



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**  
**KAKINADA – 533 003, Andhra Pradesh, India**  
**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

## **COURSE STRUCTURE AND SYLLABUS**

**For**

### **B. TECH ELECTRICAL AND ELECTRONICS ENGINEERING**

*(Applicable for batches admitted from 2020-2021)*



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**

**KAKINADA - 533 003, Andhra Pradesh, India**



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**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**I B. Tech I SEMESTER**

Sl. No	Course Components	Subjects	L	T	P	Credits
1	HSMC	Communicative English	3	0	0	3
2	BSC	Mathematics-I (Calculus and Differential Equations)	3	0	0	3
3	BSC	Mathematics-II (Linear Algebra and Numerical Methods)	3	0	0	3
4	ESC	Programming for Problem Solving Using C	3	0	0	3
5	ESC	Engineering Drawing & Design	1	0	4	3
6	HSMC	English Communication Skills Laboratory	0	0	3	1.5
7	BSC	Electrical Engineering Workshop	0	1	3	1.5
8	ESC	Programming for Problem Solving Using C Lab	0	0	3	1.5
<b>Total Credits</b>			<b>19.5</b>			

**I B. Tech II SEMESTER**

Sl. No	Course Components	Subjects	L	T	P	Credits
1	BSC	Mathematics-III (Vector Calculus, Transforms and PDE)	3	0	0	3
2	BSC	Applied Physics	3	0	0	3
3	ESC	Data Structures Through C	3	0	0	3
4	ESC	Electrical Circuit Analysis -I	3	0	0	3
5	ESC	Basic Civil and Mechanical Engineering	3	0	0	3
6	BSC	Applied Physics Lab	0	0	3	1.5
7	ESC	Basic Civil and Mechanical Engineering Lab	0	0	3	1.5
8	ESC	Data Structures through C Lab	0	0	3	1.5
9	Mandatory Course	Constitution of India	2	0	0	0
<b>Total Credits</b>			<b>19.5</b>			



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**II B. Tech I Semester**

Sl. No	Course Components	Subjects	L	T	P	Credits
1	BSC	Mathematics – IV	3	0	0	3
2	PCC	Electronic Devices and Circuits	3	0	0	3
3	PCC	Electrical Circuit Analysis –II	3	0	0	3
4	PCC	DC Machines and Transformers	3	0	0	3
5	PCC	Electro Magnetic Fields	3	0	0	3
6	PCC	Electrical Circuits Lab	0	0	3	1.5
7	PCC	DC Machines and Transformers Lab	0	0	3	1.5
8	PCC	Electronic Devices and Circuits lab	0	0	3	1.5
9	SC	Skill oriented course- Design of Electrical Circuits using Engineering Software Tools	0	0	4	2
10	MC	Professional Ethics & Human Values	2	0	0	0
<b>Total Credits</b>			<b>21.5</b>			

**II B. Tech II Semester**

Sl. No	Course Components	Subjects	L	T	P	Credits
1	ESC	Python Programming	3	0	0	3
2	PCC	Digital Electronics	3	0	0	3
3	PCC	Power System-I	3	0	0	3
4	PCC	Induction and Synchronous Machines	3	0	0	3
5	HSMC	Managerial Economics & Financial Analysis	3	0	0	3
6	ESC	Python Programming Lab	0	0	3	1.5
7	PCC	Induction and Synchronous Machines Lab	0	0	3	1.5
8	PCC	Digital Electronics Lab	0	0	3	1.5
9	SC	Skill oriented course- IoT Applications of Electrical Engineering	0	0	4	2
<b>Total Credits</b>			<b>21.5</b>			



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I Year I Semester		L	T	P	C
		1	0	4	3
ENGINEERING DRAWING & DESIGN					

Course Objective: Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

### Unit I

**Objective:** To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

**Polygons:** Constructing regular polygons by general methods, inscribing and describing polygons on circles.

**Curves:** Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents and normal for the curves.

**Scales:** Plain scales, diagonal scales and vernier scales

### Unit II

**Objective:** To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.

**Orthographic Projections:** Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

### Unit III

**Objective:** The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

### Unit IV

**Objective:** The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

### Unit V

**Objective:** The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer Aided Design, drawing practice using Auto CAD, creating 2D&3D drawings of objects using Auto CAD

**Note:** In the End Examination there will be no question from CAD.



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**TEXT BOOKS:**

1. Engineering Drawing by N.D. Butt, 53<sup>rd</sup> edition, Charotar Publications, 2014.
2. Engineering Drawing by Agarwal & Agarwal, 3<sup>rd</sup> edition, Tata McGraw Hill Publishers, 2019.

**REFERENCE BOOKS:**

1. Engineering Drawing by K. L. Narayana & P. Kannaiah, Scitech Publishers, 2011.
2. Engineering Graphics for Degree by K.C. John, 1<sup>st</sup> edition, PHI Publishers, 2009.
3. Engineering Graphics by P. Varghese, Mc Graw Hill Publishers, 2012.
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, 5<sup>th</sup> edition, New Age, 2011.

**Course Outcome:** The student will learn how to visualize 2D & 3D objects.



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I Year I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LABORATORY					

### TOPICS

#### UNIT I:

Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

#### UNIT II:

Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

#### UNIT III:

Stress in compound words, rhythm, intonation, accent neutralisation.

#### UNIT IV:

Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions in speaking.

#### UNIT V:

Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.

**Prescribed text book: “Infotech English”, Maruthi Publications.**

#### **References:**

1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.



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I Year I Semester		L	T	P	C
		0	1	3	1.5
ELECTRICAL ENGINEERING WORKSHOP					

**Course Objectives:**

- To demonstrate the usage of measuring equipment
- To train the students in setting up simple wiring circuits
- To impart methods in electrical machine wiring

Any 10 of the following experiments are to be conducted

**List of Experiments:**

1. Study of various electrical tools and symbols.
2. Study various types of electrical cables/wires, switches, fuses, fuse carriers, MCB, ELCB, RCCB and MCCB with their specifications and usage.
3. Soldering and de-soldering practice.
4. Identification of various types of resistors and capacitors and understand the usage digital multi-meter.
5. Identification of various semiconductor devices.
6. Study of Moving Iron, Moving Coil, Electrodynamical and Induction type meters.
7. Fluorescent lamp wiring.
8. Wiring of lighting circuit using two-way control (stair case wiring)
9. Go down wiring/ Tunnel wiring
10. Hospital wiring.
11. Measurement of voltage, current, power in DC circuit.
12. Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and energy meter for calculating Power and Power Factor.
13. Measurement of earth resistance.
14. Wiring of backup power supply for domestic Installations including inverter, battery and load.
15. Troubleshooting of domestic electrical equipment's (tube light and fan).
16. Understand the usage of CRO, function generator. & Regulated power supply and Measurement of ac signal parameters using CRO.
17. Assembling electronic components on bread board.
18. Obtain V-I characteristics of Light Emitting Diode.

