Virtual Lab Mapping for B.Tech in Electrical Engineering

Subject Code	Subject Name	List of Experiment	V-Lab [Links]
		2nd Semester	
		No Labs	
		4th Semester	
PC-EE 491	Electric Machine-I laboratory	1. Determination of the characteristics of a separately excited DC generator.	IIT Bombay Virtual Lab http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/Sadhya/experimentlist.html
		2. Determination of the characteristics of a DC motor	
		3. Study of methods of speed control of DC motor	Shakshat Virtual Lab INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI http://vem-iitg.vlabs.ac.in/
		4. Determination of the characteristics of a compound DC generator (short shunt)	
		5. Determination of speed of DC series motor as a function of load torque.	
		6. Polarity test on a single phase transformer	
		7. Determination of equivalent circuit of a single phase transformer and efficiency.	
		8. Study of different connections of three phase transformer.	
		9. Study of Parallel operation of a single phase transformers.	http://em-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering
		10. Determination of temperature rise and efficiency of the transformer.(Back to back test)	
PC-EE 492	Digital Electronics laboratory	1. Realization of basic gates using Universal logic gates.	http://vlabs.iitkgp.ernet.in/dec/
		2. Code conversion circuits- BCD to Excess-3 & vice-versa.	
		3. .4-bit parity generator & comparator circuits.	
		4. Construction of simple Decoder & Multiplexer circuits using logic gates.	
		5. Design of combinational circuit for BCD to decimal conversion to drive 7-segment display using multiplexer.	
		6. Construction of simple arithmetic circuits-Adder, Subtractor.	
		7. Realization of RS-JK & D flip-flops using Universal logic gates.	
		8. Realization of Universal Register using JK flip-flops & logic gates.	http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/cool_developers/labs/index.html
		9. Realization of Universal Register using multiplexer & flip-flops.	
		10. Construction of Adder circuit using Shift Register & full Adder.	
		11. Realization of Asynchronous Up/Down counter	
		12. Realization of Synchronous Up/Down counter	
		13. Design of Sequential Counter with irregular sequences.	
		14. Realization of Ring counter & Johnson's counter.	

		15. Familiarization with A/D and D/A circuits	
PC-EE 493	Electrical and electronic measurement laboratory	1. Instrument workshop- Observe the construction of PMMC, Dynamometer, Electrothermal and Rectifier type of instruments, Oscilloscope and Digital multimeter.	Virtual Labs An MHRD Govt of India Initiative http://vlabs.iitkgp.ernet.in/asnm/
		2. Calibrate moving iron and electrodynamometer type ammeter/voltmeter by potentiometer.	
		3. Calibrate dynamometer type wattmeter by potentiometer.	
		4. Calibrate AC energy meter.	
		5. Measurement of resistance using Kelvin double bridge.	
		6. Measurement of power using Instrument transformer.	
		7. Measurement of power in Polyphase circuits.	IIT Kharagpur (Manuals) http://www.ee.iitkgp.ac.in/faci_mes.php
		8. Measurement of frequency by Wien Bridge.	
		9. Measurement of Inductance by Anderson bridge	
		10. Measurement of capacitance by De Sauty Bridge.	
		11. Measurement of capacitance by Schering Bridge	
ES-ME 491	Thermal Power Engineering laboratory	1. Study of Cut Models – Boilers IC Engines: Lanchashire Boiler, Bahcock & Willcox Boiler, Cochran Boiler, Vertical Tubular Boiler, Locomotive Boiler, 4S Diesel Engine, 4S Petrol Engine, 2S Petrol Engine	Shakshat Virtual Lab INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI http://mfts-iitg.vlabs.ac.in/
		2. Load Test on 4 Stroke Petrol Engine & Diesel Engine by Electrical Load Box.	
		3. Load Test on 4 Stroke Diesel Engine by Rope Brake Dynamometer.	
		4. Heat Balance on 4 Stroke Diesel Engine by Rope Brake Dynamometer & by Electrical Load Box.	
		5. Valve Timing Diagram on 4S Diesel Engine Model & 4S Petrol Engine Model	
		6. To find the Calorific Value of Diesel Fuel & Coal by Bomb Calorimeter	
		7. To find the Flash Point & Fire Point of Petrol & Diesel Fuel	
		8. To find the Cloud Point & Pour Point of Petrol & Diesel Fuel	
		9. To find Carbon Particle Percentage in Diesel Engine Exhaust Smoke by Smokemeter and trace the BHP Vs. % Carbon Curve	
		10. Measurement of the Quality of Steam – Enthalpy & Dryness fraction	
6th Semester			
EE-691	Control System-II	1. Study of a practical position control system obtaining closed step responses for gain setting corresponding to over-damped and under-damped responses. Determination of rise time and peak time using individualized components by simulation. Determination of un-damped natural frequency and damping ration from experimental data.	Virtual Labs An MHRD Govt of India Initiative http://209.211.220.205/vlabiitece/labs.php
		2. Tuning of P, PI and PID controller for first order plant with dead time using Z-N method. Process parameters (time constant and delay/lag) will be provided. The gain of the controller to be computed by using Z-N method.	

