchronous up/down counter Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops. SPICE Simulation studies.
17	19BM406 - Analog and Digital IC Laboratory (Semester – IV)	**List of Analog Experiments** Design of Regulated Power supplies Frequency Response of CE amplifiers Differential Amplifiers - Transfer characteristics, CMRR Measurement Analysis of BJT with Fixed bias and Voltage divider bias using Spice Analysis of FET with fixed bias, self-bias and voltage divider bias using simulation software like Spice **List of Digital Experiments** Design and implementation of code converters using logic gates BCD to excess-3 code ii) Binary to gray Design and implementation of Multiplexer and De-multiplexer using logic gates Design and implementation of encoder and decoder using logic gates Construction and verification of 4 bit ripple counter and Mod-10 Ripple counters Design and implementation of 3-bit synchronous up/down counter
18	EC8562 – Digital Signal Processing Laboratory (Semester – V)	**LIST OF EXPERIMENTS: MATLAB / EQUIVALENT SOFTWARE PACKAGE** Generation of elementary Discrete-Time sequences Linear and Circular convolutions Auto correlation and Cross Correlation Frequency Analysis using DFT Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and Demonstrate the filtering operations **DSP PROCESSOR BASED IMPLEMENTATION** Study of architecture of Digital Signal Processor Perform MAC operation using various addressing modes Generation of various signals and random noise Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band stop filtering

		Design and demonstration of Butter worth and Chebyshev IIR Filters for Low pass, High pass, Band pass and Band stop filtering Implement an Up-sampling and Down-sampling operation in DSP Processor
19	19BM604 - Bio Signal and Image Processing Laboratory (Semester – VI)	Preprocessing of Bio signals Analysis of ECG signals – Removal of artifacts like power line interference, baseline, electrode movement, wandering etc. and study of abnormalities in ECG pattern - using LABVIEW / MATLAB. Analysis of EEG Signal – Extraction of rhythms (delta, theta, alpha, beta and gamma waves), calculate Power spectral density in each rhythms using LABVIEW / MATLAB Analysis of EEG bands. Feature extraction in EMG signals Preprocessing of medical images. Denoising of medical images. Image Enhancement using Python Human Joint angle measurements using standard Goniometer Human Joint angle measurements using electronic Goniometer Study of DICOM standards.
20	BM8511 – Biomedical Instrumentation Laboratory (Semester – V)	Design of pre amplifiers to acquire bio signals along with impedance matching circuit using suitable IC's Design of ECG Amplifiers with appropriate filter to remove power line and other artifacts. Design of EMG amplifier Design a suitable circuit to detect QRS complex and measure heart rate Design of frontal EEG amplifier Design of EOG amplifier to detect eye blink Design a right leg driven ECG amplifier Design and study the characteristics of optical Isolation amplifier Design a Multiplexer and Demultiplexer for any two biosignals Measurement of pulse-rate using Photo transducer Measurement of pH and conductivity Measurement of blood pressure using sphygmomanometer Measurement and recording of peripheral blood flow Design a PCB layout for any bio amplifier using suitable software tool
21	19BM507 - Bio Instrumentation Laboratory (Semester – V)	Design of low noise pre-amplifier. Design of ECG amplifier and Measurement of heart rate. Design of EMG amplifier. Measurement of heart sounds using PCG. Measurement of pulse-rate using Photo transducer. Measurement of respiration rate. Measurement of blood flow velocity using ultrasound transducer.

		Measurement of blood pressure using sphygmomanometer. Study of characteristics of optical Isolation amplifiers. Measurement of vital parameters using Patient Monitoring System Study of Biotelemetry
22	EC8681 – Microprocessors and Microcontrollers Laboratory (Semester – VI)	**8086 Programs using kits and MASM** Basic arithmetic and Logical operations Move a data block without overlap Code conversion, decimal arithmetic and Matrix operations. Floating point operations, string manipulations, sorting and searching Password checking, Print RAM size and system date Counters and Time Delay **Peripherals and Interfacing Experiments** Traffic light controller Stepper motor control Digital clock Key board and Display Printer status Serial interface and Parallel interface A/D and D/A interface and Waveform Generation **8051 Experiments using kits and MASM** Basic arithmetic and Logical operations Square and Cube program, Find 2's complement of a number Unpacked BCD to ASCII
23	19BM407 - Microprocessor and Microcontroller Laboratory (Semester – IV)	Arithmetic operations using 8086, Sorting, searching and string manipulation using 8086, Hex. to ASCII/BCD code conversion using 8086 microprocessor, Matrix Addition / Subtraction using 8086 microprocessor, Addition / Subtraction / Multiplication / Division using 89c51 microcontroller, Interfacing of switch and LED with 89c51/8086 microcontroller, Interfacing of ADC with 89c51/8086 microcontroller, Interfacing of DAC with 89c51/8086 microcontroller, Stepper Motor/DC Motor interfacing with 89c51/8086 microcontroller, UART /LCD interfacing with 89c51/8086 microcontroller.
24	BM8611 – Diagnostic and Therapeutic Equipment Laboratory (Semester – VI)	Measurement of visually evoked potential Galvanic skin resistance (GSR) measurement Study of shortwave and ultrasonic diathermy Measurement of various physiological signals using biotelemetry Study of hemodialysis model Electrical safety measurements Measurement of Respiratory parameters using spirometry.

		Study of medical stimulator Analyze the working of ESU – cutting and coagulation modes Recording of Audiogram Study the working of Defibrillator and pacemakers Analysis of ECG, EEG and EMG signals Study of ventilators Study of Ultrasound Scanners Study of heart lung machine model
25	19BM506 – Diagnostic and Therapeutic Equipment Laboratory (Semester – V)	Measurement of Visually Evoked Potential, Galvanic Skin Resistance (GSR) measurement, Study of Shortwave and Ultrasonic Diathermy, Measurement of various physiological signals using Biotelemetry, Study of Hemodialysis model, Electrical safety measurements, Measurement of Respiratory parameters using Spirometry, Study of Medical Stimulator, Analyze the working of ESU – Cutting and Coagulation modes, Recording of Audiogram, Study the working of Defibrillator and Pacemakers, Analysis of ECG, EEG and EMG signals, Study of Ventilators, Study of Ultrasound Scanners, Study of Heart Lung Machine Model.
26	EC8762 - Digital Image Processing Laboratory (Semester – VII)	Image sampling and quantization Analysis of spatial and intensity resolution of images. Intensity transformation of images. DFT analysis of images Transforms (Walsh, Hadamard, DCT, Haar) Histogram Processing and Basic Thresholding functions Image Enhancement-Spatial filtering Image Enhancement- Filtering in frequency domain Image segmentation – Edge detection, line detection and point detection. Basic Morphological operations. Region based Segmentation Segmentation using watershed transformation Analysis of images with different color models. Study of DICOM standards Image compression techniques Image restoration A mini project based on medical image processing
27	19BM705 – Data Acquisition and Processing Laboratory (Semester – VII)	Acquisition and analysis of bio signals using workstation, Study of auditory and visual evoked responses, Development of software for basic telemedicine, Development of neural network for signal classification, Acquisition and analysis of medical images, Development of software for medical image

		compression, Development of algorithm for medical data security, Study of IDL as a tool for medical image analysis, Study of DICOM standards, Study of lung and cardiovascular models, Electrical safety testing of medical equipment.
Information Technology		
1.	19ES104-Python Programming Laboratory	Find the Greatest among three numbers without using third variable Sum of the Digits of a Number Generation of Prime Numbers Implement a Sequential Search Create a calculator program Explore string functions Implement Selection Sort Implement Stack Read and write into a file Demonstrate usage of basic regular expression Demonstrate use of advanced regular expressions for data validation. Demonstrate use of List Demonstrate use of Dictionaries Create Comma Separate Files (CSV), Load CSV files into internal Data Structure
2.	19ES105- Computer Hardware Servicing and Maintenance Laboratory	Introducing Hardware & Operating Systems Form Factors and Power Supplies –SMPS Processors and Chipsets Motherboard types PC Repair Fundamentals Hard disk Partitioning and Disk Defragmentation Installing Windows OS, Linux & Maintaining Windows OS, Linux Upgrading Memory and Hard Drives Installing and Supporting I/O Devices Installing Multimedia Devices and Mass Storage Installing Device Drivers – Sound, Display, Printer and Scanner Drivers Install and configure the necessary components for a small peer-to-peer network for sharing files and printers. Install and configure PC with internet for sharing data. Securing the PC and LAN.
3.	19BS105-Chemistry Laboratory	Determination of Total, Temporary & Permanent hardness of water by EDTA method. Determination of chloride content of water sample by Argentometric method. Determination of Dissolved oxygen content in water sample using Winklers Method Determination of Alkalinity in Water Sample Determination of strength of given hydrochloric acid using pH meter Determination of strength of acids in a mixture of acids