**Course Outcomes:**

After the completion of the course the student should be able to:

- Explain the limitations, tolerances, safety aspects of electrical systems and wiring.
- Select wires/cables and other accessories used in different types of wiring.
- Make simple lighting and power circuits.
- Measure current, voltage and power in a circuit.



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		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ES1202)					

**Course Objectives:**

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

**Exercise 1:**

- Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
- Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
- Write a C program to display multiple variables.

**Exercise 2:**

- Write a C program to calculate the distance between the two points.
- Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

**Exercise 3:**

- Write a C program to convert a string to a long integer.
- Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
- Write a C program to calculate the factorial of a given number.

**Exercise 4:**

- Write a program in C to display the n terms of even natural number and their sum.
- Write a program in C to display the n terms of harmonic series and their sum.  
 $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$  terms.
- Write a C program to check whether a given number is an Armstrong number or not.

**Exercise 5:**

- Write a program in C to print all unique elements in an array.
- Write a program in C to separate odd and even integers in separate arrays.
- Write a program in C to sort elements of array in ascending order.

**Exercise 6:**

- Write a program in C for multiplication of two square Matrices.
- Write a program in C to find transpose of a given matrix.

**Exercise 7:**

- Write a program in C to search an element in a row wise and column wise sorted matrix.
- Write a program in C to print individual characters of string in reverse order.

**Exercise 8:**

- Write a program in C to compare two strings without using string library functions.
- Write a program in C to copy one string to another string.

**Exercise 9:**

- Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
- Write a program in C to demonstrate how to handle the pointers in the program.





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**Exercise 10:**

- Write a program in C to demonstrate the use of & (address of) and \*(value at address) operator.
- Write a program in C to add two numbers using pointers.

**Exercise 11:**

- Write a program in C to add numbers using call by reference.
- Write a program in C to find the largest element using Dynamic Memory Allocation.

**Exercise 12:**

- Write a program in C to swap elements using call by reference.
- Write a program in C to count the number of vowels and consonants in a string using a pointer.

**Exercise 13:**

- Write a program in C to show how a function returning pointer.
- Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

**Exercise 14:**

- Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
- Write a program in C to convert decimal number to binary number using the function.

**Exercise 15:**

- Write a program in C to check whether a number is a prime number or not using the function.
- Write a program in C to get the largest element of an array using the function.

**Exercise 16:**

- Write a program in C to append multiple lines at the end of a text file.
- Write a program in C to copy a file in another name.
- Write a program in C to remove a file from the disk.

**Course Outcomes:**

After the completion of the course the student should be able to:

- Gains Knowledge on various concepts of a C language.
- Draw flowcharts and write algorithms.
- Design and development of C problem solving skills.
- Design and develop modular programming skills.
- Trace and debug a program



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		0	0	3	1.5
APPLIED PHYSICS LAB					

(For All Circuital Branches like CSE, ECE, EEE etc.)

(Any 10 of the following listed experiments)

**List of Applied Physics Experiments**

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect .
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method & Meissner effect.

**References:**

1. S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"- S Chand Publishers, 2017.



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I Year II Semester		L	T	P	C
		0	0	3	1.5
BASIC CIVIL AND MECHANICAL ENGINEERING LAB					

**Preamble:**

**Course Objectives:**

- COB 1: To make the student learn about the constructional features and operational details of various types of internal combustion engines.
- COB 2: To make the student learn about the constructional features, operational details of various types of hydraulic turbines
- COB 3: To practice the student about the fundamental of fluid dynamic equations and its applications fluid jets.
- COB 4: To train the student in the areas of types of hydro electric power plants, estimation and calculation of different loads by considering various factors.

**Course Outcomes:**

At the end of the Course, Student will be able to:

- CO 1: Solve to arrive at finding constant speed and variable speed on IC engines and interpret their performance.
- CO 2: Estimate energy distribution by conducting heat balance test on IC engines
- CO 3: Explain procedure for standardization of experiments.
- CO 4: Determine flow discharge measuring device used in pipes channels and tanks.
- CO 5: Determine fluid and flow properties.
- CO 6: Solve for drag coefficients.
- CO 7: Test for the performance of pumps and turbines

**Mapping of Course Outcomes with Program Outcomes**

CO/PO	PO 1 (K3)	PO 2 (K4)	PO 3 (K5)	PO 4 (K5)	PO 5 (K3)	PO 6 (K3)	PO 7 (K2)	PO 8 (K3)	PO 9 (K2)	PO 10 (K2)	PO 11 (K3)	PO 12 (K3)
CO1(K3)	3	2	1	1	3	3	-	-	-	2	3	-
CO2(K5)	3	3	-	-	3	3	-	-	-	3	3	-
CO3(K2)	2	1	-	-	2	2	-	-	-	3	2	-
CO4(K5)	3	3	3	3	3	3	-	-	-	-	3	-
CO5(K5)	3	3	3	3	3	3	-	-	-	-	3	-
CO6(K3)	3	2	1	1	3	3	-	-	-	3	3	-
CO7(K4)	3	3	2	2	3	3	-	-	-	3	3	-

**Mapping of Course Outcomes with Program Specific Outcomes**



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CO/PSO	PSO 1 (K5)	PSO 2 (K5)	PSO 3 (K3)
CO1 (K3)	-	-	-
CO2 (K5)	-	-	-
CO3 (K2)	-	-	-
CO4 (K5)	-	-	-
CO5 (K5)	-	-	-
CO6 (K3)	-	-	-
CO7 (K4)	-	3	-

**Part-A**

**List of Experiments:**

**Thermal Engineering Lab:**

1. Valve time timing diagram on 4-S Diesel engine.
2. Valve time timing diagram on 4-S Petrol engine.
3. Port timing diagram on 2-S Petrol engine.
4. Study on Boiler models.
5. COP determination of Refrigeration tutor.
6. COP determination of Air conditioner tutor.