		Steady state and transient performance of the closed loop plant to be noted with and without steady disturbances. The theoretical phase margin and gain margin to be calculated manually for each gain setting.	**IIT Kharagpur** http://vlabs.iitkgp.ac.in/mvl1/exp.html
		3. Design of Lead, Lag and Lead-Lag compensation circuit for the given plant transfer function. Analyze step response of the system by simulation.	
		4. Obtain Transfer Function of a given system from State Variable model and vice versa. State variable analysis of a physical system - obtain step response for the system by simulation.	
		5. State variable analysis using simulation tools. To obtain step response and initial condition response for a single input, two-output system in SV form by simulation.	
		6. Performance analysis of a discrete time system using simulation tools. Study of closed response of a continuous system with a digital controller and sample and hold circuit by simulation.	
		7. Study of the effects of nonlinearity in a feedback controlled system using time response. Determination of step response with a limiter nonlinearity introduced into the forward path of 2nd order unity feedback control systems. The open loop plant will have one pole at the origin and other pole will be in LHP or RHP. To verify that (i) with open loop stable pole, the response is slowed down for larger amplitude input (ii) for unstable plant, the closed loop system may become oscillatory with large input amplitude by simulation	
		8. Study of effect of nonlinearity in a feedback controlled system using phase plane plots. Determination of phase plane trajectory and possibility of limit cycle of common nonlinearities.	
EE-692	Power System-II	1. Study of the characteristics of on delay relay and off delay relay.	**Virtual Power Lab - Dayalbagh** http://vp-dei.vlabs.ac.in/Dreamweaver/index.html **IIT Kharagpur** (Manuals) http://www.ee.iitkgp.ac.in/facips.php
		2. Test to find out polarity, ratio and magnetization characteristics of CT and PT.	
		3. Test to find out characteristics of (a) under voltage relay (b) earth fault relay.	
		4. Study on DC load flow	
		5. Study on AC load flow using Gauss-seidel method	
		6. Study on AC load flow using Newton Raphson method.	
		7. Study on Economic load dispatch.	
		8. Study of different transformer protection schemes by simulation.	
		9. Study of different generator protection schemes by simulation.	
		10. Study of different motor protection schemes by simulation.	
		11. Study of different characteristics of over current relay.	

		12. Study of different protection scheme for feeder.	
EE-693	Power Electronics	1. Study of the characteristics of an SCR.	**PSIM** Download PSIM Demo Version https://powersimtech.com/try-psim/ [Help: https://powersimtech.com/support/resources/video-library/] **IIT Kharagpur** (Manuals) http://www.ee.iitkgp.ac.in/faci_pe.php
		2. Study of the characteristics of a Triac	
		3. Study of different triggering circuits of an SCR	
		4. Study of firing circuits suitable for triggering SCR in a single phase full controlled bridge.	
		5. Study of the operation of a single phase full controlled bridge converter with R and R-L load.	
		6. Study of performance of single phase half controlled symmetrical and asymmetrical bridge converters.	
		7. Study of performance of step down chopper with R and R-L load.	
		8. Study of performance of single phase controlled converter with and without source inductance (simulation)	
		9. Study of performance of step up and step down chopper with MOSFET, IGBT and GTO as switch (simulation).	
		10. Study of performance of single phase half controlled symmetrical and asymmetrical bridge converter.(simulation)	
		11. Study of performance of three phase controlled converter with R & R-L load. (simulation)	
		12. Study of performance of PWM bridge inverter using MOSFET as switch with R and R-L load.	
		13. Study of performance of three phase AC controller with R and R-L load (simulation)	
		14. Study of performance of a Dual converter. (simulation)	
		15. Study of performance of a Cycloconverter (simulation)	
EE-694A	Software Engineering	1. Preparation of requirement document for proposed project in standard format.	**Virtual Labs** An MHRD Govt of India Initiative **IIT Kharagpur** http://vlabs.iitkgp.ernet.in/se/
		2. Project schedule preparation using tools like MSP project, Generation of Gnatt and PERT chart from schedule. Prepare project management plan in standard format.	
		3. Draw Use case diagram, Class diagram, Sequence diagram and prepare Software design document using tools like Rational Rose.	
		4. Estimate project size using Function Point (FP)/Use Case Point. Use Excel/Open Office template for calculation.	
		5. Design Test Script/Test Plan (both Black box and White Box approach) for a small component of the proposed project. (Develop that component using programming languages like c/Java/VB etc.)	
		6. Generate test result and perform defect cause analysis using Pareto or Fishbone diagram.	
		7. Compute Process and Product Metrics (e.g. Defect Density, Defect Age, Productivity, Cost etc.)	
		8. Familiarization with any Version control system like	