		using conductivity meter Conductometric titration of Weak acid vs Weak base. Estimation of iron content of the given solution using potentiometer. Conductometric titration of strong acid vs strong base. Determination of Molecular weight of polyvinyl alcohol using Ostwald viscometer Estimation of iron content of the water sample using spectrophotometer Estimation of Copper in Brass
4.	19ES221- Engineering Drawing Laboratory	Forming of simple object in sheet metal using suitable tools (Example: Dust Pan / Soap Box Fabrication of a simple component using thin and thick plates. (Example: Bookrack) Making a simple component using carpentry power tools. (Example: Pen stand/Tool box/ Letter box. Prepare a "V" (or) Half round (or) Square joint from the given mild Steel flat. Construct a household pipe line connections using pipes, Tee joint, Four way joint, elbow, union, bend, Gate way and Taps (or) Construct a pipe connections of house application centrifugal pump using pipes, bend, gate valve, flanges and foot valve. Prepare a green sand mould using solid pattern/split pattern. Construct a domestic electrical wire connections using indicator, one way switch with calling bell, two way switch with lamp, one way switch with fan regulator and one way switch with socket. Dismantling and assembly of Centrifugal Mono block / Gear Pump / Gearbox. Dismantling and assembly of two stroke and four stroke petrol engine. Mini Project (Fabrication of Small Components).
5.	19ES214- Advanced C Programming Laboratory	Programs using only I/O Functions Programs to study operators and datatypes Programs based on control Structures Programs using For and While loops Programs using single dimensional arrays Programs using multi-Dimensional arrays Programs on Sorting and searching using arrays Programs based on string Manipulations Programs based on User defined function programs Programs using Functions with parameters Program using storage classes Programs to introduce pointers Programs using structures Programs using array of structures Program to send and receive signals Program to handle process Program to display device details
6.	19IT305- DBMS Laboratory	Conceptual Database design using E-RDIAGRAM. Implementation f SQL commands DDL,

		DML, DCL and TCL Queries to demonstrate implementation of Integrity Constraints Practice of In built functions Implementation of Join operation and Nested Queries, practicing set operators in SQL queries Implementation of virtual tables using Views Practice of Procedural extensions (Procedure, Function, Cursors, Triggers) Application Development using front end tools Inventory Control System Railway Reservation System Bank Management System Payroll Processing System Hotel Management System Project Management System Student Information System Study of Mongo DB
7.	19IT306- Data Structures and Algorithms Laboratory	Implementation of Searching Algorithms Implementation of sorting algorithms Implementation of Array ADT Implementation of Stack ADT using Arrays and Linked list Implementation of Queue ADT using Arrays and Linked list Implementation of Doubly Ended Queue Applications of Stack and Queue Implementation of Singly and Doubly Linked Lists Implementation of Tree Traversals Implementation of Binary Search Tree Implementation of AVL Trees Implementation of Graph Traversals Implementation of Minimum Spanning Tree
8.	19ES308-Digital Electronics Laboratory	Logic gates using discrete Components. Verification of truth table for AND, OR, NOT, NAND, NOR and XOR gates. Realization of NAND and NOR gates **Implementation of Logic Circuits.** Verification of Boolean laws. Verification of DeMorgan's law **Adder and Subtractor** Implementation of Half-Adder and Full-Adder Implementation of Half-Subtractor and Full Subtractor **Combinational Circuit Design** Design of Decoder and Encoder Design of Code Converter. Design of multiplexers and demultiplexers. **Sequential Circuit Design** Implementation of Shift registers, Serial Transfer. Ring Counter , 4-bit Binary Counter , BCD Counter.
9.	19IT403- Operating Systems Laboratory	Install and Configure Operating System (Linux and Windows)

		Unix commands and Shell programming Inter-process Communication using pipes Simulation of CPU Scheduling algorithms Implementation of page replacement Algorithms Simulation of memory management Schemes Implementation of file methods Virtualization Kernel Configuration Mini Project : Develop Linux like OS with 10 Linux commands demonstration
10.	19IT404- Object Oriented Programming Laboratory	Programs using class and methods Program using Inner class and static Program to demonstrate file handling Program using single and multi level inheritance Inheritance via Interface and Abstract class Programs on Package implementations Applications using Generic collections Program using IO Streaming Create user defined exception Develop application to demonstrate multithreading Program using Applet Program to demonstrate event handing using AWT/Swing Program to demonstrate Layout Managers
11.	19HS401-Language Skills	Listening Speaking Reading Writing Integration of LSRW
12.	19IT504- Internet Programming Laboratory	Programs in java using servlets Write programs in Java to create three-tier applications using JSP and Databases for conducting on-line examination. For displaying student mark list. Assume that student information is available in a database which has been stored in a database server. To invoke Servlets from HTML Forms To invoke servlets from Applets Create a web page with the following using HTML To embed an image map in a web page To fix the hotspots Show all the related information when the hot spots are clicked. Create a web page with all types of Cascading stylesheets Client Side Scripts for Validating Web Form Controls using DHTML Write programs in Java to create applets incorporating the following features: Create a color palette with matrix of buttons Set background and foreground of the control text area by selecting a color from color palette. In order to

		select Foreground or background use check box control as radio buttons To set background images Programs using XML – Schema–XSLT/XSL Programs using AJAX Consider a case where we have two web Services- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Database.
13.	19IT505- Computer Networking Laboratory	Network topology – study experiment Types of Cables – study experiment Basic switch setup & Configuring switch interfaces VLAN and VTP configuration Basic router setup Prepare the Network, perform all the necessary basic configurations for your device. Configure and Activate Serial and Ethernet Addresses and assign appropriate addresses to the device interfaces. Configure the DHCP configurations Configure the Port Security for the ports connected to the switches Configure the access-list in routers Check the Connectivity to all the devices inside your LAN Configure RIP Routing on the Router and verify the Configurations &Connectivity
14.	19HS504- Professional Skills for Software Engineers	Listening Public Speaking Academic Reading Writing Skills IT Career Skills
15.	19IT604- Cloud Computing Laboratory	Install Virtualbox/VMware Work station with different flavours of Linux or Windows OS on top of Windows InstallaCompilerintheVirtualMachinecreatedusingVirtual boxandexecutesimpleprograms Install GoogleApp Engine. Create hello world app and other simple web applications using Python/Java. Use GAE launcher to launch the Web Applications. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm that is not present in CloudSim. Find a procedure to transfer the files from one Virtual Machine to another Virtual Machine. Find a procedure to launch Virtual Machine using try stack(Online Open Stack Demo Version) Install Hadoop Single node Cluster and run simple applications like word count
16.	19IT605-Comprehensive Review-I	Review, prepare and present technological developments
17.	19IT606- Mini Project	--
18.	19IT704- IOT Laboratory	LED ON/OFF Pattern

		Push Button Control with LED Pattern Push Button Counter Temperature and Humidity Sensor Interface Fire Alarm Remote Controlled AC Fan Regulator Motion Detection Playing Music Controlling and Monitoring a Traffic Light Controller Password Security Lock System
19.	19IT705- Security Laboratory	Create various Network Topologies emulated in Packet Tracer 7.3.1. Study various types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool. Configure basic settings such as hostname, motd banner, encrypted passwords, and terminal options on a Cisco Catalyst 2960 switch emulated in Packet Tracer 7.3.1. Examine and configure a standalone LAN switch using Cisco Packet tracer. Configure VLAN and VTP on a small network of 4 switches using Packet Tracer. Perform basic configuration to secure administrative access to the router using Packet Tracer. Prepare a network simulated environment and perform all the necessary basic configurations for the device. Activate the Serial and Ethernet addresses and assign appropriate addresses to the device interfaces. Configure DHCP configuration in the respective routers. 10.Enable the port security for the ports connected to the switches. 11.Configure the access list in Routers. 12.Verify connectivity of directly connected networks. 13.Configure RIP routing on the router and verify the configurations and connectivity.
Electronics and Communication Engineering		
1.	19BS105- Chemistry Laboratory	Determination of Total, Temporary & Permanent hardness of water by EDTA method. Determination of chloride content of water sample by Argentometric method. Determination of Dissolved oxygen content in water sample using Winklers Method Determination of Alkalinity in Water Sample Determination of strength of given hydrochloric acid using pH meter. Determination of strength of acids in a mixture of acids using conductivity meter. Conductometric titration of Weak acid vs Weak base.