**Part-B**

**Hydraulic machinery Lab:**

1. Determination of coefficient of discharge on Impact of Jets on Vanes apparatus.
2. Performance test on Pelton wheel.
3. Performance test on Francis turbine.
4. Performance test on Kaplan turbine.
5. Performance test on Single stage Centrifugal pump.
6. Performance test on Reciprocating pump.

**List of Augmented Experiments:**

(Student can perform any one of the following experiments)

1. Heat balance sheet on VCR engine
2. Determination of Loss of head due to sudden contraction and sudden enlargement.
3. Heat balance sheet on Multi cylinder Petrol engine.
4. Heat balance sheet on 4-S diesel engine.



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5. Determination of coefficient of discharge on Venturimeter.
6. Determination of coefficient of discharge on Orificemeter.

**Web Links:**

1. <https://www.iare.ac.in/sites/default/files/lab2/TE%2Blab.pdf>
2. <https://www.dbit.ac.in/ce/syllabus/hydraulics-and-hydraulic-machines-lab.pdf>



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I Year II Semester		L	T	P	C
		0	0	3	1.5
DATA STRUCTURES THROUGH C LAB					

**Any 10 of the following experiments are to be conducted**

**Course Objectives:**

- To develop skills to design and analyze simple linear and non linear data structures.
- To strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem.
- To gain knowledge in practical applications of data structures.

**List of Experiments:**

1. Implement operations on Strings.
2. Implement basic operations on Stacks.
3. Implement basic operations on Queue.
4. Implement basic operations on Circular Queue.
5. Implement multi stack in a single array.
6. Implement List data structure using i) array ii) singly linked list.
7. Implement basic operations on doubly linked list.
8. Implement basic operations (insertion, deletion, search, find min and find max) on Binary Search trees.
9. Implementation of Heaps.
10. Implementation of Breadth First Search Techniques.
11. Implementation of Depth First Search Techniques.
12. Implementation of Prim's algorithm.
13. Implementation of Kruskal's Algorithm.
14. Implementation of Linear search.
15. Implementation of Fibonacci search.
16. Implementation of Merge sort.
17. Implementation of Quick sort.

**Course Outcomes:**

After the completion of the course the student should be able to:

- Be able to design and analyze the time and space efficiency of the data structure.
- Be capable to identify the appropriate data structure for given problem.
- Have practical knowledge on the applications of data structures.



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II Year I Semester		L	T	P	C
		0	0	3	1.5
ELECTRICAL CIRCUITS LAB					

**Preamble:**

To verify and demonstrate various theorems, locus diagrams, resonance and two port networks. To determine self and mutual inductance of a magnetic circuit, parameters of a given coil and measurement of 3- phase power.

**Course Objectives:**

- To verify and demonstrate various theorems and resonance.
- To draw the locus diagram of series circuits
- To determine the various parameters of a two port networks
- To determine self and mutual inductance of a magnetic circuit, parameters of a given coil.
- To measure the power of three phase unbalanced circuit.

**(Any 10 of the following experiments are to be conducted)**

1. Verification of Kirchhoff's circuit laws.
2. Verification of Superposition theorem
3. Verification of Thevenin's and Norton's Theorems
4. Verification of Maximum power transfer theorem
5. Verification of Compensation theorem
6. Verification of Reciprocity and Millman's Theorems
7. Locus diagrams of R-L(L Variable) and R-C (C Variable) series circuits
8. Series and parallel resonance
9. Determination of self, mutual inductances and coefficient of coupling
10. Determination of Impedance (Z) and Admittance (Y) Parameters for a two port network
11. Determination of Transmission and Hybrid parameters
12. Determination of Parameters of a choke coil.
13. Determination of cold and hot resistance of an electric lamp.
14. Measurement of 3-phase power by two wattmeter method for unbalanced loads

**Course Outcomes:**

At the end of the course, student will be able to

- Apply various theorems
- Determination of self and mutual inductances
- Two port parameters of a given electric circuits
- Draw locus diagrams
- Draw Waveforms and phasor diagrams for lagging and leading networks



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II Year I Semester		L	T	P	C
		0	0	3	1.5
DC MACHINES AND TRANSFORMERS LAB					

**Preamble:**

The aim of the lab is to demonstrate the operation of various types of DC machines and transformers under no load and loaded conditions by conducting various tests and performance will be analyzed.

**Course Objectives:**

- To plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self-excitation.
- To control the speed of DC motors.
- To determine and predetermine the performance of DC machines.
- To predetermine the efficiency and regulation of transformers and assess their performance.

**(Any 10 of the following experiments are to be conducted)**

1. Determination of critical field resistance and critical speed of DC shunt generator by using Magnetization characteristics
2. Predetermination of efficiency of DC Machine by conducting Swinburne's test
3. Performance characteristics of a DC shunt motor by conducting Brake test.
4. Predetermination of efficiency of two DC shunt machines by conducting Hopkinson's test
5. Speed control of DC shunt motor by Field and armature Control methods
6. Determination of constant losses of DC shunt motor by conducting Retardation test
7. Separation of losses (Eddy current and Hysteresis) in a DC shunt motor.
8. Predetermination of efficiency, regulation and to obtain the parameters of the equivalent circuit of a single phase transformer by conducting OC & SC tests.
9. Predetermination of efficiency, regulation and to obtain the parameters of the equivalent circuit of a single phase transformer by conducting Sumpner's test.
10. Conversion of three phase to two phase supply by using Scott connection of transformers
11. Parallel operation of two Single phase Transformers under no-load and load conditions
12. Separation of core losses of a single phase transformer
13. Heat run test on a bank of three single phase Delta connected transformers

**Course Outcomes:**

At the end of the course, student will be able to

- Determine and predetermine the performance of DC machines and Transformers.
- Control the speed of DC motor.
- Obtain three phase to two phase transformation.