		CVS/VSS/PVCS etc	
EE-694B	Data Base Management System	1. Creating Database: • Creating a Database • Creating a table • Specifying Relational Data Types • Specifying Constraints • Creating Indexes.	**Live SQL** https://livesql.oracle.com/apex/f?p=590:1000 IIT Bombay http://vlabs.iitb.ac.in/bootcamp/labs/dbms/exp8/index.php IIT Bombay http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php
		2 .Table and record Handling • INSERT statement • Using SELECT and INSERT together • DELETE, UPDATE, TRUNCATE statements • DROP, ALTER statements	
		3. Retrieving Data from Database • The SELECT statement • Using the WHERE clause • Using Logical Operators in the WHERE clause • Using IN, BETWEEN, LIKE, ORDER,BY GROUP BY and HAVING	
		4. Clause • Using AGGREGATE function • Combining Tables using JOINS • Sub queries	
		5. Database Management. • Creating views • Creating Column Aliases • Creating Database Users • Using GRANT and REVOKE	
EE-694 C	Object Oriented Programming	1. Assignments on class, constructor, overloading, inheritance, overriding.	Use Java for programming Preferably download"java_ee_sdk-6u4-jdk7-windows.exe" from http://www.oracle.com/technetwork/java/javaee/downloads/java-ee-sdk-6u3-jdk-7u1-downloads-523391.html w3schools.com https://www.w3schools.com/java/ CodingBat https://codingbat.com/java codingground SIMPLY EASY CODING https://www.tutorialspoint.com/compile_java_online.php
		2. Assignments on wrapper, class, arrays.	
		3. Assignments on developing interfaces-multiple inheritance, extending interfaces.	
		4. Assignments on creating and accessing packages.	
		5. Assignments on multithreaded programming.	
		6. Assignment on applet programming	
EE-694D	Embedded Systems	1. Familiarization with a microcontroller kit (and its associated PC based development system). Entering and executing a program, interfacing a LED matrix and display a specific pattern (digit) on the matrix.	
		2. Key board-MCU interfacing: Interfacing a 4X4 switch	

| | | matrix with Microcontroller. – detect keyboard operation through interrupt, take an input from the keyboard and display the data on an LED Matrix. |
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http://vlabs.iitkgp.ernet.in/rtes/ |
		3. Generation of triangular wave analog signal by PWM, triggering through internal timer.	
		4. MCU-DAC interfacing and generation of triangular wave, triggering through timer (on chip timer).	
		5. MCU interfacing and displaying a string in an LCD Display.	
		6. Interfacing of an ADC and data transfer by software polling.	
		7. ADC triggering through timer (on chip timer), Interrupt driven data transfer from ADC	
		8. Stepper motor position control using a Microcontroller. Generating a periodic staircase triangular wave position pattern with a fixed time period. Recording the rotor position in a video.	
		9. Serial communication between Microcontroller and PC	
		10. Temperature control (PD and PID) using a microcontroller and PWM output.	

		8th Semester	
EE-882	Electrical system Lab-II	Design the control circuit of a Lift mechanism.	Use resources from following virtual labs and design these experiments by yourself
http://vlabs.iitb.ac.in/vlab/labsee.html
&
http://www.vlab.co.in/broad-area-electrical-engineering
		Design a controller for speed control of DC machine.	
		Design a controller for speed control of AC machine.	

 for Electrical Engineering

http://www.vlab.co.in/broad-area-electrical-engineering

 for Electrical Engineering
http://vlabs.iitb.ac.in/vlab/labsee.html

 IIT Kharagpur
http://vlabs.iitkgp.ac.in/vlt/

IIT Guwahati Virtual Lab: https://www.iitg.ac.in/cseweb/vlab/