		Estimation of iron content of the given solution using potentiometer. Conductometric titration of strong acid vs strong base. Determination of Molecular weight of polyvinyl alcohol using Ostwald viscometer Estimation of iron content of the water sample using spectrophotometer Estimation of Copper in Brass
2.	19ES104- Python Programming Laboratory	Find the Greatest among three numbers without using third variable Sum of the Digits of a Number Generation of Prime Numbers Implement a sequential search Create a calculator program Explore string functions Implement Selection Sort Implement Stack Read and write into a file Demonstrate usage of basic regular expression Demonstrate use of advanced regular expressions for data validation. Demonstrate use of List Demonstrate use of Dictionaries Create Comma Separate Files (CSV), Load CSV files into internal Data Structure
3.	19ES214- Advanced C Programming Laboratory	Programs using only I/O Functions Programs to study operators and data types Programs based on control Structures Programs using For and While loops Programs using single dimensional arrays Programs using multi Dimensional arrays Programs on Sorting and searching using arrays Programs based on string Manipulations Programs based on User defined function programs Programs using Functions with parameters Program using storage classes Programs to introduce pointers Programs using structures Programs using array of structures Program to send and receive signals Program to handle process Program to display device details
4.	19ES219- Devices Laboratory	Characteristics of PN Junction Diode Zener diode Characteristics & Regulator using Zener diode Common Emitter input-output Characteristics Common Base input-output Characteristics Characteristics of FET Characteristics of SCR Characteristics of UJT Characteristics of MOSFET Characteristics of TRIAC Simulation of Characteristics of PN Junction Diode and

		Zener diode using SPICE Simulation of Characteristics of BJT (common emitter configuration) and determination of h parameters using SPICE Simulation of Characteristics of JFET and MOSFET using SPICE Simulation of Characteristics of SCR and UJT using SPICE
5.	19EC305- Analog Electronics Laboratory	Frequency Response of CE and CS amplifiers Darlington Amplifier Differential Amplifiers - Transfer characteristics, CMRR Measurement Cascode and Cascade amplifiers Series and Shunt feedback amplifiers Astable and Monostable multivibrators using Spice Analysis of Frequency Response of BJT and FET using Spice Bistable Multivibrator using Spice
6.	19EC306- Digital Electronics Laboratory	Verification of Boolean theorems using digital logic gates. Design and implementation adder and Subtractor using logics Design and implementation of 4 bit binary Adder/ Subtractor using MSI devices. Design and implementation of code converters using logic gates BCD to excess-3 code and vice versa (ii) Binary to gray and vice-versa Design and implementation of multiplexers and demultiplexers using basic gates and MSI devices Design and implementation of decoders and encoders using basic gates and MSI devices Implementation of Boolean Functions using MUX Design and implementation of simple ALU using basic gates and MSI devices Design and implementation of paritygenerator/checker using basic gates and MSI devices Design and implementation of magnitude comparator using basic gates and MSI devices Design of BCD to seven-segment display using 7447 IC Construction and verification of 4 bit ripple counter and Mod-10 /Mod-12 Ripple counters Design and implementation of shift registers in SISO, SIPO PISO, PIPO modes using ICs. Simulation of Boolean theorems , adder and Subtractor , 4 bit binary Adder
7.	19EC404- Linear Integrated Circuits Laboratory	Design and testing of Inverting, Non-Inverting Amplifiers, Summer, Subtractor, Differentiator and Integrator using op-amps and Spice Simulation. Design and testing of Precision half wave and Full wave rectifiers using op-amps and Spice Simulation.

		RC phase shift and wein bridge oscillator using Op-Amps- Multisim Design and testing of Comparator, Zero crossing Detectors, Peak Detector and Schmitt trigger using op-amps and Spice Simulation. Design of Astable and Monostable Multivibrator & Schmitt trigger circuit using IC 741 Design and testing of Active Analog Filters using op-amp. Astable multivibrator ,Monostable multivibrator & Schmitt trigger circuit using IC 555 Design of D/A Converter using R-2R ladder network and A/D Convertor using flash type. Study of Phase Locked Loop (PLL) and Spice Simulation. Voltage regulator using 7805 and Spice Simulation.
8.	19EC405- Digital Signal Processing Laboratory	Generation of basic continuous-time (CT) and Discrete time (DT) signals i) unit impulse ii) unit step iii) ramp iv)exponential v) sinusoid vi) sinc vii) square viii) signum ix)triangle Basic operation on CT and DT signals i) time reversal ii)time shifting iii) time scaling iv) signal addition v) signal multiplication vi) combination of various operations Computation of convolution and Correlation of given signals Overlap add and overlap save method for performing Convolution Implementation of FFT algorithm. Sampling and Reconstruction of a signal IIR Filter Design using bilinear transformation and impulse invariant technique. FIR Filter design using windows. Graphical simulations and modeling of an image using MATLAB Modeling and Prototyping With Simulink Arithmetic operation using Digital Signal Processor. Wave form generation using Digital Signal Processor. Implementation of FIR filter using Digital Signal Processor
9.	19EC504- Microprocessor Microcontroller and Interfacing Laboratory	Arithmetic operations using 8086 Sorting, searching and string manipulation using 8086 Hex. to ASCII/BCD code conversion using 8086 microprocessor Matrix Addition / Subtraction using 8086 microprocessor Addition / Subtraction / Multiplication / Division using 89c51microcontroller Interfacing of switch and LED with 89c51/8086 microcontroller Interfacing of ADC with 89c51/8086 microcontroller. Interfacing of DAC with 89c51/8086 microcontroller. Stepper Motor/DC Motor interfacing with 89c51/8086

		microcontroller UART /LCD interfacing with 89c51/8086
10.	19EC505- Communication Systems Laboratory	AM modulation and demodulation FM transmitter & receiver Signal sampling and reconstruction PAM,PPM,PWM modulation and demodulation Pulse code modulation and demodulation Delta modulation and demodulation Time Division Multiplexing Modulation and demodulation of shift keying techniques Radiation pattern measurement of dipole antenna Radiation pattern measurement of Yagi-uda antenna Design and simulate the shift keying techniques Simulation of convolution coding scheme.
11.	19EC603- VLSI Design Laboratory	Design and simulation of combinational circuits Design and simulation of Binary Multiplier (Array /Wallace tree/Booth). Design and simulation of MAC Design and simulation of sequential circuits (Counter/Shift Registers). Design and simulation of FSM. Design and implementation of 4-bit Adder (RCA/CLA/CSA). Design and implementation of 4 bit ALU on FPGA board. Design and implementation of 4 bit Ripple Counter Design and implementation of Traffic Light controller / Real Time Clock on FPGA board. Design and simulation of CMOS gates using Microwind /Tanner EDA Tool.
12.	19CS406- Networking Laboratory	Basic switch setup Configuring switch interfaces VLAN and VTP configuration Basic router setup Prepare the Network, perform all the necessary basic configurations for your device. Configure and Activate Serial and Ethernet Addresses and assign appropriate addresses to the device interfaces. Configure the DHCP configurations in the respective routers Configure the Port Security for the ports connected to the switches Configure the access-list in routers Check the Connectivity to all the devices inside your LAN Configure RIP Routing on the Router and verify the Configurations & Connectivity
13.	EC8561- Communication Systems Laboratory	Signal Sampling and reconstruction Time Division Multiplexing AM Modulator and Demodulator FM Modulator and Demodulator