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		0	0	3	1.5
ELECTRONIC DEVICES AND CIRCUITS LAB					

**Preamble:**

The aim of the lab imparts the knowledge to understand the concepts, working and characteristics of Different Diodes, BJT and FET Transistors, amplifiers and compensation techniques of transistors

Course Objectives: The student is able

- To study the characteristics of electronic components and measuring instruments.
- To understand the characteristics of PN, Zener diode, design rectifiers with and without filters
- To understand the characteristics of BJT, FET, MOSFET, SCR, UJT
- To understand the biasing of transistors
- To understand the frequency response of amplifiers, measure frequency, phase of signals.

**Electronic Workshop Practice:**

1. Identification, Specifications, Color Codes for resistor, R, L, C Components, Potentiometers, Coils, Gang condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital
5. Multimeter, Function Generator, Regulated Power Supply and CRO.

**List of Experiments**

**(Any 10 of the following experiments are to be conducted)**

1. P.N Junction Diode Characteristics
  - Part A: Germanium Diode (Forward bias & Reverse bias)
  - Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics
  - Part A: V-I Characteristic
  - Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter)
  - Part A: Half-wave Rectifier
  - Part B: Full-wave Rectifier
4. BJT Characteristics (CE Configuration)
  - Part A: Input Characteristics
  - Part B: output Characteristics
5. FET Characteristics
  - Part A: Drain Characteristics
  - Part B: Transfer Characteristics
6. SCR Characteristics



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- 7.UJT Characteristics
- 8.MOSFET Characteristics
- 9.Transistor Biasing
10. Measurement of electrical quantities using CRO
11. BJT-CE Amplifier
- 12.Emitter Follower –CC Amplifier
- 13.FET-CS Amplifier

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

**Equipment required:**

- 1.Regulated Power supplies
- 2.Analog/Digital Storage Oscilloscopes
- 3.Analog/Digital Function Generators
- 4.Digital Multi-meters
- 5.Decade Résistance Boxes/Rheostats
- 6.Decade Capacitance Boxes
- 7.Ammeters (Analog or Digital)
- 8.Voltmeters (Analog or Digital)
- 9.Active & Passive Electronic Components

**Course Outcomes:** At the end of the course, student will be able to

- Analyze the characteristics of diodes, transistors and other devices
- Design and implement the rectifier circuits, SCR and UJT in the hardware circuits.
- Design the biasing and amplifiers of BJT and FET amplifiers
- Measure electrical quantities using CRO in the experimentation.



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II Year I Semester		L	T	P	C
		0	0	4	2
SKILL ORIENTED COURSE DESIGN OF ELECTRICAL CIRCUITS USING ENGINEERING SOFTWARE TOOLS					

**Preamble:**

The aim of the course is to simulate various theorems and resonance. Also to determine self and mutual inductance of a magnetic circuit, parameters of a given coil through simulation.

**Course Objectives:**

- To Learn the fundamentals of MATLAB Tools
- To generate various waveform signals and sequences
  - To verify and simulate various electrical circuits using Mesh and Nodal Analysis
- To verify and simulate various theorems
- To verify and simulate RLC series and parallel resonance.
- To determine self and mutual inductance of a magnetic circuit, parameters of a given coil.

**List of Experiments**

**(Any 10 of the following experiments are to be conducted)**

**Note: MATLAB/SMULINK fundamentals shall be explained during the first week before starting of the Lab course**

1. Generation of various signals and sequences (Periodic and Aperiodic), such as unit Impulse, Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp.
2. Operations on signals and sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy, and Average Power
3. Verification of Kirchhoff's current law and voltage law using simulation tools.
4. Verification of mesh analysis using simulation tools.
5. Verification of nodal analysis using simulation tools.
6. Determination of average value, rms value, form factor, peak factor of sinusoidal wave, square wave using simulation tools.
7. Verification of super position theorem using simulation tools.
8. Verification of reciprocity theorem using simulation tools.
9. Verification of maximum power transfer theorem using simulation tools.
10. Verification of Thevenin's theorem using simulation tools.
11. Verification of Norton's theorem using simulation tools.
12. Verification of compensation theorem using simulation tools.
13. Verification of Milliman's theorem using simulation tools.
14. Verification of series resonance using simulation tools.
15. Verification of parallel resonance using simulation tools.
16. Verification of self inductance and mutual inductance by using simulation tools.



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**Course Outcomes:**

At the end of the course, student will be able to

- write the MATLAB programs to simulate the electrical circuit problems
- simulate various circuits for electrical parameters
- simulate various wave form for determination of wave form parameters
- simulate RLC series and parallel resonance circuits for resonant parameters
- simulate magnetic circuits for determination of self and mutual inductances



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II Year II Semester		L	T	P	C
		0	0	3	1.5
PYTHON PROGRAMMING LAB					

**Preamble:**

This lab is designed to impart the advanced programming skills to the students and prepare them to suitable for industry ready

**Course Objectives:**

The aim of Python Programming Lab is

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

- 1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
- 2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
- 3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
- 4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
- 5) Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.
 

```
*
**
***
****
```
- 6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
- 7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and *Not close* otherwise.
- 8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
- 9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For



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example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.

- 10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.
- 11) In algebraic expressions, the symbol for multiplication is often left out, as in  $3x+4y$  or  $3(x+5)$ . Computers prefer those expressions to include the multiplication symbol, like  $3*x+4*y$  or  $3*(x+5)$ . Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
- 12) Write a program that generates a list of 20 random numbers between 1 and 100.
  - (a) Print the list.
  - (b) Print the average of the elements in the list.
  - (c) Print the largest and smallest values in the list.
  - (d) Print the second largest and second smallest entries in the list
  - (e) Print how many even numbers are in the list.
- 13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
- 14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in  $[1,0,1,1,0,0,0,1,0,0]$  is 4.
- 15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list  $[1,1,2,3,4,3,0,0]$  would become  $[1,2,3,4,0]$ .
- 16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, it is much shorter with lists and it is also easier to add new conversions if you use lists.
- 17) Write a function called *sum\_digits* that is given an integer num and returns the sum of the digits of num.
- 18) Write a function called *first\_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
- 19) Write a function called *number\_of\_factors* that takes an integer and returns how many factors the number has.
- 20) Write a function called *is\_sorted* that is given a list and returns True if the list is sorted and False otherwise.
- 21) Write a function called *root* that is given a number x and an integer n and returns  $x^{1/n}$ . In the function definition, set the default value of n to 2.
- 22) Write a function called *primes* that is given a number n and returns a list of the first n primes. Let the default value of n be 100.