		Pulse Code Modulation and Demodulation Delta Modulation and Demodulation Line coding schemes Simulation of ASK, FSK, and BPSK generation schemes Simulation of DPSK, QPSK and QAM generation schemes Simulation of signal constellations of BPSK, QPSK and QAM Simulation of ASK, FSK and BPSK detection schemes Simulation of Linear Block and Cyclic error control coding schemes Simulation of Convolutional coding scheme Communication link simulation
14.	EC8681-Microprocessors and Microcontrollers Laboratory	8086 Programs using kits and MASM Basic arithmetic and Logical operations Move a data block without overlap Code conversion, decimal arithmetic and Matrix operations. Floating point operations, string manipulations, sorting and searching Password checking, Print RAM size and system date Counters and Time Delay Peripherals and Interfacing Experiments Traffic light controller Stepper motor control Digital clock Key board and Display Printer status Serial interface and Parallel interface A/D and D/A interface and Waveform Generation 8051 Experiments using kits and MASM Basic arithmetic and Logical operations Square and Cube program, Find 2's complement of a number Unpacked BCD to ASCII
15.	EC8562 -Digital Signal Processing Laboratory	Simulation using MATLAB software Generation of signals Correlation Linear and Circular Convolutions Sampling and effect of aliasing FFT using DIT algorithm Spectrum analysis using DFT Design of Butterworth digital IIR filters Design of chebychev digital IIR filters Design of FIR filters using window Design of Multirate filter Implementation using TMS320C6713 Study of signal processing architecture Mac operation using addressing modes Waveform generation FIR low pass filter IIR low pass filter Up sampling and down sampling operation

16.	EC 8563- Communication Networks Laboratory	Study of Network Topology - Star, Bus, Ring using LAN Trainer Implementation of Goback-N and selective repeat protocols using LAN Trainer Study of Goback-N and selective repeat protocols using NETSIM software Implementation of Stop and Wait Protocol and sliding window using LAN Trainer Study of Stop and Wait Protocol and sliding window using NETSIM software Study of Error Detection and Error Correction Techniques usingNETSIM software Write a C-program for Error Detection and Error Correction Techniques Study of distance vector routing algorithm using NETSIM software Study of Link state routing algorithm using NETSIM software Implementation of High Level Data Link Control (ARP Protocol) using NETSIM software Implementation of Encryption and decryption using LAN Trainer Study of Encryption and decryption using NETSIM software Write a C-program for Encryption and decryption Write a C-program for distance vector routing algorithm Study of Socket Programming and Client – Server model Write a socket Program for Echo/Ping/Talk commands Wireless LAN Protocol performance of the network with CSMA/CA protocol comparison of CSMA/CA with CSMA/CD protocol Study of Network simulator (NS) and simulation of Congestion Control Algorithms
17.	EC8711- Embedded Laboratory	Study of ARM evaluation system Interfacing ADC and DAC Interfacing LED and PWM. Interfacing real time clock and serial port. Interfacing keyboard and LCD. Interfacing EPROM and interrupt. Mailbox. Interrupt performance characteristics of ARM and FPGA. Flashing of LEDS. Interfacing stepper motor and temperature sensor. Implementing zigbee protocol with ARM.
18.	EC8761-Advanced Communication Lab	Mode Characteristics of Reflex Klystron Oscillator Characteristics of gunn diode oscillator Measurement of VSWR using slotted line method Impedance measurement by slotted line method. Measurement of numerical aperture Mode characteristics of fiber.

		Measurement of propagation losses and bending losses in optical fiber DC characteristics of led and pin photodiode S-parameter measurement in isolator, circulator. S-parameter measurement in directional coupler Wireless Channel Simulation including fading and Doppler effects Simulation of Channel Estimation, Synchronization & Equalization techniques Analysing Impact of Pulse Shaping and Matched Filtering using Software Defined Radios OFDM Signal Transmission and Reception using Software Defined Radios
19.	EC8661-VLSI design laboratory	Design and implementation of 8-bit adder. Design and implementation of 4*4 array Multiplier. Design and implementation of Multiplexer & Demultiplexers. Design and implementation of 4 bit Ripple Counter. Design and implementation of ALU. Design and implementation of Universal Shift Register. Design and implementation of FSM. Design and implementation of Memories Design and simulation of CMOS Inverter, NAND & NOR gate. Design and simulation of Flip flops. Design and simulation 4-bit synchronous counter. Design and simulation of CMOS Inverting Amplifier & 5 transistor differential amplifier. Design and simulation of Common Source, Common Gate and Common Drain Amplifiers. Design Layout of CMOS Inverter, NAND & NOR gate.
B.E. Electrical and Electronics Engineering		
1	19BS102 - Engineering Physics	Determination of rigidity modulus – Torsion pendulum Determination of Young's modulus by non-uniform bending method Determination of Young's modulus by uniform bending method Determination of wavelength and particle size using Laser Determination of acceptance angle and numerical aperture in an optical fiber Determination of thermal conductivity of a bad conductor– Lee's Disc method Determination of velocity of sound and compressibility of liquid– Ultrasonic interferometer Determination of wavelength of mercury spectrum– spectrometer grating Determination of band gap of a semiconductor Determination of thickness of a thin wire – Air wedge method
2	19ES104 - Python Programming Laboratory	Find the Greatest among three numbers without using third variable

		Sum of the Digits of a Number Generation of Prime Numbers Implement a sequential search Create a calculator program Explore string functions Implement Selection Sort Implement Stack Read and write into a file Demonstrate usage of basic regular expression Demonstrate use of advanced regular expressions for data validation. Demonstrate use of List Demonstrate use of Dictionaries Create Comma Separate Files (CSV), Load CSV files into internal Data Structure
3	19BS105 - Chemistry Laboratory	Determination of Total, Temporary & Permanent hardness of water by EDTA method. Determination of chloride content of water sample by Argentometric method. Determination of Dissolved oxygen content in water sample using Winklers Method Determination of Alkalinity in Water Sample. Determination of strength of given hydrochloric acid using pH meter. Determination of strength of acids in a mixture of acids using conductivity meter. Conductometric titration of Weak acid vs Weak base. Estimation of iron content of the given solution using potentiometer. Conductometric titration of strong acid vs strong base. Determination of Molecular weight of polyvinyl alcohol using Ostwald viscometer Estimation of iron content of the water sample using spectrophotometer Estimation of Copper in Brass
4	19ES107 - Workshop Practices	Forming of simple object in sheet metal using suitable tools (Example: Dust bin / Tray) Fabrication of a simple component using thin and thick plates. (Example: Book rack) Making a simple component using carpentry power tools. (Example: Pen stand/Tool box/ Letter box) Prepare a "V", Half-round or Square joint from the given mild steel flat plate. Construct a household pipe line connections using pipes, Tee-joint, Four-way joint, elbow, union, bend, gateway and taps (or) Construct a pipe connection for domestic application (centrifugal pump) using pipes, bend, gate valve, flanges and foot valve Prepare a green sand mould using solid pattern/split pattern. Dismantling and assembly of Centrifugal Gear Pump / Gear box. Dismantling and assembly of two-stroke and four-

		stroke petrol engine. (a) Preparation of butt joints, lap joints and T- joints by Electric Arc Welding. Gas Welding practice. Mini-Project (Fabrication of small components).
5	19ES218 - Electronic Devices and Circuits Laboratory	Verify the characteristics of PN junction diode and Zener diode. Designing to measure the ripple factor at the output of Half wave rectifier with and without capacitive filter. Designing to measure the ripple factor at the output of (a)Full Wave rectifier with and without filter capacitor (b)Bridge rectifier with and without filter capacitor. Verify the Input and Output characteristics of CE and CB Configurations. Design and verify the frequency response of single stage transistor amplifier. Verify the transfer characteristics of FET. Verify the V-I characteristic of photo diode. Design and verify the frequency response of RC Phase shift and Wein bridge oscillator. Simulate clipper and clamper circuits Study of digital storage oscilloscope.
6	19EE306 - DC Machines and Transformers Laboratory	Load test on DC Shunt motor. Load test on DC Series motor. Load test on DC Compound motor. Speed Control of DC Motor: Field control, Armature control. Swinburne's test and separation of losses in DC Machine. Open circuit and Load characteristics of DC generator (Self and Separately Excited). Load test on DC series generator. Hopkinson's test. Load test on single phase transformer. Open circuit & Short circuit test on single phase transformer. Sumpner's test.
7	19EE307 - Electric Circuits Laboratory	Verification of ohm's laws and Kirchhoff's laws. Verification of Thevenin's and Norton's theorem. Verification of superposition Theorem. Verification of maximum power transfer theorem. Verification of reciprocity theorem. Measurement of self inductance of a coil. Verification of mesh and nodal analysis. Transient response of RL and RC circuits for DC input. Frequency response of series and parallel resonance circuits. Frequency response of single tuned coupled circuits.
8	19EE405 - AC Machines Laboratory	Regulation of three phase alternator by E.M.F. method. Regulation of three phase alternator by M.M.F.

		method. Regulation of three phase alternator by ZPF. method. Determination of direct axis and quadrature axis reactance of salient pole alternator by slip test. V and inverted V-curves of three phase synchronous motors. Load test on three-phase induction motor. Speed control of three-phase induction motor. Determine the equivalent circuit parameters of three-phase induction motor. Separation of no-load losses of three-phase induction motor. Load test on single-phase induction motor. No load and blocked rotor test on single-phase induction motor.
9	19EE406 - Linear and Digital Integrated Circuits Laboratory	Verification of Logic gates truth table using simulation tool. Implementation of Boolean Functions Adder/Subtractor circuits & Construction of Logic Gates using NAND gates. Code converters by using suitable IC's Gray to Binary Binary to Gray Design and test Encoders and Decoders. Design and test Multiplexer and De multiplexer 2^n:1&1:2^n b) Implement 4:1 using 2:1 Mux Design and test Shift registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's. Design and test Parity Generator & Parity Checker Counters: Ring counters Up and Down Counters Design and test the inverting and non inverting amplifier using IC 741 Design and test the integrator and differentiator using IC 741. Design and implement the adder circuit using IC 741. Design and implement the subtraction circuit using IC 741. Timer IC application Astable mode Mono stable mode
10	19EE504 - Power Electronics Laboratory	Steady State Characteristics of SCR Steady State Characteristics of TRIAC Steady State Characteristics of MOSFET Steady State Characteristics of IGBT Steady State Characteristics of IGCT Step down and step up MOSFET based chopper Performance Analysis of Voltage commutated chopper Performance Analysis of Series Inverter IGBT based single phase PWM Inverter

		IGBT based three phase PWM Inverter Implementation of AC voltage controllers using TRIAC Implementation of Three phase half and fully controlled Rectifiers using MATLAB Implementation of Single phase half and fully controlled Rectifiers using MATLAB
11	19EE505 - Control Systems Laboratory	Determination of transfer functions of self excited DC generator Determination of transfer functions of separately excited DC generator Determination of transfer function of armature controlled DC shunt motor Determination of transfer function of field controlled DC shunt motor Determination of transfer function of DC servo motor Determination of transfer functions of AC servo motor DC position control system Stepper motor control system Digital simulation of Type-0 and Type-1 systems Digital simulation of first order and second order systems Stability Analysis of linear systems Simulate frequency response of lag and lead network
12	19ES502 - Microcontroller and Embedded Programming Laboratory	8 bit arithmetic operations using basic 8085 Microprocessor a)Addition b)Subtraction c)Multiplication d)Division 8/16 bit arithmetic operations using 8051 Microcontroller a)Addition b)Subtraction c)Multiplication d)Division To design the implementation & interfacing of LCD using 8051. To develop an interface of keypad with 8051 Microcontroller. To generate 10 kHz square wave using 8051 Microcontroller. To develop a Program for Transmission and Reception of data through serial port using 8051. To implement the design of DC Motor control using PWM method. To interface PWM based voltage regulator using PIC Microcontroller Analysis of interfacing of graphical LCD using PIC Microcontroller. Real time clock interfacing with Arduino using I^2C bus.
13	19EE605 - Renewable Energy Laboratory	Simulation study on Solar PV Energy System. Experiment on "VI-Characteristics and Efficiency of 1kWp Solar PV System". Experiment on "Shadowing effect & diode based solution in 1kWp Solar PV System". Experiment on Performance assessment of Grid connected and Standalone 1kWp Solar Power System.

		Simulation study on Wind Energy Generator Experiment on Performance assessment of micro Wind Energy Generator Simulation study on Hybrid (Solar-Wind) Power System. Experiment on Performance Assessment of Hybrid (Solar-Wind) Power System. Experiment on Performance Assessment of 100W Fuel Cell. Simulation study on Intelligent Controllers for Hybrid Systems.
14	19EE703 - Power System Simulation Laboratory	Computation of Parameters and Modeling of Transmission Lines. Formation and solution of Bus Admittance and Impedance Matrices. Solution of Load Flow Problems Using Gauss -Seidel Method. Solution of Load Flow Problems Using Newton-Raphson and Fast-Decoupled Methods. Fault Analysis Small Signal Stability Analysis of Single-Machine Infinite Bus System Transient Stability Analysis of Single-Machine Infinite Bus System Electromagnetic Transients in Power Systems Load – Frequency Dynamics of Single- Area and Two-Area Power Systems
Electronics and Instrumentation Engineering		
1	19BS102 - Engineering Physics	Determination of rigidity modulus – Torsion pendulum Determination of Young's modulus by non-uniform bending method Determination of Young's modulus by uniform bending method Determination of wavelength and particle size using Laser Determination of acceptance angle and numerical aperture in an optical fiber Determination of thermal conductivity of a bad conductor– Lee's Disc method Determination of velocity of sound and compressibility of liquid– Ultrasonic interferometer Determination of wavelength of mercury spectrum– spectrometer grating Determination of band gap of a semiconductor Determination of thickness of a thin wire – Air wedge method
2	19ES104 - Python Programming Laboratory	Find the Greatest among three numbers without using third variable Sum of the Digits of a Number Generation of Prime Numbers Implement a sequential search Create a calculator program

		Explore string functions Implement Selection Sort Implement Stack Read and write into a file Demonstrate usage of basic regular expression Demonstrate use of advanced regular expressions for data validation. Demonstrate use of List Demonstrate use of Dictionaries Create Comma Separate Files (CSV), Load CSV files into internal Data Structure
3	19BS105 - Chemistry Laboratory	Determination of Total, Temporary & Permanent hardness of water by EDTA method. Determination of chloride content of water sample by Argentometric method. Determination of Dissolved oxygen content in water sample using Winklers Method Determination of Alkalinity in Water Sample. Determination of strength of given hydrochloric acid using pH meter. Determination of strength of acids in a mixture of acids using conductivity meter. Conductometric titration of Weak acid vs Weak base. Estimation of iron content of the given solution using potentiometer. Conductometric titration of strong acid vs strong base. Determination of Molecular weight of polyvinyl alcohol using Ostwald viscometer Estimation of iron content of the water sample using spectrophotometer Estimation of Copper in Brass
4	19ES107 - Workshop Practices	Forming of simple object in sheet metal using suitable tools (Example: Dust bin / Tray) Fabrication of a simple component using thin and thick plates. (Example: Book rack) Making a simple component using carpentry power tools. (Example: Pen stand/Tool box/ Letter box) Prepare a "V", Half-round or Square joint from the given mild steel flat plate. Construct a household pipe line connections using pipes, Tee-joint, Four-way joint, elbow, union, bend, gateway and taps (or) Construct a pipe connection for domestic application (centrifugal pump) using pipes, bend, gate valve, flanges and foot valve Prepare a green sand mould using solid pattern/split pattern. Dismantling and assembly of Centrifugal Gear Pump / Gear box. Dismantling and assembly of two-stroke and four-stroke petrol engine. (a) Preparation of butt joints, lap joints and T- joints by Electric Arc Welding. Gas Welding practice.

		Mini-Project (Fabrication of small components).
5	Electrical Machines and Electric Circuits Laboratory	Open circuit characteristics of D.C. shunt generator. Load characteristics of D.C. shunt generator. Load test on D.C. series motor. Load test and speed control of D.C. shunt motor Open circuit and short circuit tests on single phase transformer (Determination of equivalent circuit parameters). Load test on single phase induction motor. Simulation and experimental solving of electrical circuit problems using Kirchhoff's voltage and current laws. Simulation and experimental solving of electrical circuit problems using Thevenin's theorem and Norton's theorem Simulation and experimental solving of electrical circuit problems using Superposition theorem and Maximum Power transfer Theorem. Simulation and Experimental validation of R-C electric circuit transience. Measurement of three phase power supply using two watt meter method. Design and Simulation of parallel and series resonant circuits.
6	Sensors and Measurements Laboratory	Displacement versus output voltage characteristics of a potentiometric transducer Characteristics of Strain gauge and Load cell. Characteristics of LVDT, Hall Effect transducer and Photoelectric tachometer. Characteristics of LDR, thermistor and thermocouple (J, K, E types). Step response characteristic of RTD and thermocouple. Temperature measurements using RTD with three and four leads. Wheatstone and Kelvin's bridge for measurement of resistance. Schering Bridge for capacitance measurement and Anderson Bridge for inductance measurement. Measurement of Angular displacement using resistive and Capacitive transducer. Calibration of Single-phase Energy meter and wattmeter. Calibration of Ammeter using Shunt type potentiometer. Calibration of Voltmeter using Shunt type potentiometer
7	Object Oriented Programming Laboratory	Programs using class and methods Inheritance implementation Inheritance via Interface and Abstract class Programs on Package implementations Applications using Generic collections