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- 23) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.  
 (a) Do this using the sort method. (b) Do this without using the sort method.
- 24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
- 25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
- 26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called *ftemps.txt*.
- 27) Write a class called Product. The class should have fields called name, amount, and holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get\_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make\_purchase* that receives the number of items to be bought and decreases amount by that much.
- 28) Write a class called Time whose only field is a time in seconds. It should have a method called *convert\_to\_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert\_to\_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
- 29) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class for example, *c = Converter(9,'inches')*. The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call *c. feet()* and should get 0.75 as the result.
- 30) Write a Python class to implement *pow(x,n)*.
- 31) Write a Python class to reverse a string word byword.
- 32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
- 33) Write a program to demonstrate Try/except/else.
- 34) Write a program to demonstrate try/finally and with/as.



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**Course Outcomes:**

By the end of this lab, the student is able to

- Write, Test and Debug Python Programs
- Use Conditionals and Loops for Python Programs
- Use functions and represent Compound data using Lists, Tuples and
- Dictionaries Use various applications using python





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II Year II Semester		L	T	P	C
		0	0	3	1.5
INDUCTION AND SYNCHRONOUS MACHINES LAB					

**Preamble:**

The aim of the lab is to provide a detailed analysis of operation and performance of 3-phase induction motor, 1-phase induction motor and synchronous machines. In addition, it also covers voltage regulation and parallel operation of synchronous generators.

**Course Objectives:**

**The students are able to understand the,**

- Speed control methods of three-phase induction motors.
- Performance characteristics of three-phase and single-phase induction motors.
- Principles of power factor improvement of single-phase induction motor.
- Voltage regulation calculations of three-phase alternator by various methods,
- Performance curves of three-phase synchronous motor.

**(Any 10 of the following experiments are to be conducted)**

1. Performance characteristics of a three- phase Induction Motor by conducting Brake test
2. Determination of equivalent circuit parameters, efficiency and regulation of a three phase Induction motor by conducting No-load & Blocked rotor tests
3. Determination of Regulation of a three-phase alternator by using synchronous impedance & m.m.f. methods
4. Determination of Regulation of a three-phase alternator by using Potier triangle method
5. Determination of V and Inverted V curves of a three phase synchronous motor.
6. Determination of  $X_d$  and  $X_q$  of a salient pole synchronous machine
7. Speed control of three phase induction motor by V/f method.
8. Determination of equivalent circuit parameters of single phase induction motor
9. Determination of efficiency of three-phase alternator by loading with three phase induction motor.
10. Power factor improvement of single-phase induction motor by using capacitors.
11. Parallel operation of three-phase alternator under no-load and load conditions
12. Determination of efficiency of a single-phase AC series Motor by conducting Brake test.
13. Starting of single-phase Induction motor by using capacitor start and capacitor start run methods.
14. Determination of efficiency of a single-phase Induction Motor by conducting Brake test.



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**Course Outcomes:**

At the end of the course, student will be able to

- Assess the performance of single phase and three phase induction motors.
- Control the speed of three phase induction motor.
- Predetermine the regulation of three-phase alternator by various methods.
- Find the  $X_d/X_q$  ratio of alternator and assess the performance of three-phase synchronous motor.
- Determine the performance of single phase AC series motor.



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II Year II Semester		L	T	P	C
		0	0	3	1.5
DIGITAL ELECTRONICS LAB					

**Preamble:**

The aim of this lab is to understand the Basics of digital electronics and able to design basic logic circuits, combinational and sequential circuits.

**Course Objectives:**

- To know the concept of Boolean laws for simplifying the digital circuits.
- To understand the concepts of flipflops.
- To understand the concepts of counters.
- To analyze and design various circuits.

**List of Experiments:**

Any TEN of the following Experiments are to be conducted

1. Verification of truth tables of Logic gates: Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
2. Design a simple combinational circuit and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit
3. Verification of functional table of 3 to 8 line Decoder / De-multiplexer
4. 4 variable logic function verification using 8 to 1 multiplexer.
5. Design full adder circuit and verify its functional table.
6. Design full Subtractor circuit and verify its functional table.
7. Verification of functional tables of Flip-Flops
8. Design a four bit ring counter using D Flip – Flops / JK Flip Flop and verify output
9. Design a four bit Johnson's counter using D Flip-Flops / JK Flip Flops and verify output
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip-Flops and Test it with a low frequency clock and Sketch the output waveforms.
11. Design MOD – 10 ripple counter using T- Flip-Flop and verify the result and Sketch the output waveforms
12. Design MOD – 8 synchronous counter using D Flip-Flop and verify the result and Sketch the output waveforms.

**Course Outcomes:** At the end of the course, student will be able to

- Learn the basics of gates, flip-flops and counters.
- Construct basic combinational circuits and verify their functionalities
- Apply the design procedures to design basic sequential circuits
- To understand the basic digital circuits and to verify their operation
- Apply Boolean laws to simplify the digital circuits.



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II Year II Semester		L	T	P	C
		0	0	4	2
SKILL ORIENTED COURSE					
IOT APPLICATIONS OF ELECTRICAL ENGINEERING					

**Preamble:**

The aim of this course is to introduce Internet of Things to simulate real time applications using Arduino/Raspberry Pi.

**Course Objectives:**

- To understand fundamentals of various technologies of Internet of Things.
- To know various communication technologies used in the Internet of Things.
- To know the connectivity of devices using web and internet in the IoT environment.
- To understand the implementation of IoT by studying case studies like Smart Home, Smart city, etc.