		Program using IO Streaming Create user defined exception Develop application to demonstrate multi-threading Program using Applet with event handling Program to demonstrate event handing using AWT/ Swing Program to demonstrate Layout Managers Program to demonstrate file handling
8	Linear and Digital Integrated Circuits Laboratory	Implementation of Boolean Functions, Adder/ Subtractor circuits Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa Parity generator and parity checking Counters: Design and implementation of 4-bit modulo counters Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes Timer IC application: Study of NE/SE 555 timer in Astable and Monostable operation. Application of Op-Amp: inverting, non-inverting amplifier and comparator Application of Op-Amp Adder, Integrator and Differentiator Voltage to frequency characteristics of NE/ SE 566 IC Variability Voltage Regulator using IC LM317
9	Industrial Instrumentation Laboratory	Measurement of speed, torque and vibration Calibration of ammeter, voltmeter and wattmeter using multifunction calibrator Calibration of pressure gauge using dead weight tester. Measurement of level using d/p transmitter and fibre optics system. Measurement of flow using Discharge coefficient of orifice plate Calibration of Rotameter. Design and Testing of Electromagnetic Flow meters. Measurement of temperature using IR thermometer and IC sensor Measurement of Absorbance and Transmittance of Test solutions using UV-Spectrometer Measurement of Conductivity, Moisture and Viscosity of test solutions. Standardization and measurement of pH values of different solutions Measurement and analysis of ECG and pulse rate.
10	Microprocessors and Microcontrollers Laboratory	Simple arithmetic operations: addition / subtraction / multiplication / division. Programming with control instructions: Ascending / Descending order, Maximum / Minimum of numbers. Programs using Rotate instructions. Hex / ASCII / BCD code conversions. Interface Experiments: with 8085

		A/D Interfacing. (ii) D/A Interfacing. Traffic light controller I/O Port / Serial communication Programming Practices with Simulators/Emulators/open source Read a key ,interface display Demonstration of basic instructions with 8051 Micro controller execution, including: Conditional jumps & looping Calling subroutines. Programming I/O Port and timer of 8051 study on interface with A/D & D/A Study on interface with DC & AC motors Application hardware development using embedded processors.
11	Data Structures Laboratory	Array implementation of Stack and Queue ADTs Array implementation of List ADT Linked list implementation of List, Stack and Queue ADTs Applications of List, Stack and Queue ADTs implementation of Binary Trees and operations of Binary Trees Implementation of Binary Search Trees Implementation of AVL Trees Implementation of Heaps using Priority Queues Graph representation and Traversal algorithms Applications of Graphs Implementation of searching and sorting algorithms Hashing – any two collision techniques
12	Process Control Laboratory	Simulation of lumped /distributed parameter system Mathematical model of a typical industrial process using nonparametric identification methods Tuning of PID Controller for mathematically described processes PID Enhancements (Cascade and Feed-forward Control Schemes) Design and Implementation of Multi-loop PID Controller on the simulated model of a typical industrial process. Study of AC and DC drives.
13	Process Control Laboratory	Characteristics of Pneumatically Actuated Control Valve (with and without Positioner). Study and control of flow process using Compact Flow Control Unit. Control of Level and Pressure using Process Control Training Plant Design and implementation of ON/OFF Controller for the Temperature Process Design and implementation of Interacting and non-interacting system Design and implementation of adaptive or model predictive control schemes

14	Industrial Automation Laboratory	Study of PLC field device interface modules (AI,AO,DI,DO modules) Programming Logic Gates Function in PLC Implementing Mathematical Operations in PLC Programming Jump-to-subroutine & return operations in PLC PLC Exercises: - 1. Traffic Light Control and Filling/Draining Control Operation PLC Exercise: 1. Reversal of DC Motor Direction 2. ON/OFF Controller for Thermal Process PC based control of Level Process On-line Monitoring and Control of a Pilot plant using DCS PLC based Control of Flow Process Study of Foundation Fieldbus /IOT/Wireless HART Enabled Transmitter
15	Instrumentation System Design Laboratory	Design of Instrumentation amplifier Design of active filters – LPF, HPF and BPF Design of regulated power supply and design of V/I and I/V converters. Design of linearizing circuits and cold–junction compensation circuit for thermocouples. Design of signal conditioning circuit for strain gauge and RTD. Design of orifice plate and rotameter. Design of Control valve (sizing and flow-lift characteristics) Design of PID controller (using operational amplifier and microprocessor) Design of a multi-channel data acquisition system Design of multi range DP transmitter Piping and Instrumentation Diagram – case study. Preparation of documentation of instrumentation project and project scheduling for the above case study. (Process flow sheet, instrument index sheet and instrument specifications sheet, job scheduling, installation procedures and safety regulations).
B.E. Mechanical Engineering		
1	**19ES107 - WORKSHOP PRACTICE**	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings Carpentry Vice (fitted to work bench) Standard woodworking tools Models of industrial trusses, door joints, furniture joints Power Tools: (a) Rotary Hammer (b) Demolition Hammer (c) Circular Saw (d) Planer (e) Hand Drilling Machine

		(f) Jigsaw Arc welding transformer with cables and holders Welding booth with exhaust facility Welding accessories like welding shield, chipping hammer, wire brush, etc. Oxygen and acetylene gas cylinders, blow pipe and other welding outfits Centre lathe Hearth furnace, anvil and smithy tools Moulding table, foundry tools Power Tool: Angle Grinder Study-purpose items: Centrifugal pump, Air-conditioner
2	19BS105 - CHEMISTRY LABORATORY	Determination of Total, Temporary & Permanent hardness of water by EDTA method. Determination of chloride content of water sample by Argento metric method. Determination of Dissolved oxygen content in water sample using Winklers Method Determination of Alkalinity in Water Sample Determination of strength of given hydrochloric acid using pH meter. Determination of strength of acids in a mixture of acids using conductivity meter. Conductometric titration of Weak acid vs Weak base. Estimation of iron content of the given solution using potentiometer. Conductometric titration of strong acid vs strong base. Determination of Molecular weight of polyvinyl alcohol using Ostwald viscometer Estimation of iron content of the water sample using spectrophotometer Estimation of Copper in Brass
3	19ES213 - PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	Find the Greatest among three numbers without using third variable Sum of the Digits of a Number Generation of Prime Numbers Implement a sequential search Create a calculator program Explore string functions Implement Selection Sort Implement Stack Read and write into a file Demonstrate usage of basic regular expression Demonstrate use of advanced regular expressions for data validation. Demonstrate use of List Demonstrate use of Dictionaries Create Comma Separate Files (CSV), Load CSV files into internal Data Structure
4	19ES216 - ELECTRICAL ENGINEERING LABORATORY	OCC on a dc shunt generator, determination of critical resistance, critical speed, additional resistance

		required in the field circuit. Load characteristics of DC Shunt generator Load characteristics of DC Compound generator. Load test on DC Series motor Load test on DC Shunt motor. Load test on single phase transformer. Starting of three phase squirrel cage induction motor by star delta switch, load test on three phase squirrel cage induction motor. Load test on three phase slip ring induction motor. Load test on single phase induction motor. OC and SC test on single phase transformer. V-I Characteristics of diodes and Zener diodes. Input and output characteristics of CE configuration of BJT S. Determination of β, input resistance and output resistance. Half wave and full wave rectifiers with and without filters- Observe the waveforms on CRO.
5	19ME306 - Fluid Mechanics And Machinery Laboratory	Experimental verification of Bernoulli's theorem in a pipe flow and visualize the flow using Reynolds apparatus. Measurement of flow rate using venturimeter and orifice meter and calculate the coefficient of discharge. Determination of loss of head in different pipes (major loss) and fittings (minor loss) for various flow rates. Performance test on tangential flow impulse (Pelton wheel) turbine against constant head. Performance test on Francis turbine against constant head. Performance test on reaction (Kaplan) turbine. Performance characteristics of a reciprocating pump. Performance characteristics of a gear pump. Performance test on centrifugal pump. Performance test on submersible pump
6	19ME307 - Strength of Materials Laboratory	Tension test on a mild steel rod. Double shear test on Mild steel and Aluminum rods. Torsion test on mild steel rod. Impact test on metal specimen. Hardness test on metals - Brinnell Hardness Number. Hardness test on metals - Rockwell Hardness Number. Hardness test on metals – Vicker's Hardness Number. Deflection test on beam. Compression test on helical spring. Tension test on helical spring.
7	19ME404- Thermal Engineering Laboratory	I.C Engine – 2 stroke and 4 stroke model Apparatus for Flash and Fire Point 4-stroke Diesel Engine with mechanical loading. 4-stroke Diesel Engine with hydraulic loading. 4-stroke Diesel Engine with electrical loading. Multi-cylinder Petrol Engine Single cylinder Petrol Engine Data Acquisition system with any one of the above

		engines Steam Boiler with turbine setup Single/two stage reciprocating air compressor Refrigeration test rig Air-conditioning test rig
8	19ME406 - Manufacturing Technology Laboratory	Turret and Capstan Lathes Horizontal Milling Machine Vertical Milling Machine Surface Grinding Machine Cylindrical Grinding Machine Radial Drilling Machine lathe Tool Dynamometer Milling Tool Dynamometer Gear Hobbling Machine Tool Makers Microscope CNC Lathe CNC Milling machine Gear Shaping machine Center less grinding machine Tool and cutter grinder
9	19ME505 - DYNAMICS & METROLOGY AND MEASUREMENTS LABORATORY	Experimental study of velocity ratios of simple, compound, Epicyclical and differential gear trains. Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms. Determination of Mass moment of inertia of Fly wheel and Axle system. Determination of Mass Moment of Inertia of axis symmetric bodies using Turn Table apparatus. Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum. Motorized gyroscope – Study of gyroscopic effect and couple. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Propel, and Hartwell Governors. Cams – Cam profile drawing, Motion curves and study of jump phenomenon Single degree of freedom Spring Mass System – Determination of natural Frequency and verification of Laws of springs – Damping coefficient determination. Multi degree freedom suspension system – Determination of influence coefficient. Determination of torsion natural frequency of single and Double Rotor systems.- Undamped and Damped Natural frequencies. Vibration Absorber – Tuned vibration absorber. Vibration of Equivalent Spring mass system – Undamped and damped vibration. Whirling of shafts – Determination of critical speeds of shafts with concentrated loads. Balancing of rotating masses. (b) Balancing of reciprocating masses Transverse vibration of Free-Free beam – with and

		without concentrated masses. Forced Vibration of Cantilever beam – Mode shapes and natural frequencies. Determination of transmissibility ratio using vibrating table. Calibration and use of measuring instruments – Vernier caliper, micrometer, Vernier height gauge – using gauge blocks. Calibration and use of measuring instruments – depth micrometer, bore gauge, telescopic gauge. Measurement of linear dimensions using Comparators. Measurement of angles using bevel protractor and sine bar. Measurement of screw thread parameters – Screw thread Micrometers and Three wire method „(floating carriage micrometer). Measurement of gear parameters – disc micrometers, gear tooth Vernier caliper. Non-contact (Optical) measurement using Toolmaker's microscope / Profile projector and Video measurement system. Measurement of Surface finish in components manufactured using various processes (turning, milling, grinding, etc.,) using stylus based instruments. Machine tool metrology – Level tests using precision level; Testing of straightness of a machine tool guide way using Autocollimator, spindle tests. Measurement of force, torque and temperature.
10	19ME506 - Computer Aided Modeling Laboratory	Create an orthographic view of machine components from the given isometric drawings. Construct a three dimensional assembly model of bearing. Generate a three dimensional shaft and coupling assembly model by considering tolerance in each Component. Create a three dimensional assembly model of Piston and Connecting Rod. Build a three dimensional assembly model of power drive system. Create a three dimensional assembly model of two wheeler suspension system. Construct a three dimensional assembly model of control valve. Generate a three dimensional assembly model of Jig/fixture. Create a three dimensional assembly model of simple mechanism and animate its working using modeling software. Prepare technical documents for an I.C. Engine Assembly by using 3D Via software.
9	19ME604 - Computer Aided Analysis Laboratory	Structural analysis of simple and composite trusses. Structural analysis of cantilever beam, simply

		supported beam and fixed beam under different boundary conditions. Stress analysis of a simple machine element. Stress analysis under plane strain condition. Stress analysis of pressure vessel subjected to an internal pressure Dynamic analysis of a rotating shaft subjected to twisting moment. Modal analysis of Cantilever, Simply supported and Fixed beams under different boundary conditions. Harmonic analysis of Cantilever, Simply supported and Fixed beams under different boundary conditions. Heat transfer analysis of 2D and 3D components under different boundary conditions. Coupled field analysis.
10	19ME605 - Heat Transfer Laboratory	Guarded plate apparatus Lagged pipe apparatus Natural convection-vertical cylinder apparatus Forced convection inside tube apparatus Composite wall apparatus Thermal conductivity of insulating powder apparatus Pin-fin apparatus Stefan-Boltzmann apparatus Emissivity measurement apparatus Parallel/counter flow heat exchanger apparatus
11	ME8711 - Simulation and AnalysisLaboratory	**SIMULATION** MATLAB basics, Dealing with matrices, Graphing-Functions of one variable and two variables Use of Matlab to solve simple problems in vibration Mechanism Simulation using Multi body Dynamic software **ANALYSIS** Force and Stress analysis using link elements in Trusses, cables etc. Stress and deflection analysis in beams with different support conditions. Stress analysis of flat plates and simple shells. Stress analysis of axis – symmetric components. Thermal stress and heat transfer analysis of plates. Thermal stress analysis of cylindrical shells. Vibration analysis of spring-mass systems. Model analysis of Beams. Harmonic, transient and spectrum analysis of simple systems.
12	ME8781 - Mechatronics Laboratory	Assembly language programming of 8085 Stepper motor interface. Traffic light interface. Speed control of DC motor. Study of various types of transducers. Study of hydraulic, pneumatic and electro-pneumatic circuits. Modeling and analysis of basic hydraulic, pneumatic

		and electrical circuits using Software. Study of PLC and its applications. Study of image processing technique.
B. Tech. Chemical Engineering		
1	19BS102 - ENGINEERING PHYSICS (Laboratory Embedded)	Determination of rigidity modulus – Torsion pendulum Determination of Young's modulus by non-uniform bending method Determination of Young's modulus by uniform bending method Determination of wavelength, and particle size using Laser Determination of acceptance angle in an optical fiber. Determination of thermal conductivity of a bad conductor – Lee's Disc method. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer. Determination of wavelength of mercury spectrum – spectrometer grating Determination of band gap of a semiconductor Determination of thickness of a thin wire – Air wedge method.
2	19ES104 - PYTHON PROGRAMMING LABORATORY	Find the Greatest among three numbers without using third variable Sum of the Digits of a Number Generation of Prime Numbers Implement a sequential search Create a calculator program Explore string functions Implement Selection Sort Implement Stack Read and write into a file Demonstrate usage of basic regular expression Demonstrate use of advanced regular expressions for data validation. Demonstrate use of List Demonstrate use of Dictionaries Create Comma Separate Files (CSV), Load CSV files into internal Data Structure
3	19ES106 - ENGINEERING GRAPHICS	Plane Curves Projection of Points and Lines Projection of Planes & Solids Projection of Sectioned Solids and Development of Surfaces Isometric Projections
4	19ES107 - WORKSHOP PRACTICES	Forming of simple object in sheet metal using suitable tools (Example: Dust Pan / Soap Box Fabrication of a simple component using thin and thick plates. (Example: Book rack) Making a simple component using carpentry power tools. (Example: Pen stand/Tool box/ Letter box. Prepare a "V" (or) Half round (or) Square joint from the given mild Steel flat.