**List of Experiments:**

Any TEN of the following Experiments are to be conducted

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface temperature sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface Organic Light Emitting Diode (OLED) with Arduino/Raspberry Pi
6. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
8. Write a program on Arduino/Raspberry Pi to upload and retrieve temperature and humidity data to thingspeak cloud.
9. 7 Segment Display
10. Analog Input & Digital Output
11. Night Light Controlled & Monitoring System
12. Fire Alarm Using Arduino
13. IR Remote Control for Home Appliances
14. A Heart Rate Monitoring System
15. Alexa based Home Automation System

**Course Outcomes:**

After the completion of the course the student should be able to:

- apply various technologies of Internet of Things to real time applications.
- apply various communication technologies used in the Internet of Things.
- connect the devices using web and internet in the IoT environment.
- implement IoT to study Smart Home, Smart city, etc.



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## **COURSE STRUCTURE-R19**

### **COURSE STRUCTURE AND SYLLABUS**

**For**

**B. TECH ELECTRICAL AND ELECTRONICS ENGINEERING**

*(Applicable for batches admitted from 2019-2020)*



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**COURSE STRUCTURE-R19**

**III Year – I SEMESTER**

S. No	Course Code	Subjects	Category	L	T	P	Credits
1		Power Systems-II	EE	3	--	--	3
2		Power Electronics	EE	3	--	--	3
3		Linear IC Applications	ES	3	--	--	3
4		Digital Signal Processing	EE	3	--	--	3
5		Microprocessors and Microcontrollers	EE	3	--	--	3
6		Electrical Machines-II Laboratory	EE	--	--	3	1.5
7		Control Systems Laboratory	EE	--	--	2	1
8		Electrical Measurements & Instrumentation Laboratory	EE	--	--	3	1.5
9		Socially Relevant Projects	MC	--	--	1	1
<b>Total Credits</b>				<b>15</b>	<b>0</b>	<b>9</b>	<b>20</b>

**III Year – II SEMESTER**

S. No	Course Code	Subjects	Category	L	T	P	Credits
1		Electric Drives	EE	3	--	--	3
2		Power System Analysis	EE	3	--	--	3
3		Data Structures	ES	3	--	--	3
4		Digital Control Systems	EE	3	--	--	3
5		<b>Elective - I</b>	EL	3	--	--	3
6		<b>Open Elective - I</b>	OE	3	--	--	3
7		Power Electronics Laboratory	EE	--	--	3	1.5
8		Microprocessors & Microcontrollers Laboratory	EE	--	--	3	1.5
9		Employability Skills	MC	3	--	--	0
<b>Total Credits</b>				<b>18</b>		<b>6</b>	<b>21</b>



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**COURSE STRUCTURE-R19**

III Year – I SEMESTER				
	L	T	P	C
	0	0	3	1.5
<b>ELECTRICAL MACHINES – II LABORATORY</b>				

**Learning objectives:**

- To control the speed of three phase induction motors.
- To determine /predetermine the performance three phase and single phase induction motors.
- To improve the power factor of single phase induction motor .
- To predetermine the regulation of three–phase alternator by various methods, find  $X_d/ X_q$  ratio of alternator and asses the performance of three–phase synchronous motor.

**Any 10 of the following experiments are to be conducted:**

1. Brake test on three phase Induction Motor
2. No–load & Blocked rotor tests on three phase Induction motor
3. Regulation of a three –phase alternator by synchronous impedance &m.m.f. Methods
4. Regulation of three–phase alternator by Potier triangle method
5. V and Inverted V curves of a three—phase synchronous motor.
6. Determination of  $X_d$  and  $X_q$  of a salient pole synchronous machine
7. Equivalent circuit of single phase induction motor
8. Speed control of induction motor by V/f method.
9. Determination of efficiency of three-phase alternator by loading with three phase induction motor.
10. Power factor improvement of single-phase induction motor by using capacitors and load test on single-phase induction motor.
11. Parallel operation of three-phase alternator.
12. Brake test on single-phase AC series Motor.
13. Starting methods of a capacitor start and capacitor start run single-phase Induction motor.
14. Brake test on single-phase Induction Motor.

**Learning outcomes:**

After the completion of the course the student should be able to:

- assess the performance of single phase and three phase induction motors.
- control the speed of three phase induction motor.
- predetermine the regulation of three–phase alternator by various methods.
- find the  $X_d/ X_q$  ratio of alternator and asses the performance of three–phase synchronous motor.
- determine the performance single phase AC series motor.



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**COURSE STRUCTURE-R19**

III Year – I SEMESTER		L	T	P	C
		0	0	2	1
CONTROL SYSTEMS LABORATORY					

**Learning Objectives:**

- To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors and Synchros.
- To understand time and frequency responses of control system with and without controllers and compensators.

**Any 10 of the following experiments are to be conducted:**

1. Time response of Second order system
2. Characteristics of Synchros
3. Effect of P, PD, PI, PID Controller on a second order systems
4. Design of Lag and lead compensation – Magnitude and phase plot
5. Transfer function of DC motor
6. Bode Plot, Root locus, Nyquist Plots for the transfer functions of systems up to 5<sup>th</sup> order using MATLAB.
7. Controllability and Observability Test using MAT LAB.
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Characteristics of DC servo motor
12. Block Diagram Representation of Field Controlled DC servo Motor Using Simulink.

**Learning Outcomes:**

After the completion of the course the student should be able to:

- analyze the performance and working Magnetic amplifier, D.C and A.C. servo motors and synchros.
- design P,PI,PD and PID controllers
- design lag, lead and lag–lead compensators
- control the temperature using PID controller
- determine the transfer function of D.C Motor
- control the performance of D.C and A.C Servo Motor.
- test the controllability and observability.
- judge the stability in time and frequency domain.





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**COURSE STRUCTURE-R19**

III Year – I SEMESTER				
	L	T	P	C
	0	0	3	1.5
<b>ELECTRICAL MEASUREMENTS &amp; INSTRUMENTATION LABORATORY</b>				

**Learning Objectives:**

- To understand the correct function of electrical parameters and calibration of voltage, current, single phase and three phase power and energy, and measurement of electrical characteristics of resistance, inductance and capacitance of a circuits through appropriate methods.
- To understand the calibration of DC and AC Potentiometers.
- To understand the testing of CT and PT.
- To Understand and the characteristics of Thermo couples, LVDT, Capacitive transducer, piezoelectric transducer.
- To understand the measurement of strain, Phase difference and frequency.

**Any 10 of the following experiments are to be conducted**

1. Calibration of dynamometer wattmeter using phantom loading
2. Crompton D.C. Potentiometer - Calibration of PMMC ammeter and PMMC voltmeter
3. Kelvin's double Bridge - Measurement of resistance - Determination of tolerance.
4. Capacitance Measurement using Schering Bridge.
5. Inductance Measurement using Anderson Bridge.
6. Calibration of LPF Wattmeter – by direct loading.
7. Measurement of 3 phase power with single watt meter and 2 No's of C.T.
8. Testing of C.T. using mutual inductor – Measurement of % ratio error and phase angle of given C.T. by Null method.
9. P.T. testing by comparison – V.G as Null detector – Measurement of % ratio error and phase angle of the given P.T.
10. AC Potentiometer – Polar form/Cartesian form – Calibration of AC Voltmeter, Parameters of Choke
11. Thermocouple – characteristics
12. LVDT – characteristics.
13. Capacitive transducers characteristics.
14. Piezoelectric transducer characteristics.
15. Measurement of strain using strain gauge
16. Measurement of phase difference, frequency using Lissajous patterns in CRO.

**Learning Outcomes:**

After the completion of the course the student should be able to:

- measure the electrical parameters voltage, current, power, energy and electrical characteristics of resistance, inductance and capacitance.
- known the characteristics of transducers.
- measure the strains, frequency and phase difference.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**  
**KAKINADA – 533 003, Andhra Pradesh, India**  
**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**COURSE STRUCTURE-R19**

III Year – I SEMESTER				
	L	T	P	C
	0	0	1	1
<b>SOCIALLY RELEVANT PROJECTS</b>				

**Preamble:**

There is lot of scientific and technological changes in the nation during last few decades in almost all the sectors. The state and central governments are introducing many schemes to all classes of people of the nation to increase the productivity in various sectors. India is a rural centric nation and the fruits of the scientific inventions and new technology shall be shared among all remote corners of the nation. With this aim, a socially relevant project is newly introduced in the curriculum with an objective of taking up the projects relevant to the societal needs.

**Objectives:**

- (1) The student(s) shall explore the technological needs of society
- (2) The student(s) shall understand the technological problems of society

**General guidelines:**

- A socially relevant project shall be a community service based project and it shall be innovative.
- A student has to pursue the socially relevant project to solve real life and pressing problems of society.
- The pursued socially relevant projects shall contribute to national development goals and priorities.
- Socially relevant project can be carried out by an individual student or by a team of maximum 5 of concerned department.
- The student(s) shall visit the society (Villages/Hospitals/Social Service Organizations etc) to identify the problem and conduct literature survey and provide a feasible solution.
- The socially relevant project selected shall be in the broad area of concerned discipline of course. Preference shall be given to rural societal problems.
- Each team shall work under the supervision of a faculty member of the concerned department.
- If the course is offered in II Year I Semester, the student or team of students shall complete this project during the vacation after I Year and so on.
- The duration of the project is about 15 to 20 hrs in total and students may split total duration into 2 to 3 hrs per day based convenience. The attendance shall be maintained by the supervisor.

**Sample Projects (but not limited to):**

(i) Energy Auditing in a rural village (ii) Smart starting and control of motors in agriculture and aqua fields (iii) TV Remote Operated Domestic Appliances Control (iv) Solar Powered Auto Irrigation System (v) Auto Intensity Control of Street Lights (vi) Hidden Active Cell Phone Detector (vii) Railway Track Security System (viii) Solar



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**COURSE STRUCTURE-R19**

Power Charge Controller (ix) Home Automation System Using Digital Control (x) Intelligent Overhead Tank Water Level Indicator (xi) Pre Stampede Monitoring and Alarm System (xii) Detect Rash Driving Speed Checker System on Highways

**Outcomes**

- (1) The student(s) are be able to provide a solutions the technological problems of society
- (1) The student(s) is able suggest technological changes which suits current needs of society
- (2) The student(s) are able to explain new technologies available for problems of the society.

**Reference:**

- (1) Web Link: <http://iitk.ac.in/new/socially-relevant-research>
- (2) <https://csie.iitm.ac.in/SocialProjectsIITM.html>
- (3) [http://www.iitkgp.ac.in/files/csr/csr\\_education.pdf](http://www.iitkgp.ac.in/files/csr/csr_education.pdf)



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**COURSE STRUCTURE-R19**

III Year –II SEMESTER		L	T	P	C
		0	0	3	1.5
POWER ELECTRONICS LABORATORY					

**Learning objectives:**

- To study the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
- To analyze the performance of single-phase and three-phase full-wave bridge converters with both resistive and inductive loads.
- To understand the operation of AC voltage regulator with resistive and inductive loads.
- To understand the working of Buck converter, Boost converter and inverters.

**Any 10 of the Following Experiments are to be conducted**

1. Characteristics of Thyristor, MOSFET & IGBT.
2. R, RC & UJT firing circuits for SCR.
3. Single -Phase semi converter with R & RL loads.
4. Single -Phase full converter with R & RL loads.
5. Three- Phase full converter with R & RL loads.
6. Single Phase dual converter in circulating current & non circulating current mode of operation.
7. Single -Phase AC Voltage Regulator with R & RL Loads.
8. Single Phase step down Cycloconverter with R & RL Loads.
9. Boost converter in Continuous Conduction Mode operation.
10. Buck converter in Continuous Conduction Mode operation.
11. Single -Phase square wave bridge inverter with R & RL Loads.
12. Single - Phase PWM inverter.

**Learning outcomes:**

After the completion of the course the student should be able to:

- study the characteristics of various power electronic devices.
- analyze the performance of single-phase and three-phase full-wave bridge converters with both resistive and inductive loads.
- understand the operation of single phase AC voltage regulator with resistive and inductive loads.
- understand the working of Buck converter, Boost converter, single-phase square wave inverter and PWM inverter.



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**COURSE STRUCTURE-R19**

III Year –II SEMESTER		L	T	P	C
		0	0	3	1.5
MICRO PROCESSORS AND MICRO CONTROLLERS LAB					

**Learning Objectives:**

- To study programming based on 8086 microprocessor and 8051 microcontroller.
- To study 8086 microprocessor based ALP using arithmetic, logical and shift operations.
- To study to interface 8086 with I/O and other devices.
- To study parallel and serial communication using 8051 & PIC 18 micro controllers.