		Construct a household pipe line connections using pipes, Tee joint, Four way joint, elbow, union,bend,Gate way and Taps (or) Construct a pipe connections of house application centrifugal pump using pipes,bend, gate valve, flanges and foot valve. Prepare a green sand mould using solid pattern/split pattern. Construct a domestic electrical wire connections using indicator, one way switch with calling bell, two way switch with lamp, one way switch with fan regulator and one way switch with socket. Dismantling and assembly of Centrifugal Monoblock / Gear Pump / Gear box. Dismantling and assembly of two stroke and four stroke petrol engine. Mini Project (Fabrication of Small Components).
5	19BS208 - ENGINEERING CHEMISTRY LABORATORY	Determination of total, temporary & permanent hardness of water by EDTA method. Determination of chloride content of water sample by argent metric method. Determination of strength of given hydrochloric acid using pH meter. Determination of strength of acids in a mixture of acids using conductivity meter. Estimation of iron content of the given solution using potentiometer. Conductometric titration of strong acid vs strong base. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer Estimation of iron content of the water sample using spectrophotometer
6	19ES222 - CHEMICAL ANALYSIS LABORATORY	Determination of Redwood / Saybolt numbers, kinematic viscosity and viscosity index of Lubricating oils. Determination of flash point, fire point, cloud and pour point of oils Determination of acid value and iodine value of oils Determination of COD of water samples Cement Analysis Estimation of silica content Estimation of mixed oxide content Estimation of calcium oxide content Estimation of calcium oxide by rapid method. Coal Analysis Estimation of sulphur present in coal Ultimate analysis of coal Proximate analysis of coal. Soap Analysis Estimation of total fatty acid Estimation of percentage alkali content Flue gas analysis by Orsat's apparatus Estimation of phenol. Determination of calorific value using bomb

		calorimeter Determination of nitrite in water.
7	19CH304- FLUID MECHANICS LABORATORY	Viscosity measurement of non-Newtonian fluids Calibration of constant and variable head meters Calibration of weirs and notches Open drum orifice and draining time Flow through straight pipe Flow through annular pipe Flow through helical coil and spiral coil Losses in pipe fittings and valves Characteristic curves of pumps (Centrifugal / Gear / Reciprocating) Pressure drop studies in packed column Hydrodynamics of fluidized bed Drag coefficient of solid particle
8	19ES306 - ELECTRICALENGINEERING LABORATORY FOR CHEMICAL ENGINEERS	Ohm's law and Kirchoff's law Diode characteristics Open circuit characteristics of a dc shunt generators Load characteristics of a dc shunt generators Load test of D.C. shunt motor Load test on single phase induction motor Equivalent circuit of a transformer Swinburne's test Load test on 3- phase squirrel cage induction motor Load test on 1 –phase transformer Characteristics of half and full wave rectifiers
9	19HS301 - COMMUNICATION SKILLS	Listening Speaking Reading Writing Integration of lSRW
10	19CH406 – ORGANIC CHEMISTRY LABORATORY	Quantitative analysis of organic compounds – Identification of aliphatic/aromatic, saturated/unsaturated compounds. Identification and characterization of various functional groups by their characteristic reactions: Alcohol Aldehyde Ketone Carboxylic acid Phenol Ester Primary, secondary and tertiary amines Imide Nitro compounds. Analysis of an unknown organic compound and preparation of suitable solid derivatives. Analysis of carbohydrates. Analysis of proteins. Methodology of filtration and recrystallization. Introduction to organic synthetic procedures: Acetylation – Preparation of acetanilide from aniline. Hydrolysis – Preparation of salycilic acid from

		methylsalyciliate. Substitution – Conversion of acetone toiodo form. Nitration – Preparation of m-dinitrobenzene from nitrobenzene. Oxidation – Preparation of benzoic acid from benzaldehyde/ benzyl alcohol.
11	19CH407 – MECHANICAL OPERATIONS LABORATORY	Sieve analysis Batch filtration studies using a Leaf filter Batch filtration studies using a Plate and Frame Filter press Characteristics of batch Sedimentation Reduction ratio in Jaw Crusher / Pulverizer/ Hammer Mill Reduction ratio in Ball mill Separation characteristics of Cyclone separator Reduction ratio of Roll Crusher Separation characteristics of Elutriator Reduction ratio of Drop weight crusher Size separation using Sub-Sieving Determination of specific surface area using air permeability setup
12	19CH505 - HEAT TRANSFER LABORATORY	Heat Transfer in a Double Pipe Heat Exchanger Heat transfer in Shell and Tube Heat Exchanger Heat Transfer in a Bare and Finned Tube Heat Exchanger Heat transfer in composite wall Heat transfer by Forced / Natural Convection Heat Transfer by Radiation - Determination of Stefan Boltzmann constant Heat Transfer by Radiation – Emissivity measurement Heat transfer in Open Pan Evaporator Heat transfer by Single effect evaporation / Multiple effect evaporation Boiling Heat Transfer Heat Transfer through Packed Bed Heat Transfer in a Horizontal Condenser / Vertical Condenser Heat Transfer in Helical Coils Heat Transfer in Agitated Vessels
	19CH506 – COMPUTATIONAL ENGINEERING PRACTICES LABORATORY	Solving equation of state, regression of parameters using EXCEL/MATLAB Calculation of Reynolds number, friction factor and pressure drop using EXCEL/MATLAB Calculation of heat transfer coefficient in a Heat Exchanger using EXCEL/MATLAB Calculation of minimum Reflux ratio for binary/tertiary system in a fractionator using EXCEL/MATLAB Calculation of HTU and NTU in a Absorber using EXCEL/MATLAB Calculation of Antoine's coefficient using EXCEL/MATLAB Estimation of settling velocity of solids in liquids using

		Stoke's law using EXCEL/MATLAB Calculation of minimum number of stages in a distillation column using EXCEL/MATLAB Solving mass and energy balance problems using EXCEL/MATLAB Calculation of Power in Reciprocating compressor using EXCEL/MATLAB Steady state simulation of Heat Exchanger using ASPEN PLUS/ HYSYS Steady state simulation of a CSTR using ASPEN PLUS/ HYSYS Steady state simulation of Flash vessel using ASPEN PLUS/ HYSYS Steady state simulation of Distillation Column using ASPEN PLUS/ HYSYS Steady state simulation of an Absorption column using ASPEN PLUS/ HYSYS Dynamic simulation of Heat Exchanger using ASPEN PLUS/ HYSYS Dynamic simulation of a CSTR using ASPEN PLUS/HYSYS Dynamic simulation of Flash vessel using ASPEN PLUS/ HYSYS Dynamic simulation of Distillation Column using ASPEN PLUS/ HYSYS 20. Dynamic simulation of an Absorption column using ASPEN PLUS/ HYSYS
	19HS501 - CAREER SKILLS	Percentages & averages Ratio, proportions and variation & profit and loss Time management Grammar Verbal reasoning – i
	19CH605 - PROCESS CONTROL LABORATORY	Response of first order system Response of second order system Response of Non-Interacting level system Response of Interacting level system Open loop study on a thermal system Closed loop study on a level system Closed loop study on a flow system Closed loop study on a thermal system Tuning of a level system Tuning of a pressure system Tuning of a thermal system Flow co-efficient of control valves Characteristics of different types of control valves Closed loop study on a pressure system Tuning of pressure system Closed loop response of cascade control system. Optimum Controller Tuning using Ziegler Nichols method

	19CH606 MASS TRANSFER LABORATORY	Separation of binary mixture using Simple distillation Separation of binary mixture using Steam distillation Separation of binary mixture using Packed column distillation Measurement of diffusivity Liquid-liquid extraction Drying characteristics of Vacuum Dryer Drying characteristics of Tray dryer Drying characteristics of Rotary dryer Water purification using ion exchange columns Mass transfer characteristics of Rotating disc contactor Estimation of mass/heat transfer coefficient for cooling tower, Surface evaporation Adsorption studies Leaching studies Demonstration of Gas – Liquid absorption.
	19CH607 - CHEMICAL REACTION ENGINEERING AND IRON SPONGE LABORATORY	Kinetic studies in a Batch reactor Kinetic studies in a Semi Batch reactor Kinetic studies in a Plug flow reactor Kinetic studies in a CSTR Kinetic studies in a Packed bed reactor Combined reactor studies in a PFR and CSTR RTD studies in a PFR RTD studies in a Packed bed reactor RTD studies in a CSTR / CSTR in series Studies on micellar catalysis Study of temperature dependence of rate constant Kinetic studies in Sono chemical reactor Kinetics of photochemical reaction Estimation of Sulfur, Volatile matter, Inherent moisture, Ash content in given coal sample. Estimation of Total iron, iron matter and loss of ignition in given iron ore sample. Estimation of Calcium Oxide, Magnesium oxide and Silica from Dolamite.