**Any 10 of the following experiments are to be conducted:**

**I. Microprocessor 8086 & Microcontroller 8051**

Introduction to MASM/TASM.

1. Arithmetic operation – Multi byte addition and subtraction, multiplication and division – Signed and unsigned arithmetic operation, ASCII – Arithmetic operation.
2. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
3. By using string operation and Instruction prefix: Move block, Reverse string Sorting, Inserting, Deleting, Length of the string, String comparison.
4. Interfacing 8255–PPI with 8086.
5. Interfacing 8259 – Interrupt Controller with 8086.
6. Interfacing 8279 – Keyboard Display with 8086.
7. Stepper motor control using 8253/8255.
8. Reading and Writing on a parallel port using 8051
9. Timer in different modes using 8051
10. Serial communication implementation using 8051
11. Understanding three memory areas of 00 – FF Using 8051 external interrupts.
12. Traffic Light Controller using 8051.

**Learning Outcomes:**

After the completion of the course the student should be able to:

- write assembly language program using 8086 micro based on arithmetic, logical, and shift operations.
- interface 8086 with I/O and other devices.
- do parallel and serial communication using 8051 & PIC 18 micro controllers.

**COURSE STRUCTURE AND SYLLABUS**  
**For**  
**ELECTRICAL AND ELECTRONICS ENGINEERING**  
*(Applicable for batches admitted from 2016-2017)*



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#### IV Year – I Semester

S. No	Subjects	L	T	P	Credits
1	Utilization of Electrical Energy	4	--	--	3
2	Linear IC Applications	4	--	--	3
3	Power System Operation & Control	4	--	--	3
4	Switchgear and Protection	4	--	--	3
5	<b><u>Elective – I:</u></b> 1. Electrical Machine Modeling and Analysis 2. Advanced Control Systems 3. Programmable Logic Controllers & Applications 4. Instrumentation	4	--	--	3
6	<b><u>Elective – II:</u></b> 1. Optimization Techniques 2. Electric Power Quality 3. Special Electrical Machines	4	--	--	3
7	Electrical Simulation Laboratory	--	--	2	2
8	Power Systems & Simulation Laboratory	--	--	2	2
<b>Total Credits</b>					<b>22</b>

#### IV Year - II Semester

S. No	Subjects	L	T	P	Credits
1	Digital Control Systems	4	--	--	3
2	HVDC Transmission	4	--	--	3
3	Electrical Distribution Systems	4	--	--	3
4	<b><u>Elective – III:</u></b> 1. High Voltage Engineering 2. Flexible Alternating Current Transmission Systems 3. Power System Reforms	4	--	--	3
5	Seminar	--	3	--	2
6	Project	--	--	--	10
<b>Total Credits</b>					<b>24</b>

**ELECTRICAL SIMULATION LAB****Learning objectives:**

- To simulate integrator circuit, differentiator circuit, Boost converter, Buck converter, full convertor and PWM inverter.
- To simulate transmission line by incorporating line, load and transformer models.
- To perform transient analysis of RLC circuit and single machine connected to infinite bus(SMIB).

**Following experiments are to be conducted:**

1. Simulation of transient response of RLC circuits
  - a. Response to pulse input
  - b. Response to step input
  - c. Response to sinusoidal input
2. Analysis of three phase circuit representing the generator transmission line and load. Plot three phase currents & neutral current .
3. Simulation of single–phase full converter using RLE loads and single phase AC voltage controller using RL loads
4. Plotting of Bode plots, root locus and nyquist plots for the transfer functions of systems up to 5<sup>th</sup> order
5. Simulation of Boost and Buck converters.
6. Integrator & Differentiator circuits using op–amp.
7. Simulation of D.C separately excited motor using transfer function approach.

**Any 2 of the following experiments are to be conducted:**

1. Modeling of transformer and simulation of lossy transmission line.
2. Simulation of single phase inverter with PWM control.
3. Simulation of three phase full converter using MOSFET and IGBTs.
4. Transient analysis of single machine connected to infinite bus(SMIB).

**Learning outcomes:**

- Able to simulate integrator circuit, differentiator circuit, Boost converter, Buck converter, full convertor and PWM inverter.
- Able to simulate transmission line by incorporating line, load and transformer models.
- Able to perform transient analysis of RLC circuit and single machine connected to infinite bus(SMIB).

**Reference Books:**

1. “Simulation of Power Electronic Circuit“,byM.B.patil, V.Ramanarayan, V.T.Ranganathan.Narosha,2009.
2. Pspice for circuits and electronics using PSPICE – by M.H.Rashid, M/s PHI Publications
3. Pspice A/D user`s manual – Microsim, USA
4. Pspice reference guide – Microsim, USA
5. MATLAB user`s manual – Mathworks, USA
6. MATLAB – control system tool box – Mathworks, USA
7. SIMULINK user`s manual – Mathworks, USA
8. EMTP User`s Manual.
9. SEQUEL– A public domain circuit simulator available at [www.ee.iitb.ac.in/~sequel](http://www.ee.iitb.ac.in/~sequel)



**POWER SYSTEMS LAB****Learning Objectives:**

To impart the practical knowledge of functioning of various power system components and determination of various parameters and simulation of load flows, transient stability, LFC and Economic dispatch.

**Any 10 of the Following experiments are to be conducted:**

1. Sequence impedances of 3 phase Transformer.
2. Sequence impedances of 3 phase Alternator by Fault Analysis.
3. Sequence impedances of 3 phase Alternator by Direct method.
4. ABCD parameters of Transmission line.
5. Power Angle Characteristics of 3phase Alternator with infinite bus bars.
6. Dielectric strength of Transformer oil.
7. Calibration of Tong Tester.
- 8 Load flow studies using Gauss-seidel method
9. Load flow studies using N-R method..
10. Transient Stability Analysis
11. Load frequency control with & without control
12. Load frequency control with control
13. Economic load dispatch with & without losses
14. Economic load dispatch with losses.

**Learning Outcomes:**

The student is able to determine the parameters of various power system components which are frequently occur in power system studies and he can execute energy management systems functions at load dispatch center.